

“Essay on the links between socio-economic inequalities and inclusive growth (case of the Morocco)”

« Essai sur les liens entre les inégalités socio-économiques et la croissance inclusive (cas du Maroc) »

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Abstract

This study aims to determine the nature of links between income inequality and inclusive growth in the Moroccan context. To do so, we started by literature review with the most recent studies, then we conducted an empirical analysis on Morocco over the period 1990-2020, then we established the link between the two variables in subperiods which are: 1990 to 2006 and 2007 to 2020. To establish the link between the variables in the overall period, stationarity and cointegration tests were used; Johansen cointegration test shows that there is evidence on the long-run relationship between the variables. Using Vector Error Correction Model (VECM), the analysis results show that there is a negative relationship between income inequality and economic growth. Granger Causality test shows that there is no causality between the two variables. In the sub-periods, we used a multiple linear regression model to establish the link between the variables.

Key words: Inclusive growth ; Income inequality ; Income distribution ; VECM.

Résumé

Cette étude vise à déterminer la nature des liens entre les inégalités de revenus et la croissance inclusive dans le contexte marocain. Pour ce faire, nous avons commencé par une revue de la littérature avec les études les plus récentes, puis nous avons mené une analyse empirique sur le Maroc entre 1990 et 2020, et ce avant d'examiner le lien entre les deux variables en sous-périodes (1990 à 2006 et 2007 à 2020). Pour étudier le lien entre les variables sur la période globale, des tests de stationnarité et de cointégration ont été utilisés ; le test de Johansen montre qu'il existe des preuves de la relation à long terme entre les variables. En utilisant le modèle vectoriel de correction d'erreurs (VECM), les résultats de l'analyse montrent qu'il existe une relation négative entre l'inégalité des revenus et la croissance économique. Le test de Granger montre qu'il n'y a pas de causalité entre les deux variables. Dans les sous-périodes, nous avons utilisé un modèle de régression linéaire multiple pour établir le lien entre les variables.

Mots clés : Croissance inclusive ; Inégalité des revenus ; Répartition des revenus ; VECM.

Introduction

Interest in the concept of development is not new, since economists have been interested in the problem of development since the 19th century, but the question of its sustainability has undergone significant growth and has become the subject of multidisciplinary research in recent decades (Henni S, 2004). The concern for the social sustainability of development is becoming more and more acute, especially for developing countries for which the persistence of poverty and the spectacular increase in inequalities constitute major challenges.

Approximating the relationship between inequality and economic growth has been the main concern of researchers and economists for more than a century, since the nature of this relationship is still imperceptible. Ideally, when the distribution of income remains unchanged, it is assumed that economic growth benefits the poor as well as the rich under the same conditions. However, the reality is that the process of growth is almost always accompanied by some dynamic in income distribution.

The question of the inclusiveness of growth is reviving the debate on economic policies aimed at reducing inequality, fighting poverty and promoting social development. In order to significantly reduce poverty and mitigate inequality, a rapid pace of growth is necessary and continuous, over the long term, while affecting all sectors of activity, with the inclusion of the entire working population (Ianchovichina & Lundstrom, 2009).

Furthermore, since the World Summit for Social Development in Copenhagen in 1995, there have been several efforts on the social front. However, the results are controversial because of the persistence of poverty in all its dimensions. Thus, the question of wealth distribution is today one of the most revisited and discussed issues in the development world.

This paper discusses the nature of the relationship between inequality and inclusive growth and highlights the complexity of this relationship through the establishment of a possible bidirectional causality. The following questions arise: Are there any links between economic growth and income inequality in the Moroccan context? If there is, is it unidirectional or bidirectional?

Using a time series analysis for Morocco between 1990 and 2020, we study the relationship between economic growth, inequality and other variables such as human capital, health and education.

This paper is organized as follows; the first point will present the literature review on the links between economic growth and inequalities. The second one will explore the research methods, in the third point we will present main results of the study, the last one will present the conclusion of this study.

1. INEQUALITIES AND GROWTH: A REVIEW OF THE LITERATURE

1.1. Theoretical literature review :

Inequality is defined as perceived unfair differences in the distribution of resources and translates into unequal access to certain social advantages or disadvantages. They are multidimensional and affect all forms of access to resources. Economic inequalities reflect an unequal distribution of wealth and correspond to all differences in income and wealth between individuals or social groups.

The concept of inclusive growth emerged following the failure of the Washington consensus in 1990. In the absence of a consensus on the definition of this concept, the literature agrees on two angles of approach, the first of which focuses on participation in the wealth creation process and the second on the distribution of the dividends of this wealth.

Although the literature on the links between economic growth and income inequality is abundant, the reciprocal impact of the two phenomena remains ambiguous. Classical growth theory discusses the existence of a direct relationship between economic growth and living standards. Kuznets estimated (Barthélemy, 1995) that the relationship between GDP per capita and inequality is in the form of an inverted U-shaped curve. According to Kuznets' (Henni S, 2004) thesis, inequality initially increases, then stagnates and then decreases. Several theoretical models have examined the relationship between income distribution and the process of economic development (Orazio A, Chiara B, 2004). These theories are grouped into two broad categories: the first requires the existence of a positive relationship between growth and inequality (channels of individual savings and investment incentives), while the second considers the negative impact of a disproportionate distribution of income on the growth process (channels of social and political instability, fiscal and tax policy, and imperfect credit markets).

The theoretical current that considers that inequality supports growth is based on three arguments (Orazio A, Chiara B, 2004). The first is based on Kaldor's hypothesis (1955/1956), which predicts that the marginal propensity to save would be much higher among the rich than

among the poor. The second argument enshrines the indivisibility of investment to explain the positive effect of income inequality on growth. Galor and Tsiddon (1997) consider that in order to initiate new industrial activities and promote technological innovation, the concentration of wealth remains indispensable to any successful development process. The third argument defending the stimulating effect of inequalities on growth (Mirrlees, 1971) is based on considerations of performance motivation through monetary incentives.

Theories admitting that income inequality breaks growth are segmented into three broad categories (Panagiotis E. Petrakis, 2020): the social and political instability channel (Hibbs, 1973; Venieris and Gupta, 1983 & 1986, ; Gupta, 1990; Alesina and Perotti, 1996), the political economy channel (Bertola, 1993; Alesina and Rodrik, 1994; and Persson and Tabellini, 1994), and the imperfect credit and capital markets channel (Banerjee & Newman, 1993; and Aghion & Bolton, 1997).

1.2. Review of the empirical literature:

Empirically, several studies have attempted to assess the overall impact of inequality on growth by emerging the following three types of responses:

1.2.1. Inequality is necessary for growth:

Prior to the 1990s, the widespread view was that inequality encourages effort and saving. Adelman and Robinson (1989) argued that "inequality is necessary for accumulation and contains the seeds of eventual growth in one's income" (Riboni A, Avril 2011). In the same vein, Li and Zou (1998), Deninger & Squire (1998), Forbes (2000), and Ostry et al. (2014) also find a positive relationship between inequality and economic growth.

1.2.2. Inequality is bad for growth:

Through empirical studies conducted, in the 1990s, another position emerged predicting that inequality is bad for growth. Persson and Tabellini (1994), Alesina and Rodrik (1994), Clarke (1995) and Alesina and Perotti (1996), have all shown that inequality is negatively correlated with growth, pointing out that the magnitude of the relationship is relatively weak, although the direction of causality is ambiguous. In addition, Diniger and Squire (1998) find a strong relationship by showing that income inequality reduces income growth for the poor and not for the rich (Amarante, 2014). Similarly, Castello (2010) finds a negative effect of income and human capital inequality in low-income countries (Kh. Mdingi, S. Ho, 2021).

1.2.3. Lack of linkage between inequality and growth:

The previous view will be challenged by another wave of panel data studies, conducted in the late 1990s by proving the non-existence of a stable relationship between growth and inequality. In addition to Barro (2000), the OECD experts (2012) also consider that "despite abundant theoretical work on the links between inequality and growth, no consensus has emerged and the empirical evidence is inconclusive" (OCDE, 2012).

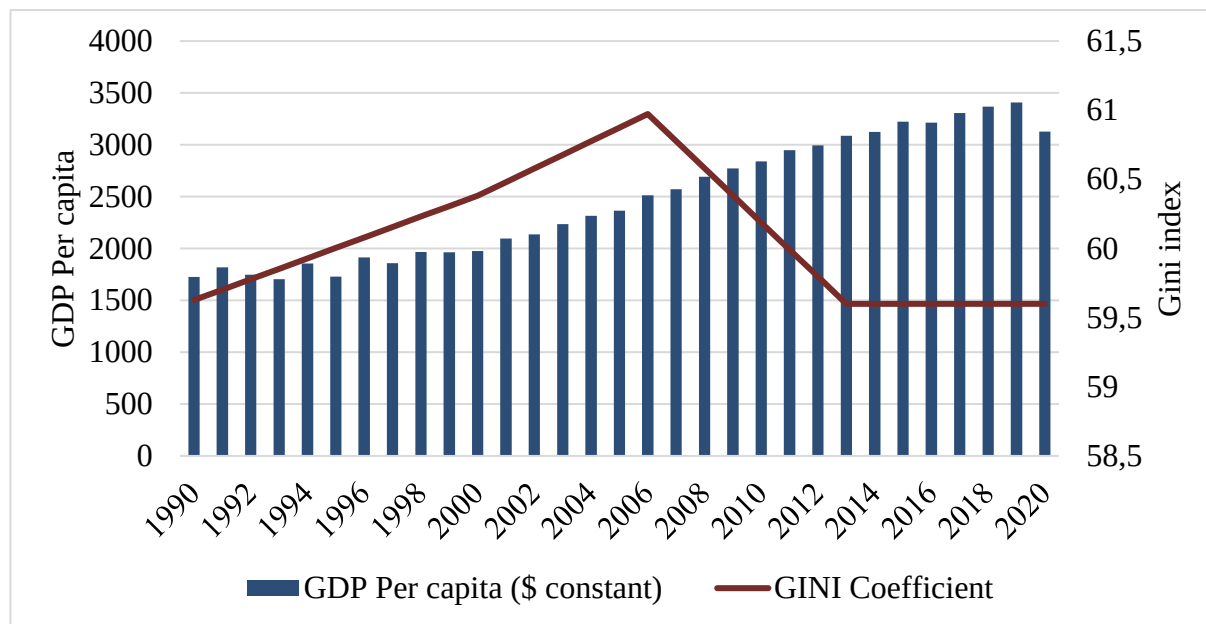
2. **STYLIZED FACTS**

Before presenting our results, we quickly describe the evolution and structure of the Moroccan economy. This description of productive structures will allow us to highlight the duality of the economy. First of all, there is the agricultural sector, whose value added represents 15% of the total.

In addition, non-agricultural activities contribute more to growth (by size effect) than to its volatility. Services account for the largest share of these activities: they provide more than 60% of the value added. The secondary sector accounts for between 26% and 29% of overall value added.

Morocco's GDP per capita recorded an average annual growth rate of 2% between 1990 and 2020. During the period 2016-2019, five regions of the country have a GDP per capita higher than the national average. These are the regions of Ed Dakhla-Oued-Ed Dahab, Casablanca-Settat, Laayoune-Saguia al Hamra, Rabat-Salé-Kénitra and Guelmim-Oued Noun.

Figure 1. Evolution of GDP per capita and Gini index in Morocco between 1990 and 2020



Source : Author's based on World Bank, WID Data

The launch by Morocco of several initiatives in the social field has helped to improve the living conditions of the population, in particular the INDH. In the wake of the steady increase in Gross National Income per capita, monetary poverty has been greatly reduced. The Gini index showed an upward trend between 1990 and 2007, then a downward trend between 2007 and 2014, and then became stable over the rest of the period.

Despite government efforts in recent years, the education system is still marked by high inequality. The Gini index for the education sector, although declining since the 1980s in line with the steady increase in the number of years of schooling, remains high, at 0.55 in 2014.

Educational inequalities can also be seen in public spending on education by living standard. In particular, public spending on secondary and higher education benefits more the wealthy social strata, since 29% of those enrolled in this level of education belong to the 20% of the wealthiest households, compared to 10% for the 20% of the least wealthy.

Furthermore, inequalities of opportunity or chance still remain important within the education system, given the significant impact of the social origin of the pupil and his or her socio-economic and cultural conditions on school success.

In terms of access to health, significant disparities persist, as illustrated by some key indicators from the 2011 National Population and Family Health Survey: the infant mortality rate is 33.9 per 1,000 live births for children from poor households, while it is only 18.7 per 1,000 live births for those from wealthy households.

However, as the financing of health expenditure in Morocco is still dominated by direct household payments (50.7% of total health expenditure in 2013).

3. RESEARCH METHODOLOGY

The data used in this study were taken mainly from the World Bank, the IMF, the World Inequality Database (WID), the UNESCO Institute for Statistics (UIS) and the IKH-Barro database. Income inequality was measured by the Gini index. Economic growth was measured by GDP per capita at constant 2010 prices. Human capital was measured by the secondary school completion rate (% of the population having completed secondary school). The study used annual data for Morocco between 1990 and 2020.

Variable	Symbol	Exprimé en	Source
Gini Index	Gini	-	WID
GDP per capita (USD)	GDP	USD/Capita	World Bank
Public spending on education	EDUC	% of GDP	World Bank
Secondary school completion rate	HK	% of the population aged between 15 and 60	IKH-Barro
Public expenditure on health	Health	% of GDP	World Bank

3.1. Analysis of the overall period (1990-2020)

For the analysis over the whole period from 1990 to 2020. We used the VECM approach as an econometric approach to examine the link between economic growth and inequality. In the first stage of the econometric analysis, all variables were tested for stationarity. We used the augmented Dickey-Fuller test and the Phillips-Perron test to check the variables have achieved stationarity or not. The second step is to perform the cointegration test which is is very important to know the existence of a long run relationship between the variables (Engle and Granger, 1987).

The third step is to verify the causality analysis between the two variables using a vector error correction model (VECM). Finally, to justify the robustness of the VECM model, we will use

the tests of stationarity of the VECM model, autocorrelation of the residuals, normality and homoscedasticity of the residual errors and stability of the model.

The general function used is the following:

$$Gini_t = f(GDP_t, Educ_t, HK_t, Health_t)$$

The estimation of the long term model equation is as follows:

$$Gini_t = \alpha + \beta GDP_t + \gamma Educ_t + \theta HK_t + \lambda Health_t + \epsilon_t$$

Where: Gini index (Gini), GDP per capita in USD (GDP), human capital (HK), health expenditure in USD (Health) and public expenditure on education (Educ).

3.2. Sub-period analysis

The analysis of the sub-periods (1990-2006 first sub-period and 2007-2020 second sub-period) was conducted using a multiple regression model. Taking the same regression equation as above.

4. RESULTS AND DISCUSSION

4.1. Study on the global period (1990-2020)

4.1.1. Unit root test

In order to check the stationarity of the four variables, we used ADF tests. The hypothesis of the ADF test can be formulated as follows (for example):

- The variable is not stationary (have a unit root)
- The variable is stationary (doesn't have a unit root)

We can reject the null hypothesis if the p-value is less than 5%. When the variable is not stationary, we take the first difference of the variables in order to make it stationary.

To investigate the stationary property of a variable, we used the augmented Dickey-Fuller and Phillips-Perron unit root test. The study indicates that, with the exception of the population growth rate, all variables are not stationary at the level in the two unit root tests. When these series (GDP, Gini, Educ, HK, and Health) are converted to first difference, then they become stationary.

Then these series are said to be integrated of order 1.

Variable	Test Dickey-Fuller		Test Phillips-Perron		Integration order
	At level	1st difference	At level	1st difference	
GDP	-2.093636	-8.314694***	-2.050652	-7.891517***	I(1)
Gini	-2.396399	-3.488102*	-1.485322	-1.737487*	I(1)
Educ	-0.169125	-4.534783***	-0.361142	-4.534783***	I(1)
Health	-2.367446	-3.811795**	-0.916922	-3.919616**	I(1)
HK	-2.513355	-8.972288***	-2.555116	-8.972288***	I(1)

*Significant at 10%, ** Significant at 5%, *** Significant at 1%

4.1.2. The selection of the optimal lag of the model

One of the most important properties in the VAR model is the selection of lags because Johansen cointegration tests are sensitive to the lags used. This criterion method is used throughout the unrestricted VAR. Therefore, the order of the optimal lag used is selected according to the information criteria.

According to the results in the table below, the optimal lag order is 1. We use this lag order to estimate the Johansen cointegration and VECM tests. The optimal lag order is sensible for both techniques

Lag	LogL	LR	FPE	AIC	SC	HQ
0	233.1448	NA	1.01e-13	-15.73412	-15.49838	-15.66029
1	444.2537	334.8624*	2.78e-19*	-28.56922*	-27.15478*	-28.12624*
2	466.7435	27.91838	3.91e-19	-28.39611	-25.80296	-27.58396

4.1.3. The cointegration test

To demonstrate the long-term correlation between the variables, we applied Johansen cointegration test.

The null hypothesis is that there is no cointegration in the equation. The rejection of the null hypothesis means that the equation is cointegrated.

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.746334	39.78041	33.87687	0.0088
At most 1	0.564606	24.11364	27.58434	0.1308
At most 2	0.507301	20.52784	21.13162	0.0605
At most 3	0.259914	8.728688	14.26460	0.3094
At most 4	0.000379	0.010989	3.841466	0.9163

Johansen's unrestricted rank cointegration test (maximum eigenvalue and trace) shows that there is a single long-run relationship between the variables. (*) indicates rejection of the null hypothesis means that there is cointegration between the variables.

4.1.4. Model results

The table below presents the long-term relationship based on the model of the equation.

Variance dépendante : ln(Gini)			
Variables	Coefficient	Ecart-type	t-Statistic
Constante	34.94092	-	-
Ln(GDP)	-1.777399	(0.25658)	[-6.92730]***
Ln(Educ)	0.723005	(0.14589)	[4.95571]***
Ln(Health)	0.848141	(0.08695)	[9.75379]***
Ln(HK)	-0.800562	(0.08861)	[-9.03472]***

The estimated long-run equation of this model is written in the following form:

$$\ln(Gini) = 34.94 - 1.77 * \ln(GDP) + 0.72 * \ln(Educ) + 0.84 * \ln(Health) - 0.80 * \ln(HK)$$

The results show that all coefficients are statistically significant at the 1% level. The results in our case revealed a negative and significant relationship between inequality and economic growth, which means that when economic growth increases, inequality tends to decrease. Thus public spending on education contributes positively to inequality in the long run. The

coefficients of the long-run relationship are long-run elasticities. Each coefficient measures the corresponding magnitude or extent of change in the dependent variable following a unit or percentage change in a particular explanatory variable.

4.1.5. Granger causality test

By examining the Granger causality between income inequality and economic growth. The main interest of this test lies in examining the Granger-Causality between the economic growth variables and income inequality. The following table presents the results of the Granger test between the two variables of interest: economic growth and inequality.

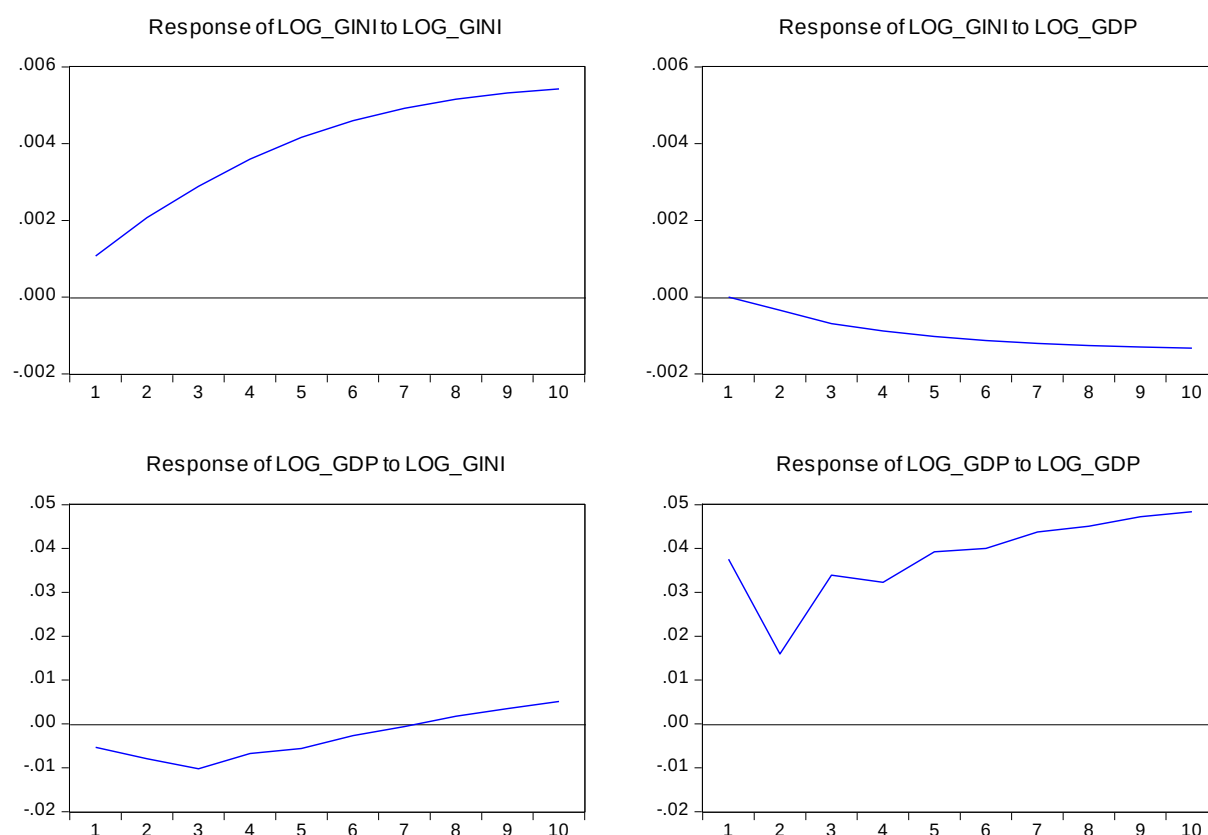
Dependent variable: D(LOG_GINI)			
Excluded	Chi-sq	df	Prob.
D(LOG_GDP)	0.000826	1	0.9771

Dependent variable: D(LOG_GDP)			
Excluded	Chi-sq	df	Prob.
D(LOG_GINI)	0.654422	1	0.4185

Based on the results of the above tables, the chi-square probability results obtained in both tables are higher than 5% and therefore the hypothesis that there is no causality between economic growth and inequality in the long run is accepted at 5%. Therefore, these two variables do not have a causal relationship with each other in the long run.

4.1.6. Impulse response function

Response to Cholesky One S.D. Innovations



As shown in the previous figures, according to the top right graph a positive one standard deviation shock to income inequality creates a negative effect and then spreads over the whole 10 period. The bottom left graph shows that a positive one standard deviation shock to economic growth decreases and lowers income inequality until the third period, the effect becomes positive until the last period.

4.2. Sub-periods analysis

4.2.1. Results of the analysis of the first sub-period: 1990 – 2006

Dependent variable: Ln(Gini)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GDP	-0.003263	0.002878	-1.133671	0.2791
LOG_EDUCATION	0.001683	0.003457	0.486908	0.6351
LOG_HEALTH	0.018429	0.002171	8.490524	0.0000
LOG_HK	0.004363	0.002714	1.607914	0.1338
C	3.718005	0.028058	132.5116	0.0000

The results of the first sub-period show that the relationship between economic growth and inequality is negative but not significant at the 5% level. The only variable that was significant at the 5% level was health, where the relationship between inequality and the health share of GDP was positive.

4.2.2. Results of the analysis of the second sub-period: 2007-2020

Dependent variable: Ln(Gini)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GDP	-0.055052	0.014175	-3.883789	0.0037
LOG_EDUCATION	0.007077	0.006925	1.021970	0.3335
LOG_HEALTH	0.004585	0.011859	0.386602	0.7080
LOG_HK	-0.044649	0.015551	-2.871160	0.0184
C	4.531060	0.248686	18.22002	0.0000

The results of the second sub-period were different from the first, as the link between economic growth and inequality is negative and significant at the 5% level, which shows the importance of growth in reducing inequality in Morocco during this period. Human capital measured by the secondary school completion rate contributes negatively to inequality, which also shows that this variable reduces income inequality in Morocco during this period.

Conclusion

In conclusion, this study has established relationships between economic growth and income inequality on two dimensions:

- In the long run using a VECM model after testing the stationarity of the series and the long run relationship between the variables. Unit root tests for the data series of the variables considered in the study established that the time series are integrated of order one, I(1). Johansen cointegration tests showed that there is a long-term relationship between the variables. Subsequently, the VECM and Granger causality tests showed that there is no causal link between economic growth and income inequality. The coefficient associated with economic growth in the long run is negative and significant at the 5% level, which shows that economic growth increasingly contributes to an equal distribution of income.

- Using sub-periods, it was concluded that the relationship can be established in two sub-periods:
 - The first between 1990 and 2006: The relationship between economic growth and income inequality was negative and not significant, but the relationship between the health variable and inequality was positive
 - The second between 2007 and 2020: The relationship between economic growth and income inequality was negative and significant at the 1% level. This shows the importance of growth in reducing inequality during this period, and human capital as measured by the secondary school completion rate was negative and significant.

The results of our study have confirmed to us that generally, growth is not sufficient to reduce inequalities and/or poverty. In fact, it is a necessary condition that must be accompanied by the implementation of policies to reduce inequalities, making it possible to better direct the dividends of growth towards the parties concerned. An integration of distribution problems could be the basis of another policy to reduce inequalities and fight against poverty, above all through the mobilization of certain mechanisms for sharing wealth. Thus, if we can propose certain actions to be undertaken in the light of the results of this study, a fundamental measure must be underlined, it is in this case to work seriously for the reduction of inequalities. This must be based on inclusive and pro-poor growth, that is to say growth in which the poor are actively involved and which would consist in raising the standard of living of the poor in order to create the conditions fairer access to opportunities and sustainable poverty reduction.

It is worth mentioning that there are several limitations in this study which needs further research. One limitation is that we didn't include institutional quality variables which may impact or improve the links between economic growth and income inequality. Another limitation is that our study didn't deepen the analysis during crisis period which could be a factor for income inequalities.

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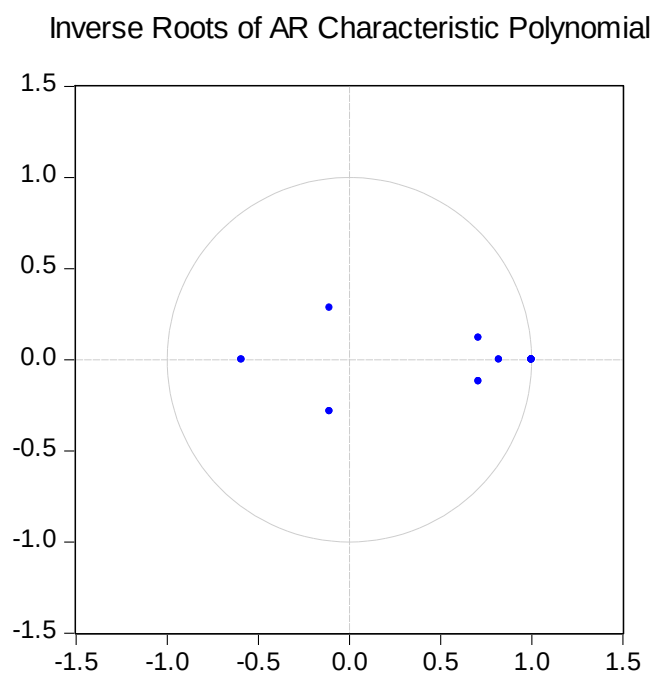
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ANNEX:**1. Short-run relationship analysis**

Error Correction:	D(LOG_GINI)	D(LOG_GDP)	D(LOG_EDUCATION)	D(LOG_ACHIEVEMENT)	D(LOG_HEALTH)
CointEq1	-0.003897 (0.00010) [-3.89744]	-0.095396 (0.14518) [-0.65707]	0.416285 (0.09540) [4.36357]	-0.296245 (0.07696) [-3.84953]	0.064778 (0.15092) [0.42922]
D(LOG_GINI(-1))	0.770178 (0.13461) [5.72140]	-3.852136 (4.76182) [-0.80896]	5.486357 (3.12900) [1.75339]	-9.163223 (2.52406) [-3.63035]	8.649293 (4.94991) [1.74736]
D(LOG_GDP(-1))	0.000208 (0.00724) [0.02873]	-0.508792 (0.25602) [-1.98728]	-0.556057 (0.16823) [-3.30526]	0.242401 (0.13571) [1.78618]	0.147509 (0.26614) [0.55426]
D(LOG_EDUCATION(-1))	0.007089 (0.00535) [1.32400]	0.168164 (0.18940) [0.88789]	0.450539 (0.12445) [3.62015]	0.139673 (0.10039) [1.39128]	0.181757 (0.19688) [0.92319]
D(LOG_ACHIEVEMENT(-1))	0.005482 (0.00506) [1.08362]	0.245541 (0.17895) [1.37209]	0.045158 (0.11759) [0.38402]	-0.228616 (0.09486) [-2.41010]	0.066931 (0.18602) [0.35980]
D(LOG_HEALTH(-1))	-0.007205 (0.00491) [-1.46732]	0.269670 (0.17369) [1.55258]	0.436439 (0.11413) [3.82394]	0.374519 (0.09207) [4.06787]	0.719211 (0.18055) [3.98338]
R-squared	0.745596	0.286406	0.471752	0.707465	0.042840
Adj. R-squared	0.690290	0.131277	0.356915	0.643871	-0.165239
Sum sq. resids	2.65E-05	0.033123	0.014302	0.009306	0.035791
S.E. equation	0.001073	0.037949	0.024936	0.020115	0.039448
F-statistic	13.48146	1.846244	4.108029	11.12463	0.205882
Log likelihood	160.4991	57.08577	69.26333	75.49380	55.96228
Akaike AIC	-10.65511	-3.523157	-4.362988	-4.792676	-3.445675
Schwarz SC	-10.37222	-3.240268	-4.080100	-4.509787	-3.162786
Mean dependent	-5.93E-05	0.018723	0.025293	0.025325	0.058397
S.D. dependent	0.001928	0.040715	0.031096	0.033707	0.036544
Determinant resid covariance (dof adj.)		3.38E-19			
Determinant resid covariance		1.06E-19			
Log likelihood		427.7460			
Akaike information criterion		-27.08593			
Schwarz criterion		-25.43575			

2. Model stability



3. Autocorrelation test

Lags	LM-Stat	Prob
1	21.10850	0.6865
2	27.60199	0.3265
3	27.78275	0.3180
4	14.84523	0.9449

Probs from chi-square with 25 df.

4. Heterosedasticity test

Joint test:

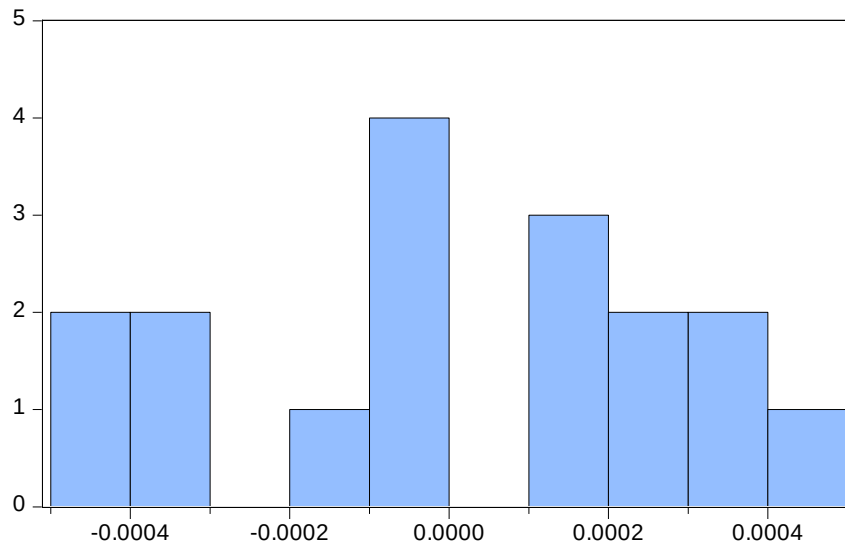
Chi-sq	df	Prob.
208.5571	180	0.0712

Joint test:

Chi-sq	df	Prob.
429.2645	405	0.1951

5. Results of sub-periods: Post-regression tests

1990-2006 sub-period



Series: Residuals
Sample 1990 2006
Observations 17

Mean -3.66e-16
Median -2.18e-05
Maximum 0.000443
Minimum -0.000486
Std. Dev. 0.000285
Skewness -0.265343
Kurtosis 1.914786

Jarque-Bera 1.033682
Probability 0.596401

- Autocorrelation test

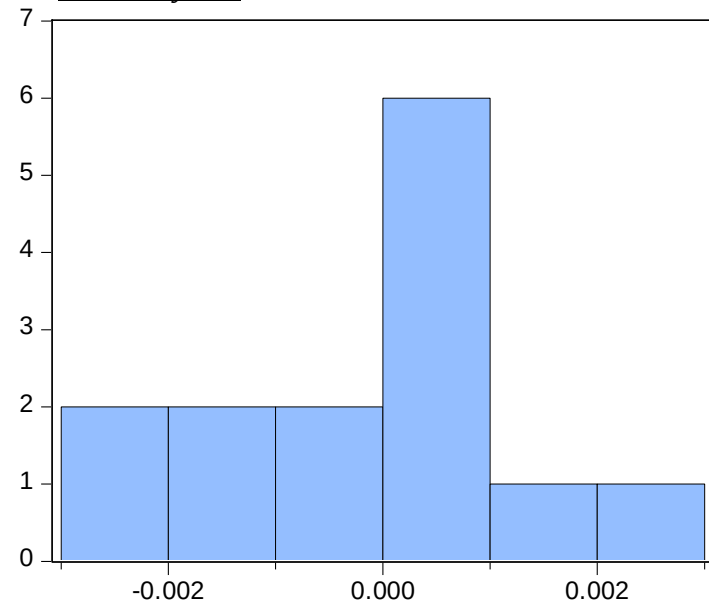
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.323711	Prob. F(2,10)	0.3090
Obs*R-squared	3.558526	Prob. Chi-Square(2)	0.1688

- Heterosedasticity test

Heterosedasticity Test: White

F-statistic	2.488723	Prob. F(11,5)	0.1623
Obs*R-squared	14.37460	Prob. Chi-Square(11)	0.2130
Scaled explained SS	3.276045	Prob. Chi-Square(11)	0.9866

2007-2020 sub-period- Normality test

Series: Residuals
 Sample 2007 2020
 Observations 14

Mean 6.34e-16
 Median 0.000226
 Maximum 0.002934
 Minimum -0.002574
 Std. Dev. 0.001494
 Skewness 0.029213
 Kurtosis 2.558224

Jarque-Bera 0.115838
 Probability 0.943726

- Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.798091	Prob. F(2,7)	0.4873
Obs*R-squared	2.599590	Prob. Chi-Square(2)	0.2726

- Heterosedasticity test

Heterosedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.374771	Prob. F(4,9)	0.1294
Obs*R-squared	7.188853	Prob. Chi-Square(4)	0.1262
Scaled explained SS	2.314666	Prob. Chi-Square(4)	0.6781