

The causality relationship between poverty and human development:

Empirical evidence from Tunisia for the period of 1990-2017

Besma Belhadj¹ Khadhra Berrek² Hadda Azhar Boukhris^{*3}

1. 3. Tunis El Manar, Faculté University économétrie appliquée à la finance, Tunis.

2. Larbi Tébessi University, Algeria

العلاقة السببية بين الفقر والتنمية البشرية: الأدلة التجريبية من تونس للفترة 1990-2017

بسمة بالحاج¹ خضرة براك² حدة أزهار بوخريس^{3*}

3.1. جامعة تونس المنار- تونس 2. جامعة العربي التبسي- الجزائر

Received: 20/03/2020

Accepted: 07/08/2020

Published: 15/09/2020

Abstract:

The goal of this paper is to explore whether there is a relationship between poverty and human development. And research in the direction of causality between these two variables in Tunisia, from 1990 to 2017 using Toda-Yamamoto Granger causality approach. The findings of this analysis, revealed a strong inverse relationship between the two variables. Also, the relationship between human development and poverty exists in unidirectional direction causality. Where the Tunisian state should take some measures. To avoid the phenomenon of poverty, by focusing and activating programs, to educate the people and promote the economy. This is in the form of plans studied by thinker's researchers in the field of human development and the State's search for alternative short-term solutions through the development of projects.

Keywords: Human development, Poverty, VAR, Toda-Yamamoto approach.

(JEL) Classification: B23, C01, C02, C1, C2.

ملخص:

الهدف من هذه الورقة هو استكشاف ما إذا كانت هناك علاقة بين الفقر والتنمية البشرية، والبحث في اتجاه العلاقة السببية بين هذين المتغيرين في تونس من سنة 1990-2017 باستخدام منهج تودا ياماموتو غرانجر السببية. وكشفت نتائج هذا التحليل عن علاقة عكسية قوية بين المتغيرين، والعلاقة السببية بين التنمية البشرية والفقر موجودة في اتجاه واحد، حيث يجب على الدولة التونسية اتخاذ بعض التدابير لتجنب ظاهرة الفقر من خلال تركيز وتنفيذ البرامج لتنشيط الشعب والنهوض بالاقتصاد، وهذا في شكل خطط يدرسها المفكرون الباحثون في مجال التنمية البشرية، وبحث الدولة عن حلول بديلة قصيرة الأجل من خلال تطوير المشاريع.

الكلمات المفتاحية: تنمية بشرية، فقر، VAR، منهج تودا ياماموتو.

الترميز الاقتصادي: B23, C01, C02, C1, C2.

* Corresponding author, e-mail: haddaazhar.boukhris@fsegt.utm.tn

I. Introduction :

Poverty is one of the most complex problems. There may be no state, no European or Arab city alike. It is a global problem and a social phenomenon with economic spillovers, political and social repercussions in various forms.

Despite many efforts being made to eradicate poverty. There is no law that protects the poor from food, drink, clothing and home, and inequality in wealth. Will make the problem of poverty an escalating problem, also, we will not find solutions to it for a short time and quickly.

The definition of poverty differs from society to another, from culture to culture depending on the associated circumstances. Poverty is the inability of the individual to achieve a minimum standard of living for a certain standard within economic and social criteria. The meanings of poverty can be distinguished through the first being social poverty, which includes economic inequality resulting from a lack of income and a low standard of living, socioeconomic inequality, and a feeling of inferiority and deprivation. Regarding the second meaning, this is deprivation And the third is moral poverty, which is defined as a poor quality of life that does not fulfill the needs of well-being which values and is linked to the individual's self-respect.

World Bank's statement on understanding poverty, defined as follows: « Poverty is hunger. Poverty is a lack of shelter. Poverty is being sick and not being able to see a doctor. Poverty is not having access to school and not knowing how to read. Poverty is not having a job, is fear for the future, living one day at a time. Poverty is losing a child to illness brought about by unclean water. Poverty is powerlessness, lack of representation and freedom ». (Sanal & Zare, 2015, p. 98.)

Poverty is a condition in which a person or community lacks the requisite financial support and foundations to achieve the lowest possible and appropriate quality of living and well-being in the community in which it exists.

This definition has evolved and become more systematic, particularly the Copenhagen Summit in 2006, which highlighted the value of ensuring a minimum of precious life for individuals, providing a safe atmosphere and incentives for democratic engagement decision-making in areas of public life.

The causes spread of poverty includes political reasons such as geographical distribution, wars and monopoly of wealth. Economic reasons such as poor utilization of available resources, lack of exploitation of natural resources, lack of exploitation of human resources, globalization and lack of interest in establishing new projects. In addition, social reasons such as the culture of society and neglect to provide basic services.

For many countries, poverty is an issue, but the way to eradicate it is not easy. Some studies have shown that human development is capable of eliminating and reducing poverty in some countries, and some consider it an effective solution to the social and awareness methods it contains in the lives of individuals. The relationship between poverty and human development is the focus of research by many economic experts and researchers, and this is especially important today. However, this relationship is not a constant in its application to countries, as the latter differs on several points such as its policies, cultures, and economies. Which forces us to look at this axis, through which we will try to fill these gaps.

Human development (HD) is about increasing human life's wealth, rather than just the riches of the economy in which people work (UNDP 2019). An approach focuses on people and their

opportunities and choices. We may unhesitatingly assume that the absence of such important choices is debasing or restricting many other incentives for people to expand their choices. Human development is therefore, a process of broadening the choices made by people as well as raising the level of well-being achieved.

The Human Development Index (HDI) offers a combination of 3 dimensional HD: living a long and healthy life, having an education and decent living standard. A higher HDI implies higher levels of HD. In 2019, the HDI showed that Tunisia has ranked among the 28 countries of the continent with a “high” HDI rate. Tunisia is ranked 91 out of 189 countries and territories and 4th in Africa from the HDI (UNDP 2019). This position represents a high level of development, and many others in Africa belong to this group.

The study of our paper was of two variables to determine the causal relationship between poverty and long-term human development using the Toda Yamamoto method .

The aims of this research are to investigate if there is any relationship between these two factors, and analyze the direction of causality between Tunisia's poverty and human development from 1990 to 2017 by using Toda-Yamamoto Granger causality approach.

The highlighted goal of the Toda-Yamamoto causality test is to solve the issue of invalid asymptotic critical values when causality tests are performed in the presence of non-stationary series or even co-integrated. The benefit of the T-Y technique is that it makes Granger Causality test easier. Researchers do not have to check cointegration or transform VAR into VECM (Toda & Yamamoto 1995).

The article is structured in the following way. The second section will be introduced to the previous studies. The third section, will be identified by the model and data employed by this study. Results and empirical findings will discuss in the fourth section, while the last part concludes.

1. Previous Studies:

The relationship between poverty and human development in previous studies has not been given much importance because of its theoretical ambiguity, complex, and no clear relationship between the two variables. Among the few available studies about the relationship between them:

The work of Amaluddin et al.(2018), studied in the village's province Indonesia, an updated HDI and poverty applies principal component analysis (PCA) and using panel data for the period 2015-2016. Their results show that the human development index's indicators have negative relationships and a significant impact on poverty.

Researchers Afzal et al.(2012) utilized time series data for the period 1971-1972 to 2009-2010 in Pakistan on education, poverty, physical capital, and economic growth. ARDL model findings indicate that both on short and long-term impact of physical capital on economic growth has been positive and significant. Education has a positive and significant impact on long-term economic growth only. Throughout the long run, poverty and economic growth are linked throughout the opposite and significant ways. The findings of Toda Yamamota Granger's approach suggests that education and economic development, economic growth and poverty, as well as poverty and education are bi-directional causality

In another study, Ingrid(2012) contrasted human development and poverty indexes with old and modern approaches in the least developed countries. The study reveals that the human

development index utilizing the new methodology, with the exception of three countries, made the values of individual economies worse. The findings of a new methodology of poverty indexes are less clear but more acceptable, provide that almost half of the economies have not changed the values and 8 countries have strengthened their situation in relation to poverty.

In 2019, the research carried out by Olopade et al. indicated that investigating the interactive relationship between human capital components and poverty reduction in OPEC member countries. It is a cross-country analysis within the OPEC area of a panel of fully modified least-squares of twelve nations. In OPEC Member Countries, the interactive effects of the components of human capital development have a long-term effect on poverty reduction. Therefore, human capital components confirm a positive impact on poverty reduction .

2. Study model and data

Before explaining the method of Toda-Yamamoto, the methodological model of our research is described in this section.

The sample of the study consists of an Arab country, Tunisia. This sample was selected according to the data availability criteria in the study, and to avoid structural discontinuity for all years. The study period was from 1990 to 2017. The relationship between poverty and human development was analysed by following:

$$POV_t = \alpha_{it} + HDI_{it} + \varepsilon_{it} \quad (1)$$

Where POV_t stands for poverty gap in year t , HDI_t indicates human development index in year t and ε_{it} is an error term.

Based on the subject of the study, a dependent variable and an independent variable were selected as follows:

Poverty in this analysis is the dependent variable, The poverty gap at \$1,90 a day (2011 PPP) (%) is used to describe this measure. It's defined as the mean shortfall in income or consumption from the poverty line \$1.90 a day (counting the non-poor as having zero shortfall), expressed as a percentage of the poverty line. This variable has been described by the World Bank as the mean income or consumption shortfall \$1.90 a day from the poverty line, expressed as a percentage of the poverty line. This calculation reflects the extent and prevalence of poverty. The revisions of PPP exchange rates make it impossible to compare the poverty rate for individual countries recorded in previous editions. (The World Bank, 2019). The data was taken from the World Bank, and POV was used in the empirical analysis as a symbol of poverty.

Human development is the independent variable, and to express this variable has been used human development index.

The Human Development Index (HDI) has been measured for several countries and it is very common because it's easy to use when comparing countries' development. The roots of HDI can be located in the annual Development Reports of the United Nations Development Programme. The data was taken from the United Nations Development programme, and HDI was used in the empirique study as a symbol of human development.

II. Methods and Materials:

1. Unit Root Test:

The first step is to check the variables with a unit root to verify that each variable is stationary. That is achieved by applying the Augmented Dickey–Fuller (1981) test for the unit root.

The approach should be applied as the fundamental assumptions for the ADF approach are that there is no serial correlation between the (ε_t) . This method, however, would help to solve this issue by adding a lag difference of the dependent variable as part of the new explanatory variable(s).

$$\Delta POV_t = \delta(POV_{t-1}) + \beta \Delta POV_{t-1} + \varepsilon_t \quad (2)$$

Equation (2) is the unit root test Augmented Dickey–Fuller function where the POV_t variable indicates a random walk without trend and drift.

$$\Delta POV_t = \beta_0 + \delta(POV_{t-1}) + \beta_1 \Delta POV_{t-1} + \varepsilon_t \quad (3)$$

Equation (3) represents the Augmented Dickey–Fuller function for unit root testing where a no trend and random drift walk reveals the variable POV_t .

$$\Delta POV_t = \beta_0 + \beta_1 t + \delta(POV_{t-1}) + \beta_2 \Delta POV_{t-1} + \varepsilon_t \quad (4)$$

Equation (4) reflects the Augmented Dickey–Fuller function for unit root testing where the trend process and both drifts for POV_t variable indicate a random walk movement.

2. Toda Yamamoto:

Many tests are available to validate the causality between variables i.e. Granger (1969), Granger & Engle (1987) and Juselius & Johansen (1990). Such tests are not error free because they tend to be stationary, the maximum lag length has been chosen and very reactive to the model specifications. The unit root and co-integration need to be tested before these tests are carried out. To solve these issues, Toda Yamamoto (1995) applied a more robust causality technique; nonetheless, Rambaldi & Doran (1996) and Zapata & Rambaldi (1997) have made a better explanation. Toda Yamamoto's (1995) improved the Augmented Granger Causality approach is very straightforward to use and fits the asymptotic Chi-square distribution (Afzal et al. 2012, p. 32).

In the literature, so many Granger causality tests were developed which include: MWALD tests, Granger causality test, Error Correction Model (ECM), etc. Generally, Granger causality is applicable if the underlying series becomes stationary and involves the integration of the series. Therefore, it might give the results of a spurious regression and the F-test turns invalid. As for Error Correction Model (Granger and Engle 1987) and Vector Error Correction Models (Juselius and Johansen 1990) seen as alternatives to non-causality testing among time series, they look difficult and take many steps. The results of the Granger Causality Tests standard in ECM, as per Phillips and Toda (1993) may be wrongly interpreted and, in certain situations, could be asymptotically influenced by nuisance parameter dependence. In order to avoid this issue, Toda and Yamamoto (1995) suggest a method utilized for estimating unrestricted VAR through using the Modified Wald test on limiting VAR (k) parameters model and estimating VAR [k+dmax], which k is the lag order of VAR and dmax is the maximum order of integration for the system series.

The best two advantages of this technique, firstly, it improves the power of Granger-causality testing and secondly, it requires no knowledge of the system's cointegration properties. The Toda-Yamamoto approach is helpful as it adapts the standard vector autoregressive model in the levels of

the variables thus minimizing the risks associated with the possibility of incorrect order identification of the series integration (Mavrotas and Kelly, 2001).

In the following equations (4) and (5) represented the VAR model, the Toda Yamamoto Granger-causality test was estimated among 2 variables in this study:

$$POV_t = \alpha_1 + \sum_{i=1}^{K+d} \beta_{1i} POV_{t-i} + \sum_{i=1}^{k+d} \beta_{1i} HDI_{t-i} + \varepsilon_{1t} \quad (4)$$

$$HDI_t = \alpha_2 + \sum_{i=1}^{K+d} \beta_{2i} POV_{t-i} + \sum_{i=1}^{k+d} \beta_{2i} HDI_{t-i} + \varepsilon_{2t} \quad (5)$$

Where POV represents the poverty gap, HDI is the Human development index, β_{1i} and β_{2i} are model capabilities, d_{max} represents the maximum order of integration of the variables in the system, ε_{1t} and ε_{2t} represents the error limits, which are not correlated, with zero and a sum arithmetic mean of each.

To sum up the theoretical aspect, the Toda-Yamamoto approach is conducted in two stages. In the first stage, the lag length (k) of the VAR model is determined where for each criterion the lowest value is selected. The following statistic criteria: Akaike, Schwarz, Hannan-Quinn, and the highest log likelihood value match with the optimal time lag, and the maximum time series variables composition order (d) within the system. The VAR level is estimated at a total of $[k \ d_{max}]$ following after the specification of the optimal lag length VAR (k) and the integration order d_{max} . The second stage requires for the application of standard Wald tests to make Granger causal inference with a chi square (χ^2) distribution on the firstly (k) vector autoregressive regression coefficient matrix (Hamdi 2013, p. 5). We compare the statistics of this test with the scheduled value of the Kido test. Two tests can be obtained from this analysis. The null hypothesis can be given for the equation (5) as:

- ♦ H_0 : No causal relationship going from HDI to POV

Against the alternate hypothesis :

- ♦ H_1 There is a causal relationship going from HDI to POV

For the equation (6), the null hypothesis is:

- ♦ H_0 : No causal relationship going from POV to HDI

Against the alternate hypothesis :

- ♦ H_1 There is a causal relationship going from POV to HDI

When we fail to refuse the previous null hypothesis and refuse the latter, instead we infer that the changes in HDI_t are Granger caused by a change in POV_t . Where any null hypothesis of equation (5) or (6) has been rejected, unidirectional causality between two variables may exist. If both null hypotheses are rejected then there is bidirectional causality, and if causality null hypothesis of equation (5) or (6) is rejected, there is no causality (Bel-Haj-Mohamed 2014, p. 4).

III. Results and discussion:

Before estimating the model of the study, we will start with check data normality through descriptive statistics and correlation matrix.

1. Descriptive Statistics:

The two variables represented in our study model as illustrated in table 1 have been tested statistically. Where the results have been as follows:

The highest value of poverty in the period between 1990-2017 was estimated at 2.963 in 1993 in Tunisia. This is because of many socio-economic factors with fragile policies where human development has not played an important role in addressing poverty because of its lack of awareness.

The minimum value of poverty was 0.00 in 2015, due to the lack of data of the riots and strikes that Tunisia witnessed in late 2010 and 2011 due to unemployment, extreme poverty and the outbreak of the revolution, which made the country enter a new corner of the freedom achieved by the Tunisian people. Civil society played a major role in raising awareness and values of tolerance. Due to the outbreak of the Tunisian revolution, the Tunisian state has gained many freedoms to combat financial and administrative corruption in the social and economic field and to work to address the phenomenon of poverty.

The Human Development has a maximum value of 0.735 in 2017; the pre-Tunisian revolution was a low of 0.569 in 1990.

Human development witnessed the lowest value in the standard deviation of 0.053, which indicates that it is more homogeneous, while poverty has the highest value in the standard deviation of 1.060, which indicates that its value is dispersed, which varies greatly from one country to another.

2. Correlation Matrix:

The correlation matrix examination allows the identification of possible correlation pairs. Between these variables, thus ensuring that the model is free of the most important problems that can occur when estimating the model. So that multiple correlation coefficients are related to the regression of each independent variable relative to the rest of the explanatory variables which is calculated by using the various programs of econometrics.

From the table 2, we note that the correlation matrix between poverty and human development shows that there is a very strong inverse relationship by -97.62% that is, as poverty decreases, human development increases and vice versa. This reflects the effective role of human development in the fight against poverty by expanding choices for individuals, increasing their ability to attain education and good health, living at an acceptable level and feeling safe in Tunisia, which is in line with economic theory.

3. Unit Root Test:

In the following stage, we need to know the stability of the both series. Before going to the test, the poverty variable had many missing values so it was used "cubic spline interpolation". Eviews program (Eviews Help, 2019) defined it as a global interpolation method so that changing any one point (or adding an additional point) to the source, series will affect all points in the interpolated series.

The findings of the ADF unit root test in the table 3 shows that the dependent and independent variables are not stables at their level I(0), poverty stable at the first degree difference I(1). HDI proved stable only after the second-degree differences I(2), which enabled us to apply the self-regression (VAR) technique to test the causality relationship between poverty and human development in Tunisia in 1990-2017 using Toda Yamamoto approach in the long term .

4. Selection Lag Length Of The Model VAR:

we specify the degree of delay for the VAR model. For that we built VAR models with different delay levels, from $p = 0$ to $p = 4$, and choose the optimal VAR model, that has the delay degree p where the lowest value is chosen for each criterion. Which corresponds to the optimal time slowdown and that through the following statistical criteria: (Akaike AIC standard, Schwartz SC standard and Hannen Queen criterion HQ), and the largest value of (Log Likelihood criterion). From the table 4,

the lowest values of AIC, SIC and HQ and the maximum value of Log L are associated with a delay of $p = 4$, which means that the number of delays in the VAR model is 4.

5. Stability Of The VAR Model:

The instability of any model leads to wrong and incorrect results. Therefore, it is necessary to perform a stability test using the (Inverse Roots of AR Characteristic) test, and to ensure the stability of the model VAR (4).

From the Fig. 1, it is clear that all single polynomial roots are inverted inside the unity circle. This means that VAR does not have a problem with linear correlation or heterogeneity of variance, and therefore VAR (4) is stable.

6. Toda & Yamamoto Augmented Granger Causality Test:

The study of causality that exists between the variables allows us to formulate a correct economic policy and this is by knowing the variables that help to explain a specific phenomenon, using Granger causality test by Toda & Yamamoto. The approach is estimated by MWALD testing.

Causality is nevertheless tested in four different ways. First, the presence of a unidirectional relationship from poverty to human development. The second is that the relationship between the human development and poverty is unidirectional. Third, there is feedback from HDI and POV variables it means there is a presence of bidirectional causality and last, there is no causality relationship between variables.

Table 5 shows that we accept the null hypothesis and refuse the alternative hypothesis at the 5 percent significant level, which means that from Human development to poverty there is no causality relationship. Also, we accept the alternative hypothesis at the 5 percent significant level, that there is a causality relationship going from POV to HDI.

We are therefore able to conclude that the relationship of causality between human development and poverty is **unidirectional**.

The meaning of the causality relationship between POV and HDI is summarized as:

$$\text{POV} \rightarrow \text{HDI}$$

IV. Conclusion:

Poverty is a phenomenon that ranks among the most concepts that the world suffers from today, which has exhausted countries, and has known various and various aspects. Investing in human development is the key to contribute more to reduce poverty where humans get healthier, better nurture, and better educate. Increased levels of human development affect the economy by improving the effectiveness of people and their productivity and innovation.

The main objective of our research. Was to explore the causality relationship between poverty and human development in Tunisia. With the causality of Toda Yamamoto Granger approach, and it knew one of the most advanced Granger causality tests as it removes the requirement for cointegration pre-testing and thus helps avoid biases of pre-test and applies to any arbitrary integration level of the series utilized.

For the period 1990 to 2017, the data utilized in this analysis was annual. This paper used a vector autoregressive (VAR) system, this includes unit root diagnosis and optimum lag selection before the Granger causality test on the variables is used. The results of the Toda-Yamamoto Granger causality test show that a unidirectional causality relationship exists between poverty and human

development, which indicates that poverty, causes human development in Tunisia for the duration referred to above.

In conclusion, it is necessary to acknowledge the efforts. Made by the Arab countries, in particular in their war on the poverty pandemic. However, it is imperative to urge more perseverance, and strive to develop awareness, the intellectual side of individuals and provide the necessary briefing, whether material or moral. To invest energies, resources local humanity, and encouraging them to invest internally. Advance the economy by urging them to initiate, innovate and attract specialists from immigrants. To resurrect their projects and benefit. From their experiences in the homeland. In addition, to the imperative of seeking, to refine, develop competencies and support them. It is necessary to mention the preparation of structures infrastructure, health care, public facilities and improving the individual's standard of living with create of charities, specialized in economic, social follow-up in poverty centers, slums and the creation of a national fund. To finance the poor family in the country in case of extreme poverty. Finally, deducting the financial value of the monthly working citizens, for example, once a year to fight poverty.

References:

- Afzal, M, Malik, M. E, Begum, I, Sarwar, K, Fatima, H 2012, Relationship among education, poverty and economic growth in Pakistan: An econometric analysis, *Journal of Elementary Education*, vol.22, no. 1, pp.23-45. Corpus ID: 27453343
- Amaluddin, A, Payapo, W. R, Laitupa, A. A, Serang, M. R (2018), A modified human development index and poverty in the villages of west seram regency, Maluku province, Indonesia, *International journal of economics and financial issues*, vol. 8, no. 2, 325-330.
- Bel-Haj-Mohamed, M., Saafi, S. & Farhat, A. 2014, Testing the causal relationship between exports and imports using a Toda-Yamamoto approach : evidence from Tunisia, *Economics & Strategie Management of Business Process*, vol. 2, 75-80.
- Development Research Group, *Poverty gap at \$1.90 a day (2011 PPP) (%)*, data file, The World bank, viewed 17 october 2019, <<https://data.worldbank.org/indicator/SI.POV.GAPS>>.
- Eviews Help 2019, *Frequency conversion*, Eviews, viewed 1 November 2019, <https://eviews.com/help/helpintro.html#page/content%2FBasedata-Frequency_Conversion.html%23ww233553>.
- Hamdi Helmi 2013, Testing export-led growth in Tunisia and Morocco : New evidence using the Toda and Yamamoto procedure, *Economics Bulletin*, vol. 33, no. 1, 677-686.
- Ingrid Majerova 2012, Comparison of old and new methodology human development and poverty indexes: A case of the least developed countries, *Journal of Economics Studies and Research*, vol. 2012, 1-15. DOI: 10.5171/2012.290025
- Mavrotas, G. & Kelly, R. 2001, Old wine in new bottle: Testing causality between savings and growth, *The Manchester School Supplement*, vol. 69, no. 1, 97-105. DOI: 10.1111/1467-9957.69.s1.6
- Olopade, B. C., Okodua, H., Oladosun, M., Asaleye, A. J. 2019, Human capital and poverty reduction in OPEC member-countries, *Heliyon*, vol. 5, no. 8. DOI: 10.1016/j.heliyon.2019.e02279
- Sanal ,M & Zare, L 2015, End poverty with true management, *International Journal of Business and Social Science*, vol. 6, no. 9, 98-110.
- Toda, H. Y., & Yamamoto, T. 1995, Statistical inference in vector autoregressions with possibly integrated processes, *Journal of Econometrics*, vol. 66, 225-250. DOI: 10.1016/0304-4076(94)01616-8
- UNDP (2019), *human development reports*, United Nations Development Programme, viewed 19 November 2019, <<http://hdr.undp.org/en/content/2019-human-development-index-ranking>>.
- UNDP 2019, '*Human development data*', United Nations Development Programme, viewed 19 October 2019, <<http://hdr.undp.org/en/data>>.
- UNDP 2019, *human development reports*, United Nations Development Programme, viewed 14 November 2019, <<http://hdr.undp.org/en/humandev>>.

Appendix :

Table 1. Descriptive statistics of the study variables

	POV	HDI
Mean	1.308	60.66
Median	8170.	770.6
Maximum	2.963	350.7
Minimum	0.000	0.569
Std. Dev.	1.060	0.053

Table 2. Coefficients of the independent variable correlation with the dependent variable

Independent \ Dependent	HDI	POV
POV	1.000	-0.976
HDI	-0.976	1.000

Table 3. The probability results for the unit root test at levels

	At level I (0)			At level I (1)			At level I (2)		
	N	I	T&I	N	I	T&I	N	I	T&I
POV	0.000	0.081	0.000	0.033	0.025	0.037			
HDI	0.966	0.0007	0.999	0.303	0.189	0.005	0.000	0.000	0.040
The decision	The two variables are not stable at the level, so we accept the hypothesis H_0 because the probability is greater than 5%.			After making first-order differences, POV stabilizes, and then we accept the hypothesis H_1 . As for HDI, it has not stabilized because the probability is more than 5%.			After making the second order a difference, the HDI variable is stabilizes and we accept the hypothesis H_1 .		
Note : N : None/ I : Intercept/ T&I : Trend and intercept									

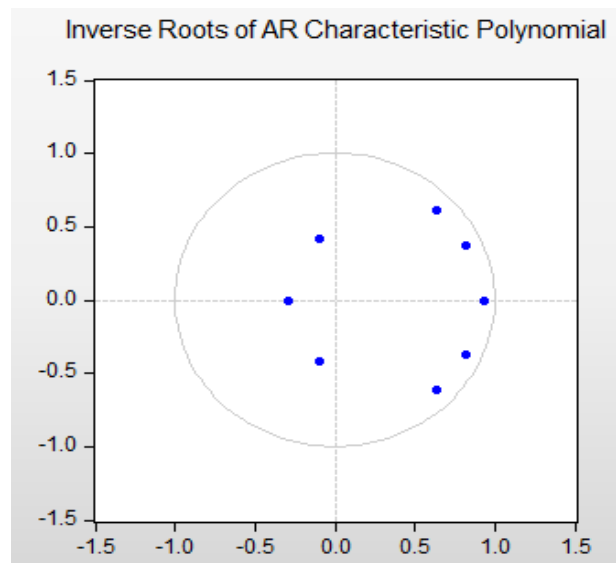
Table 4. Selection the lag length

Degree of delay	Statistical standards	AIC	SC	HQ	LogL
Var(4)		-16.979*	-16.087*	-16.769*	204.7780*

Table 5. The causal relationships between the two variables

Zero hypothesis	Chi-sq	Prob	Decision
HDI does not cause POV	6.595	0.158	Accept H_0
POV does not cause HDI	15.284	0.004	Reject H_0
P-value significant at 5% significance levels			

Fig.1. Stability of the VAR model



How to cite this article by the APA method:

Besma Belhadj, Khadhra Berrek, Hadda Azhar Boukhris.(2020). The causality relationship between poverty and human development: Empirical evidence from Tunisia for the period of 1990-2017, **Roa Iktissadia Review**, 10 (02), Algeria: Eloued University, pp 43-53.

The copyrights of all papers that were published in this journal are retained by the respective authors as per the [Creative Commons Attribution License](#).



Roa Iktissadia Review is licensed under a [Creative Commons Attribution-Non Commercial license \(CC BY-NC 4.0\)](#)