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THE CAUSALITY BETWEEN INCOME INEQUALITY AND ECONOMIC GROWTH: CASE OF TUNISIA, JORDAN, TAIWAN AND JAPAN

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ABSTRACT

This paper explores the causality issue between income inequality and economic growth for 4 countries economically different for the period ranging from 1960 to 2012. In this article, we applied the cointegration techniques, that means the Granger causality tests (in the long-run and short-run). The results of this paper indicate that the Granger causality in the long-run exist for Taiwan and Japan. Moreover, the Granger causality in the short-run exist in developing countries; Tunisia and Jordan.

Keywords: *Income Inequality; Economic Growth; Causality and cointegration,*
Jel Classification: *I3; O4; C32*

INTRODUCTION

Economic growth is considered to be a powerful force for reducing income inequality and then reducing poverty. In recent years, many empirical studies have attempted to examine the relationship between income inequality and economic growth. Firstly, it should be noted that poverty is measured by income, so there is a great connection between these two terms. Indeed, poverty reduction requires increasing the incomes of poor agents so that they exceed a certain threshold. In this context, many works have been developed to explore the complex relationship between income inequality and economic growth. According to some economists, the evolution of the poverty rate is the result of the evolution of average income and changes in income distribution. In fact, this analysis of the interactions that constitute what Bourguignon. (2003) means: The triangle Growth, Inequality and Poverty. The primary objective of this economist was to investigate the foundations development strategies. Is that they are based on growth, poverty and / or inequality? In his article, he explained that the answer can be expressed in two steps: First, the rapid elimination of absolute poverty is a significant objective for development. Then, to quickly reduce absolute poverty, countries must follow appropriate policies for growth and income distribution.

Finally, Bourguignon. (2003) stated that poverty reduction (which is a development strategy), in a given country at a given time, is determined entirely by the rate of growth of average income of the population and the change in income distribution. Refers to many empirical researches, this study used causality and cointegration techniques and improved data on income inequality to assess the possible steady-state relationship between economic growth and income inequality for 4countries : Tunisia, Jordan, Taiwan and Japan over the period of 1960-2012. In this paper, we will present a theoretical literature of the impact of income inequality on economic growth. Then we will present the empirical part in which we study the cointegration between growth and inequality.

1-Review of the literature on the relationship between income inequality and growth

The major economic problem in the world is the fight against poverty. To do this, it is necessary to take into account two aspects: economic growth and income inequality. There must be policy targets for effective redistribution of wealth in order to promote growth. This encourages the state to invest more in different sectors of education, health, infrastructure, etc.. It allows to stimulate growth and to slow down poverty. Economic research on the study of the relationship between income inequality and growth have always held an important place in research developing economy. However, they are contradictions in economic thinking. Some economists suggest that unequal distribution of income stimulates economic growth. While others say that income inequality hampers growth and contributes to increase poverty. However, Bourguignon (2003) argue that reducing inequality causes the reduction of poverty. According to Deininger and Squire (1996), to reduce poverty and promote growth, it is necessary that public authorities reinforce their efforts to distribute the income with an egalitarian manner. In this context, Piketty and Saez (2003) suggest that countries with a large number of poor and unequal distribution of income cannot benefit from strong economic growth. In contrast, countries that are characterized by an equal distribution of income and a good proportion of the rich population can profit from advanced economy. Atkinson. (2002) explains the importance of income distribution for two reasons. The first one is to explain how the level of inequality has an impact on economic growth. The second expresses that the convergence towards more egalitarian countries promotes growth.

In addition, Kuznets (1955), known by the famous inverted-U, connects the national income per capita and the inequality. He says that the increase in productivity in the modern sector without redistribution in favor of the rural sector led to a more unequal distribution of income.

The Kuznets hypothesis postulates that an increase in inequality during the first period is followed by a decline since the late nineteenth or early twentieth century. This double movement is related to the fact that if there is a gap between average household incomes in the two sectors (rural and modern), the transfer of labor from one sector to another is sufficient to reduce inequality. In contrast, Deininger and Squire (1996) have criticized the Kuznets hypothesis stating that to achieve a high level of growth, we must consider an equal distribution of income.

Some researchers have suggested that the growth stimulation leads to the generation of employment and thus reduce unemployment Todaro (2003), it reduces the wage differentials between households Galor and Zeira (1996). A high level of income allows the state to allocate more tax in different estates: health, education and social protection ... This favors the poor to invest more in human capital Perotti (1993).

Barro (2000) concluded that the effect of income inequality on growth can be positive or negative depending on the level of economic development of the country. Income inequality in poor countries retards economic growth, while income inequality in rich countries stimulates growth. Using panel data, he showed that the correlation between inequality and growth is negative in the initial phase of economic development. This correlation can be positive during the stable phase of development. Among economists that showed a positive relationship between income inequality and growth are cited: Bourguignon. (2003), Aghion. and Howitt. (1996), Forbes (2000). Economists who said the negative relationship are Perotti (1993), Alesina and Perotti (1996).

Some researches show that there is a negative causal relationship between the initial level of inequality and the rate of long-run growth. Alesina and Rodrik. (1994) argue that initial inequalities are strongly related to growth rate, that is to say, if initial inequality is low it can accelerate growth and this contribute to slow down poverty.

According to Piketty and Saez (2003), the poor suffer from several problems due to credit market imperfections. In this context, the effect of credit market imperfections cause a phenomenon called "moral hazard". It gives a false perception about the debtors creditors. The financial organisms must provide guarantees to secure their transactions, in this case we speak about the phenomenon of “anti-selection”. For Piketty and Saez (2003) countries with a high level of poverty rate and high degree of income inequality have a greater impact on economic growth than countries with low poverty rates and low degree of inequality.

2-Empirical analysis of the contribution of income inequality on economic growth:

The approach consists of investigating empirically the causality between income inequality and economic growth in Tunisia, Jordan, Taiwan and Japan. Unit root tests are first used to establish the degree of integration of the variables and then the cointegration techniques are used to test the existence of a co-evolution between inequality and growth proxies in the long-run.

In this study, we are chose four indicators of income inequality. The first one represent a traditional proxy of income inequality, it’s the *Gini index*. This index measure the level of inequality in the distribution of the income in the society. In fact, if the coefficient has a minimum value of 0 we talk about perfect equality. Besides, when it has a maximum value of 1 we are in the case of perfect inequality, Second, we have the *openness rate (Openness)*. In fact , it is the sum of exports and imports of goods and services as a % of GDP. The third indicator of income inequality is *the secondary school enrolment rate (School)*, refers to Benhabib and Spiegel (1994) this indicator represent a good proxy of the human capital. Finally, the fourth indicator is used to measure the physical. We means the *gross fixed capital formation (GFCF)* as a % of GDP. Concerning the economic growth, the standard literature on the ties between economic growth and income inequality generally uses the growth rate of GDP per capita. The data sources are the Word Development Indicators (WDI) of the World Bank. (2012), and all variables are expressed in national currencies. The time span of the variables is 1960-2012.

Methodology

The aim of this paper is to resolve the causality issue between income inequality and economic growth. First, we have to check whether each variable is stationary or not. In other words, it's necessary to establish the degree of integration (the stationarity) of the series. One these tests are carried out, we focus on the non-stationary variables. For these variables, we say that a co-evolution between income inequality and economic growth indicators in the long-run may exist. And we have to test the cointegration between them. Such a test provides evidence of existence of a stable long-run equilibrium relationship between different proxies of inequality and economic growth. But, if the long run relationship between these indicators is absent, the causality tests are limited to short-run test of causality.

2-1: The analysis of the stationarity

This test consists to detect the non-stationary variables and then apply the cointegration test on these variables. If the variable is stationary, it called integrated I(0). Besides, the non-stationary variable is integrated I(1). To start, we use the technique of augmented Dickey-Fuller (ADF) to identify the order of integration of each variable. We apply this test on the remainders of the equation of equilibrium. In the table 1, we find the different indicators of income inequality and the proxy of economic growth expressed in their natural logarithm. The results of unit root tests are presented in level and in first difference.

Table-1. Unit root tests for the variables in levels and first differences with only a constant

Variables in level:

Countries •	**LGDP per capita**	**LGini**	**LGFCF**	**LOpenness**	**LSCHOOL**
Tunisia	-1.451*	-0.655*	-0.271*	-1.921*	-0.731*
Jordan	-0.271*	-1.672*	-2.811*	-0.513*	-1.602*
Taiwan	-2.402*	-1.552*	-2.692*	-2.331*	-.439*
Japan	-2.672*	-1.921*	-2,773*	-1.623*	-1.045*

Variables in first difference:

Countries •	**LGDP per capita**	**LGini**	**LGFCF**	**LOpenness**	**LSCHOOL**
Tunisia	-5.734	-4.427	-5.602	-5.361	-4.834
Jordan	-6.942	-5.833	-4.834	-5.732	-4.482
Taiwan	-5.565	-5.673	-5.771	-5.954	-6.426
Japan	-6.456	-5.991	-6.042	-5.663	-6.034

(*) The variable is non stationary; rejection of the null hypothesis

§ The order of the lag in the Dickey-Fuller regression is the minimum number ensuring that the residuals are white noise.

The results show that all the variables in level are integrated I(1). When the tests are carried out on the first difference, the hypothesis of unit root is rejected and all the variables have become stationary.

2-2: Cointegration Testing

The notion of cointegration has been introduced by Granger (1988), then the cointegration tests were appeared with the *VAR* approach established by Johanson. (1988). The cointegration tests consist to identify the stationarity of the residue of two linear combinations. If the cointegration is demonstrated, so a long-run relationship of equilibrium exist between the two series. In other words, if the residue is stationary we use an error correction model (ECM) to test the causality between the two series. However, if the variables are not cointegrated we test the causality in the short-run based on *bVAR*. In this paragraph we will study the cointegration tests between the different indicators of income inequality and the economic growth. The computations are based on the Johanson procedure trace statistic and the null hypothesis (H_0) is that there is no cointegration vector; the alternative one (H_1) is that there is one cointegrating vector.

The Johanson tests are based on the likelihood ratio or the so-called trace statistic (Johanson., 1988). The cointegration analysis is made using a bivariate vector auto-regressive model *(bVAR)* for different period spanning 1960 to 2012.The statistic of the tests are carried out in the table 2 with an optimal lag determined according to the Akaike information criterion (AIC). In addition, using this lag length, the residuals in each of the VAR equations were tested for the normality distribution and for the absence of serial correlation.

Table-2. Johanson cointegration tests, [§]Null hypothesis r=0, alternative hypothesis r=1

Countries	Variables	Hypotheses H0	Hypotheses H1	Trace	Critical value 5%
Tunisia (1968 – 2012)	GDP and Gini	r= 0	r≥1	9.42	15.49
		r≤1	r≥2	1.67	3.84
	GDPand Openness*	r= 0	r≥1	25.93	15.49
		r≤1	r≥2	2.81	3.84
	GDP and GFCG	–		–	–
	GDP and School	r= 0	r≥1	13.76	15.49
		r≤1	r≥2	2.64	3.84
Jordan (1965 – 2011)	GDP and Gini	r= 0	r≥1	10.80	15.49
		r≤1	r≥2	2.91	3.84
	GDP and Openness	–		–	–
	GDP and GFCF*	r= 0	r≥1	18.87	15.49
		r≤1	r≥2	3.13	3.84
	GDP and School	r= 0	r≥1	13.24	15.49
		r≤1	r≥2	1.57	3.84
Taiwan (1964 – 2012)	GDP and Gini*	r= 0	r≥1	18.48	15.49
		r≤1	r≥2	1.75	3.84
	GDP and GFCF	r= 0	r≥1	8.58	15.49
		r≤1	r≥2	2.51	3.84
	GDP and Openness	r= 0	r≥1	10.09	15.49
		r≤1	r≥2	1.62	3.84
	GDP and School	r= 0	r≥1	9.81	15.49
		r≤1	r≥2	1.04	3.84
Japan (1962 – 2012)	GDP and Gini**	r= 0	r≥1	17.46	15.49
		r≤1	r≥2	1.03	3.84
	GDP and GFCF	–		–	–
	GDP and Openness	r= 0	r≥1	8.13	15.49
		r≤1	r≥2	2.83	3.84
	GDP and School*	r= 0	r≥1	20.02	15.49
		r≤1	r≥2	1.51	3.84

(*) indicates the presence of one relationship of cointegration between the variables at 5% significance level, (**) indicates the presence of two relationships of cointegration between the variables at 5% significance level

The tests carried out according to the Johanson procedure show less cases of cointegration, as it is expected. First, we detect the cointegration in Tunisia for the variable *(Openness)*. Second, we note that the cointegration exist in Jordan with the variable (*GFCF)*. Third, with the variable (*Gini)*, there is one case of cointegration with GDP per capita in Taiwan. Finally, with the variables *(Gini)* and *(school)* the hypothesis of non-cointegration is rejected in the case of Japan. For all the countries studied the cointegration is detected and the variables are in a long-run equilibrium state. And the Error Correction Model (ECM) indicates how a system adjusts to converge to its long-run equilibrium state. In fact, the speed of adjustment is indicated by the magnitudes of the coefficients of α vector. We interpret the effect of the error correction term βX_{t-1} on economic indicator by explaining the sign of βX_{t-1} itself and the sign of the adjustment coefficient. We note that α_1 represent the adjustment coefficient of income inequality indicators and α_2 is the adjustment coefficient of growth.

Table-3. The adjustment coefficients and the error correction term

Countries	The adjustment coefficient		The error correction term
	α_1	α_2	
Tunisia	0.547	0.264	$y_{t-1} + 3.551\ (\text{Openness})_{t-1} - 1$
(Openness)	(3.38)*	(2.03)	(-3.47)*
Jordan	-0.451	-0.971	$y_{t-1} - 4.471(\text{GFCF})_{t-1} - 1$
(GFCF)	(4.47)*	(-1.71)	(3.52)*
Japan	-1.733	-2.179	$y_{t-1} - 9.551\ (\text{Gini})_{t-1} - 1$
(Gini)	(-5.19)*	(-4.01)*	(4.59)*
Taiwan	-2.931	-2.723	$y_{t-1} - 4.951\ (\text{School})_{t-1} - 1$
(Gini)	(-4.27)*	(3.47)*	(5.17)*

The numbers in parentheses are t-statistics
(*) (**) (***) indicate that the variables are significant at respectively 1%, 5% et 10%.

According to table 3, in the cases of Tunisia, Jordan, Japan and Taiwan α_1 and the error correction term are significant, this means that the effect of income inequality on long-run growth exist. However, for Tunisia and Jordan α_2 is also not significant which excludes any effect of growth on the proxies of income inequality. In contrast, for Japan and Taiwan α_1 and the error correction term are negatives and significant. So, income inequality has a long run positive effect on growth. In addition to this, α_2 is negative and significant. We can interpret that the indicator of economic growth exerts a positive effect on income inequality. To check the robustness of these results, we should use the Granger causality tests.

2-3: Granger causality tests

According to Granger (1988), if two variables are cointegrated, then one should test for Granger causation in at least one direction. The dynamic interaction between the cointegrated variables is summarized in two tests: the first one is a test of weak exogeneity and the second is a test of exogeneity of the dynamic terms.

- *Test of weak exogeneity*: A variable is said to be weakly exogenous if the t-statistic of the error correction term is less than its critical value, in other words, the error correction term is statistically insignificant in its relevant equation. Consequently, the variable is not adjusting to the long-run equilibrium path. t_i: H_0: $\alpha_i = 0$, $i=1,2$
  Where α_i are the adjustment coefficients in the ECM (for i=1,2) and t_i are tests of weak exogeneity of economic growth and income inequality for i=1,2, respectively.
- *Test of exogeneity of dynamic terms*: There tests are simply considered as Granger causality tests, where the null hypothesis is that income inequality (economic growth) does not cause economic growth (income inequality). Formally :F_1: $H_0 : \sigma_{12}(L) = 0$
  F_2: $H_0 : \sigma_{21}(L) = 0$
  Where F_i with i = 1,2 are the F-statistics of the tested hypothesis.

Table-4. Results of Granger causality tests according to the Johanson procedure

Null Hypothesis	*INQ does not Granger-cause GDP*		*GDP does not Granger-cause INQ*	
Countries	t_1: $\alpha_1 = 0$	F_1: $\gamma_{12} = 0$	t_2: $\alpha_2 = 0$	F_2: $\gamma_{21} = 0$
Granger causality between Gini and GDP				
Japan	(-5,19)*	3,58*	(4,01)*	-3,52*
Granger causality between School and GDP				
Taiwan	(-4,27)*	4,41*	(3,47)*	4,51*

(*) Significant at least at 10%

In table 4, the results show that for Taiwan and Japan the evidence is in favor of bidirectional causality between the growth rate of GDP per capita and income inequality. Indeed, we conclude that in Japan t_1 and F_1 statistics are both significant, and t_2 and F_2 statistics are also significant. That means that real growth has two effects on income inequality: The first one is coming from the lagged dynamic terms and the second from the error correction term.

2-4: Short-run Granger Causality: Tests based on first-differenced VARs

Table-5. Causality tests based on first-differenced *bVAR* framework

Countries and variables	Null hypothesis	F(n,k)
	INQ ≠> Growth	Growth ≠> INQ
Tunisia		
(GDP , Gini)	0.439	0.659
(GDP , GFCF)	0.983	1.942
(GDP , School)	3.032*	0.873
Jordan		
(GDP , Gini)	1.673	1.542
(GDP , Openness)	1.052	0.783
(GDP , School)	0.956	0.653
Taiwan		
(GDP , GFCF)	2.548**	0.649
(GDP , Openness)	1.114	3.563*
(GDP , School)	0.749	0.744
Japan		
(GDP , GFCF)	3.739*	0.054
(GDP , Openness)	0.739	2.369**

(*) The Fischer statistics are significant at the 5% level.

We remember that, according to the table 2, in all the countries and for some variables the cointegration is detected. For the remaining variables, we applied the causality tests using the first differenced VARs. The evidence presented is not far from the results obtained from the ECMs. The causation turns out to be bidirectional in the case of Japan and Taiwan. Indeed, for Tunisia the evidence is in favor of a causation going from income inequality to economic growth, with at least one income inequality proxy at 5% level.

Conclusion

This study has examined empirically the causality between income inequality and economic growth in a bivariate VAR structure for a sample covering 4 countries economically different: Tunisia, Jordan, Taiwan and Japan over the period 1960-2012. The results of this paper clearly indicate that a strong evidence exist in favor of a bidirectional causality between growth and inequality for Taiwan and Jordan. For countries where inequality and economic indicators are not cointegrated, Granger causality tests were carried out with first-differenced VARs to check the causality problem in the short-run.. The empirical evidence presented above has important implications for the conduct economic policies in studied countries. Indeed, despite the results of the study, developing countries (Tunisia and Jordan) must take into consideration the fact that fighting the poverty to decrease income inequality is still a priority.

References

1. Abhijit, V.B. and D. Esther, 2003. Inequality and growth: What can the data say? American Economic Review 45:152-186
2. Aghion, P., E. Caroli and P. Garcia, C. , 1998. Inequality and economic growth: The perspective of the new growth theories. unpublished, forthcoming in the Journal of Economic Literature.
3. Barro, R., J., 1991. Economic growth in a cross section of countries. Quarterly Journal of Economics, 106(2): 407-442.
4. Deininger, K. and L. Squire, 1998. New ways of looking at old issues: Inequality and growth. Journal of Development Economics, 57: 259-287.
5. Garbis, I., 2005. Inequality, poverty and growth: Cross country evidence. Working Paper, n°28.
6. Galor, O. and O. Moav, 2004. From physical to human capital accumulation: Inequality and the process of development. Review of Economic Studies, 71(4): 1001–1026.
7. Igbokwe-Ibeto., Y. Chin, Justine., , I. Akhakpe and C. Otech, Okpo., , 2012. Poverty and subtainable socio-economic development in africa: The nigerian experience. Asian Economic and Financial Review.
8. Jr-Tsung, H., K. An-Pang and C. Tsun-Feng, 2004. The granger causality between economic growth and income inequality in post-reform china. The International Centre for the Study of East Asian Development (ICSEAD)
9. Kuznets, S., 1955. Economic growth and income inequality. American Economic Review, V45(P1-28).
10. Milanovic, B., 2005. Can we discern the effect of globalization on income distribution: Evidence from household surveys",working paper no. No. 2876. World Bank Economic Review.
11. Mo, P., Hung, , 2000. Income inequality and economic growth. Indian Economic Review, 53: 293-316.
12. Mohamed, K., Kefi., and Z. Hadhek, 2012. Inequality and economic growth. Asian Economic and Financial Review.
13. Morrison, C., 2000. Historical perspectives in income distribution : The case of europe», in and book of income distribution. North-Holland: A. Atkinson et F.Bourguignon.
14. Mankiw, N., D. Romer and D. Weil, 1992. A contribution to the empirics of economic growth. Quarterly Journal of Economics 152: 407-437.
15. Piketty, T. and E. Saez, 2003. Income inequality in the united states, 1913–1998. Quarterly Journal of Economics, 118(1): 1-39.
16. Risso, W., E. Adrian and C. Sanchez, J. , 2010. Inequality and economic growth in china: Pre and post-reform periods. Quaderni del Dipartimento di economia politica
17. Sala-i-Martin. and Xavier., 2002. The world distribution of income. NBER Working paper No. 8905. Available from www.nber.org.
18. Solow, R., 1956. A contribution to the theory of economic growth. Quarterly Journal of Economics 70: 65-94.
19. Swan, T., 1956. Economic growth and capital accumulation. Economic Record, 32: 334-361.
20. Todaro., 2003. Economic growth and poverty : In search of trickle-down. Journal of Economic Studies
21. Zouhair, A. and M. Imen, Sghaier., , 2012. Economic growth and income inequality: Empirical evidence from north african countries. Asian Economic and Financial Review(1): 142-154.