

**Higher education, Graduate unemployment,  
Poverty and Economic growth in Tunisia, 1990-  
2013**

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## Abstract

This paper examines the relationship between economic growth, higher education, unemployment and poverty using properties of time series variables while applying the Ordinary Least Squares (OLS) method. Our study thus contributes to the existing literature by giving the first integrated approach to examine the four way linkages in the Tunisian background over the period 1990-2013. This paper holds that higher education can impact unemployment and graduate unemployment causes poverty which would affect economic growth. Our empirical results show that there is bi-directional causal relationship between per capita gross domestic product (GDP) and poverty rate (POV) and also between Number of graduate students (GRA) and School enrollment tertiary education (ENR) besides unidirectional causal relationship which running from Number of graduate students to Unemployment with tertiary education (UNP), from Higher education expenditure (EXP) to poverty rate and from Unemployment with tertiary education to poverty rate. Our empirical results also verified the existence of positive effect of ENR, GRA and POV on economic growth, while, UNP and EXP have negative determining influence on economic growth with only GRA statistically significant. These empirical insights are of particular interest for the policy makers as they help build sound economic policies to sustain economic development and improve the higher educational quality.

## Resumen

Este artículo examina la relación entre el crecimiento económico, la educación superior, el desempleo y la pobreza utilizando las propiedades de las variables de series de tiempo mientras se aplica el método de Mínimos Cuadrados Ordinarios. Nuestro estudio contribuye así a la literatura existente, dando el primer enfoque integrado para examinar los vínculos cuatro vías en el fondo de Túnez durante el período 1990-2013. En este trabajo se sostiene que la educación superior puede afectar el desempleo y el desempleo de los graduados causa la pobreza lo que afectaría el crecimiento económico. Nuestros resultados empíricos muestran que existe una relación causal bidireccional entre el producto per cápita interno bruto (PIB) y la tasa de pobreza (POV) y también entre el número de estudiantes graduados (GRA) y la educación terciaria matrícula escolar (ENR), además de una relación causal unidireccional la cual que va desde Número de estudiantes graduados de desempleo con educación terciaria (UNP), de los gastos de educación superior (CAD) a la tasa de pobreza y de desempleo con educación superior a la tasa de pobreza. Nuestros

resultados empíricos también verificado la existencia del efecto positivo de ENR , GRA y punto de vista sobre el crecimiento económico , mientras que , UNP y EXP tienen influencia determinante negativo sobre el crecimiento económico con la única GRA estadísticamente significativa. Estos conocimientos empíricos son de particular interés para los responsables de las políticas , ya que ayudan a construir políticas económicas sólidas para sostener el desarrollo económico y mejorar la calidad de la educación superior .

*Keywords:* Higher education, Graduate unemployment, Poverty, Economic Growth, Granger causality, Ordinary Least Squares, Tunisia.

*Jel Codes:* I23-E24-I30-O49-C32

## 1. Introduction

The relationship between higher education and economic growth has been the subject of considerable academic research over the past few decades.

Actually, education is a crucial factor for economic growth, in general, particularly for social development of a country (Barro and Lee, 2013). At the economic level, higher education is of great importance since it has been a response to growing demand for employment. That is to say, higher education improves the skills which offer people essential job opportunities and then higher incomes. For this reason, higher education quality raises the employment rate by a competitive workforce for better productivity.

In fact, a country that hopes to stimulate its growth by increasing employment opportunities must necessarily invest in the field of higher education to boost its human capital stock intended for acquiring skills and training.

Recently, some studies have incorporated employment in the production function in order to investigate the relationship between economic growth, higher education and employment (e.g Zaneta and al. (2015); Lee and Chung (2015)).

In addition to higher education and employment, some of the recent studies, such as that of Akwara and al. (2013); Ukwueze and Nwosu (2014), have included poverty in the production function.

Jenkins (2011) showed that over half of entries into poverty is associated with a fall in the employment earning, due to the jobless.

The objective of this study is to use production function approach where GDP depends on investment in higher education to create employment and reduce the rate of poverty.

Various studies have focused on different countries, time periods, modeling techniques and different proxy variables which have been used to examine the relation between higher education-economic growth (Brynjolfsson and Mcfee, 2014; Zaneta and al. 2015); higher education-employment (Lee and Chung, 2015) and unemployment-poverty (Aiyedogbon and Ohwofasa, 2012).

Our study thus investigates the relationship between economic growth, higher education, unemployment and poverty in the Tunisian background over the period 1990-2013.

This country was chosen as the focus of this study because empirical analysis is relatively scarce. In addition, the characteristics of the country are very suitable for the case of the present study.

For example, in Tunisia, unemployment has stabilized at a high level. In 2010, the graduate unemployment rate reached 22.9%. In absolute terms, the number of unemployed people has

increased dramatically. This problem is quite tricky because it does not arise today in the same way as it used to do. Actually, it has been increasingly affecting almost every young educated person regardless of his gender. Actually, in 2009, the number of unemployed graduates amounted to 139000, thus recording a rate of 21% whereas that of the workforce having a primary or a secondary education level was between 10.5% and 14%, respectively (NIS, 2010).

In 2011, the youth unemployment rate (15-29 years) reached 38%, while that of university graduates recorded 30.5% compared to 18.9% of that of the national average. Furthermore, unemployment in Tunisia leads to unexpected results, such as poverty. In 2010, the poverty rate has reached 15.5% in Tunisia.

The algorithm of the article is as follows: Section 2 briefly reviews the related literature, followed by Section 3 which outlines the econometric modeling approach and describes the data used as well as the empirical findings, then the final section, Section 4, holds the concluding annotations and offers some policy implications.

## **2. Literature review**

The economic literature has rarely tackled the relationship between higher education, unemployment, poverty and economic growth. In general, each concept was examined in isolation from economic growth.

Some studies, such as that of Brynjolffson and MCfee (2014); Zaneta and al. (2015) focus on the relation between higher education-economic growth, and others like that of Lee and Chung (2015), are interested in the link between higher education and employment. Finally the relationship between unemployment and poverty is emphasized by Aiyedogbon and Ohwofasa (2012).

These works have neglected the potential interaction between the series. Thus, this paper reviews the literature under three subsections.

### ***2.1 Higher education and economic growth***

Economic theory has long been interested in focusing on the relationship between human capital and economic growth (Shultz (1961), Becker (1964), Mincer (1974) and Adam Smith (1997). These authors argued that education is the most productive investment for a development strategy. This relationship is rooted in the theory of the human capital.

This theory, which was developed with the work of Becker (1964) has emphasized that the knowledge gained by individuals plays a crucial role in the society.

According to this theory, Mankiw (1995) argue that education can have an impact on economic growth. It actually increases the human capital inherent to the labour force and labour productivity by engendering transitional growth.

The empirical studies which emerged in the 1990s, such as those of (Barro, 1991), Mankiw et al. (1992)), showed that education has a positive and significant impact on economic growth.

Following this seminal study, a number of researchers, such as that of Aghion and Cohen (2004) who concluded that educational level affects the long-term growth through its impact on the adaptation speed to the technological change.

A recent study, which examine the relationship between education and economic growth, was carried out by Barrell et al. (2010) who found a strong correlation between the number of institutes and productivity performance.

Using a heterogeneous sample of 146 countries during the 1950-2010 period, and an improved dataset aggregated by sex and age, Barro and Lee (2013) found that education has a significant positive effect on economic growth.

More recently, Brynjolffson and McAfee (2014) have shown that education changes the nature of demanded job skills and therefore the labour market growth trajectory.

Zaneta et al. (2015) anticipated the importance of investment in higher education because it offers a quality training in preparing a better educated and trained worker (competent) who produces and earns more.

Generally, human capital theories agree upon the existence of a correlation between higher education and economic growth. However, correlation does not mean causality.

It seems that the relationship between higher education and economic growth can be explained by the employment level. From this relationship, employment is thought to improve with the education level.

## *2.2 Higher education and unemployment*

Education increases simultaneously with the increase of employment and careers. In this context, several countries have put employment based on the youth and adult learning at the heart of their approaches regarding professional skills, UNESCO (2012).

The relationship between higher education and employment has been investigated in recent years by various researchers, such Gyimah-Brempong and al. (2006) and Bloom and al. (2014) for Africa, Cogan and Kennedy (2004); Asian Development Bank (2012) for Asia and Pacific; Delgado and Boncheva (2012); Rangel and Ivanova (2014) for Mexico; Lee and Chung (2015) for Korea.

Actually, a good education is synonymous with good training and therefore a good income and a distinguished position in the society. In this context, Mincer (1958) showed that wage differences between employees are mainly explained by the difference of the education level between them.

In this context, Boccanfuso et al. (2015) investigated the impact of the higher education quality on the labour market for the Senegalese case. They concluded that highly skilled young workers had an employment growth.

Recently, Lee and Chung (2015) have focused on higher education to explain how it is linked with the employment rate. Their study showed that South Korea focused on the employment rate of the higher-education graduates in institutions as the indicator that reflects the education quality. They provided evidence that variables, “education spending” and “number of students per full time faculty member”, interactively affect the employment rate.

Author researchers, such as Rangel and Ivanova (2014), investigated the relationship between higher education policies and employment in Mexico. Their results indicate that Mexico's higher education policies must provide a strategic vision based on the development of a coordinated industrial policy. It is imperative to improve the balance between supply and demand for professionals, whose studies are based on policies designed to improve Mexico's productive structure and its integration into the international economy.

Lavrinovicha et al. (2015) studied the impact of education on the unemployment rate in the case of Latvia during the 2002-2013 period. Their results showed, on the one hand, a decreasing relationship between individual training effort and unemployment and, on the other hand, a positive and significant relationship between the level of education and the future income of individuals. In other words, the higher the level of education, the better the employment status of individuals on the labour market is.

In addition, Herman (2012) sought to demonstrate the role of education, particularly higher education, in the Romanian labour market between 2000 and 2010. His results confirm that a better-educated population, with an adequate qualification to the needs of the labour market, is characterized by a higher employment rate and therefore a lower unemployment rate.

Education is becoming more and more a prerequisite for professional success. Therefore, its link with employment opened the discussion on a closer matching between education and the demands of the economy.

Several authors, such as Wu C. (2011) for the case of Taiwan, have examined the relationship between higher education expansion and the graduate unemployment rate. He concluded that during economic downturns, unemployment rate rises; therefore, students would rather choose long-term courses before getting graduated so as to improve their competitiveness on the labour market.

In the case of China, LI S. and al. (2014) showed that China's expansion policy has strongly increased the unemployment rate of young graduates. They suggested that reducing the unemployment rate at the national level may be ensured by promoting regional mobility of graduates and raising the quality of higher education suitable for the labor market.

Nemcek and al. (2015) confirmed the results of Wu C. (2011) after studying the situation of the young people awarded a diploma in the labour market and the length of their unemployment for Slovakia. They found that graduate young people are the most affected by unemployment besides; they face the problem of getting jobs that match their skills. For this reason, they prefer extending their studies to invest in their future employability.

In the Tunisian context, Siala and Ben Ammar (2013) focused on the situation of young unemployed people. The main estimated results show that individual's age, gender, marital status, level of education, sector of economic activity, type of employment and region of residence are significantly related to the unemployment. Particularly, the results indicate that, for young workers, unemployment incidence increases with the level of education. Education has a greater impact on the unemployment of females than on that of males. For Coastal area and public employment are associated with lower probability of transition into unemployment.

Following this line of research, Tunisia's 2015 NIS statistics showed that particularly women are the most vulnerable to unemployment since their unemployment rate, in 2015, was close to 21.6% against 12.5% for males (Table 1).

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Male	11.5	11.3	11.2	11.3	10.9	15.2	14.3	13.2	12.6	12.5
Female	15.1	15.3	15.9	18.8	18.9	27.8	25.3	22.6	21.2	21.6
<b>(Unemployment rate)</b>										
<b>Total</b>	12.5	12.4	12.4	13.3	13	18.6	16.9	15.8	15.2	15

**Table 1: Unemployment rate by gender from 2006 to 2015 (in%)<sup>1</sup>**

From this table, it can be concluded that the unemployment rate in Tunisia has not ceased rising for several years. Actually, between 2010 and 2015 it climbed from 13% to 15%. Nevertheless, these figures remain below the 18.6 recorded in 2011. Among the many factors have contributed to the surge of unemployment; we can cite the political instability which caused the freezing of many industrial projects that were expected to be carried out by foreign investors.

As it has been dealt with all along this paper, unemployment is a major issue when we speak about economic growth. On the macroeconomic level, it still has a serious impact; besides, it is often linked with education as the same level as with the public policies. Actually, the major impact of unemployment is poverty which reflects weak economic productivity.

<sup>1</sup> Source : NIS, 2015



### 2.3 Unemployment and poverty

Actually, the unemployment problem which is neither new nor certainly specific to the developing countries has no easy solution.

Recent studies which have examined the relationship between unemployment and poverty are those of : Aiyedogbon and Ohwofasa (2012) who examined the causal links between unemployment and poverty in Nigeria during the period of 1987-2011 using the Ordinary Least Squares (OLS) method. The results of their study revealed that unemployment agricultural and services contributions to real GDP as well as population have positive determining influence on poverty level in Nigeria with only agricultural sector statistically insignificant.

On the other hand, Akwara et al. (2013) argued that poverty and unemployment are a social threat to security in Nigeria. Actually, unemployment creates poverty which itself leads to insecurity. As a consequence, we can say that both unemployment and poverty have negative effects on the national security.

Very recently, Akinmulegun (2014) has focused on the sudden rise of unemployment and its impact on the level of poverty in Nigeria. He backed the results reached by Aiyedogbon and Ohwofasa (2012) believing that unemployment is a major handicap for the macroeconomic policies in creating jobs, therefore, the private sector is called to contribute the job creation.

## 3. Data and model specification

The sample used contains annual data covering the period 1990–2013 for Tunisia which is considered in this series analysis. The data collected from the World Development Indicators (<http://data.worldbank.org/indicator>) and National Institute of Statistics-Tunisia (<http://www.ins.nat.tn/indexen.php>).

In the context of our study, we consider the following transformed Cobb-Douglas log-linear production function:

$$LGDP_t = \beta_0 + \beta_1 \sum_1^3 LEDU_t + \beta_2 LUNP_t + \beta_3 LPOV_t + \varepsilon_t$$

With 
$$\sum_1^3 LEDU_t = LENR_t + LEXP_t + LGRA_t$$

Thus, we define  $t=1, \dots, T$  denotes the time period (our time frame is 1990-2013), LGDP is the gross domestic product, LENR is the school enrollment tertiary education, LEXP is the higher education expenditure, LGRA is the number of graduate students, LUNP is unemployment with tertiary education, LPOV is the poverty rate, and  $\epsilon_t$  is the white noise disturbance term.

To test the nature of the association between the variables while avoiding any spurious correlation, the empirical investigation in this paper consists of three steps: We begin by testing for the stationarity of the variables. Prompted by the existence of unit roots in the time series, we test for the long run cointegrating relation between the variables, at the second step of estimation using the cointegration technique developed by Johansen (1988).

Granted the long run relationship, we explore the causal link between the variables by testing for Granger causality at the final step.

In addition, the Augmented Dickey-Fuller method, "ADF" technique is adopted to test the unit root property of the used time series data. This method was adopted because most time series data exhibit a random walk and are often not stationary.

### 3.1 Unit root tests

To avoid a spurious regression, the Augmented Dickey-Fuller test is conducted, thus:

$$Y_t = \sum_{i=1}^p \phi_i Y_{t-i} + U_t$$

$$\Delta Y_t = \sum_{i=1}^{p-1} \phi_i^* \Delta Y_{t-i} + \phi^* Y_{t-1} + U_t, U_t \sim iid(0, u^2)$$

$$\phi^* = (\phi_1 + \phi_2 + \phi_3 + \dots + \phi_p) - 1$$

If  $\phi^* = 0$ , against the alternative  $\phi^* < 0$ , then  $Y_t$  contains a unit root. The model can be extended to allow for the possibility that the series contains deterministic components (constant and trend).

**Table 2: ADF test in level**

		<b>LGDP</b>	<b>LENR</b>	<b>LGRA</b>	<b>LEXP</b>	<b>LUNP</b>	<b>LPOV</b>
<b>(1)</b>		-2.757059	-0.907762	-2.941160	-2.676187	-0.570759	-2.380498
	***	(-4.4415)	(-4.4415)	(-4.4415)	(-4.4415)	(-4.4415)	(-4.4415)
	**	(-3.6330)	(-3.6330)	(-3.6330)	(-3.6330)	(-3.6330)	(-3.6330)
	*	(-3.2535)	(-3.2535)	(-3.2535)	(-3.2535)	(-3.2535)	(-3.2535)
<b>(2)</b>		-2.525571	-1.311393	-2.151513	1.276009	1.843284	-0.873440
	***	(-3.7667)	(-3.7667)	(-3.7667)	(-3.7667)	(-3.7667)	(-3.7667)

	**	(-3.0038)	(-3.0038)	(-3.0038)	(-3.0038)	(-3.0038)	(-3.0038)
	*	(-2.6417)	(-2.6417)	(-2.6417)	(-2.6417)	(-2.6417)	(-2.6417)
<b>(3)</b>		-0.966332	0.315451	-1.402577	0.550284	3.841942	-2.535601
	***	(-2.6756)	(-2.6756)	(-2.6756)	(-2.6756)	(-2.6756)	(-2.6756)
	**	(-1.9574)	(-1.9574)	(-1.9574)	(-1.9574)	(-1.9574)	(-1.9574)
	*	(-1.6238)	(-1.6238)	(-1.6238)	(-1.6238)	(-1.6238)	(-1.6238)
		<b>Non stationary</b>	<b>Non Stationary</b>	<b>Non Stationary</b>	<b>Non stationary</b>	<b>Non stationary</b>	<b>stationary</b>

*** significance at 1% level.	** significance at 5% level.	* significance at 10% level.
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On applying the Dickey-Fuller test, it can be noticed that variable "POV" is stationary in level, while the others are not, which implies that they be make stationary for Tunisia.

**Table 3: ADF test results for unit root**

	<b>ADF Value</b>	<b>Critical Value</b>	<b>ADF Test result</b>
$\Delta LGDP$	-4.185612 (3)	-2.6819 (***)	Integrated of order 1
$\Delta \Delta LENR$	-3.758575 (1)	-2.6889 (***)	Integrated of order 2
$\Delta LGRA$	-3.472972 (3)	-2.6819 (***)	Integrated of order 1
$\Delta LEXP$	-3.004141 (3)	-2.6819 (***)	Integrated of order 1
$\Delta LUNP$	-3.036707 (2)	-3.0114 (**)	Integrated of order 1
$LPOV$	-2.535601 (3)	-1.9574 (**)	Integrated of order 0

*** significance at 1% level.	** significance at 5% level.	* significance at 10% level.
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(1) with trend and constant	(2) without trend and with constant	(3) without trend and without constant
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Table 3 presents the ADF test results for the unit root. It shows that most variables (GDP, GRA, EXP, UNP) for the Tunisian sample are stationary in first differences, the POV is stationary in level and the ENR is stationary in second differences.

After obtaining the stationarity of the data, Johansen's (1988) approach has been used with the choice of lag length (Chang, 2002) to find out the possible long-run relationship between the considered variables. Thus, all the variables are subject to co-integration test.

### 3.2 Co-integration test

In order to find out any long run relationship between the variables, the cointegration between the variables should be tested after the decision of the order of integration. In this paper, Johansen trace test is used as the cointegration test. Cheung and Lai (1993) point out that the trace test for co-integration is more robust than the maximum Eigenvalue test. It is known that Johansen trace test decides the number of co-integrating vectors between the variables. At least one cointegrating vector should be present for a possible co-integration. The test results are summarized in Table 4.

**Table 4: Results of cointegration tests with Johansen's (1988) approach**

<i>Johansen tests for cointegration</i>					
<i>Trend: constant</i>			<i>Number of obs =</i>		
22					
<i>Sample: 1992 - 2013</i>			<i>Lags =</i>		
2			5%		
<i>Maximum</i>				<i>Trace</i>	<i>critical</i>
<i>Rank</i>	<i>parms</i>	<i>LL</i>	<i>Eigenvalue</i>	<i>statistic</i>	<i>value</i>
0	42	202.47507	.	192.9495	94.15
1	53	246.25464	0.98131	105.3904	68.52
2	62	266.24687	0.83756	65.4059	47.21
3	69	281.11137	0.74110	35.6769	29.68
4	74	292.24267	0.63649	13.4143*	15.41
5	77	297.68187	0.39011	2.5359	3.76
6	78	298.94983	0.10887		
					5%
<i>Maximum</i>				<i>Max</i>	<i>critical</i>
<i>Rank</i>	<i>parms</i>	<i>LL</i>	<i>Eigenvalue</i>	<i>statistic</i>	<i>value</i>
0	42	202.47507	.	87.5591	39.37
1	53	246.25464	0.98131	39.9845	33.46
2	62	266.24687	0.83756	29.7290	27.07
3	69	281.11137	0.74110	22.2626	20.97
4	74	292.24267	0.63649	10.8784	14.07
5	77	297.68187	0.39011	2.5359	3.76
6	78	298.94983	0.10887		

After obtaining the stationarity of data, Johansen (1988) and Johansen and Juselius's (1990) approach has been used with the choice of lag length (Chang, 2002) to find out the possible long-run relationship between the considered variables. From Table 4, it is concluded that each pair of

variables is co-integrated with another, which indicates that there is a long-run equilibrium relationship between these variables.

All the variables are co-integrated with four relationships. Therefore, the vector error-correction model is to be used to determine the direction of causality since there is a co-integration relationship between the variables. If the variables are co-integrated, Granger (1988) indicates that there is at least one direction of causality among the variables.

### 3.3 *Granger Causality test*

Cointegration implies that causality exists between the series but it does not indicate the direction of the causal relationship. With an affirmation of a long run relationship between the variables, we test for Granger causality of the long run relationship at the third and final step of estimation. Granger causality itself is a two-step procedure. The first step relates to the estimation of the residual from the long run relationship. Incorporating the residual as a right hand side variable, the short run error correction model is estimated at the second step.

**Table 5: Granger Causality test**

Null Hypothesis:	Obs	F-Statistic	Probability
POV does not Granger Cause DGDP	19	3.55793	0.04712
DGDP does not Granger Cause POV		3.85707	0.03794
DGRA does not Granger Cause DDENR	18	4.75269	0.02449
DDENR does not Granger Cause DGRA		3.93692	0.04075
DUNP does not Granger Cause DGRA	19	2.10630	0.15476
DGRA does not Granger Cause DUNP		4.14700	0.03100
POV does not Granger Cause DEXP	19	0.26376	0.89460
DEXP does not Granger Cause POV		10.4337	0.00136
POV does not Granger Cause DUNP	19	1.05104	0.42890
DUNP does not Granger Cause POV		7.07771	0.00569

The results of causality are contained in table 5. The results revealed there is a two way causation between GDP and POV and also between GRA and ENR. The result also indicated a one way causation between GRA and UNP and also between EXP and POV and between UNP and POV.

**Table 6: Result of Least Squares estimation**

Dependent Variable: DGDP

Method: Least Squares

Sample(adjusted): 1992 2013

Included observations: 22 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.832552	1.815770	-1.009242	0.3279
DDENR	0.743674	0.520369	1.429128	0.1711
DGRA	8.301388	2.606829	3.184477	0.0054
DEXP	-0.157601	4.743723	-0.033223	0.9739
DUNP	-0.114821	0.254382	-0.451372	0.6574
POV	0.105991	0.125257	0.846186	0.4092
R-squared	0.446125	Mean dependent var	-0.063636	
Adjusted R-squared	0.315801	S.D. dependent var	2.704766	
S.E. of regression	2.237283	Akaike info criterion	4.645118	
Sum squared resid	85.09238	Schwarz criterion	4.893082	
F-statistic	2.945270	Durbin-Watson stat	2.107637	
Prob(F-statistic)	0.045149			

The OLS estimation of our model shows that the set of independent variables explains the variations in the employment rate by 44.61% (table 6).

The results illustrated in table 5 indicate that the results are robust in that the Durbin-Watson statistics (DW) of 2.107 falls within the range of (1.59-2.41) of no serial correlation and it is also higher than  $R^2$  (0.4461) indicating that the model is non-spurious. The  $R^2$  showed that the combined independent variables explained about 44.61 percent of the real GDP in the period of analysis, while the F-stat of 2,945, which measures the joint effects of the explanatory variables, revealed that the entire equation is significant in explaining the real GDP in Tunisia.

It can also be seen from table 5 that the coefficients of ENR, EX, UNP and POV are found to be statistically insignificant while the coefficient of GRA is found to be statistically significant.

The regression results imply that 1 per cent change in ENR, GRA and POV raises the real GDP by 0.743 units, 8.301388 units and 0.105 units, respectively. However, 1 per cent change in EXP and UNP reduces the GDP by 0.157 and 0.114 units, respectively.

The result revealed that the growth level in Tunisia is negatively correlated with higher education expenditure and graduates' unemployment, and positively correlated with school enrollment, number of graduates and poverty. This implies that as graduate unemployment and

tertiary expenditure increases, economic growth decreases and vice-versa, whereas school enrollment, number of graduates and poverty increase with economic growth.

### 4. Conclusions and policy implications

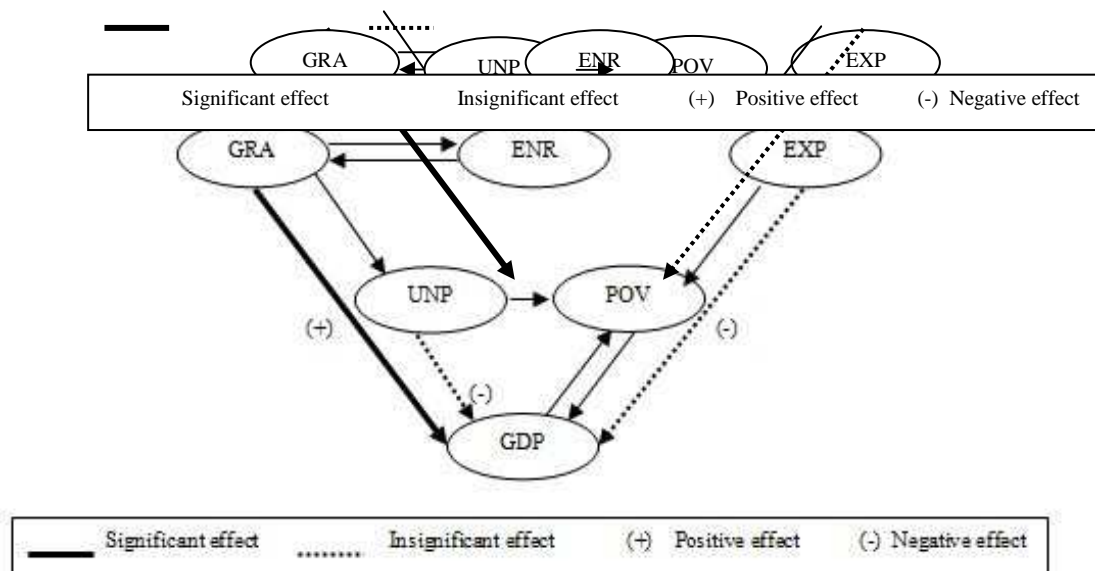
Investment in education and human capital accumulation is crucial for sustainable economic growth, higher living standards, more-equitable income distribution and better quality of life.

This study investigated the causal linkages between higher education, graduate unemployment, poverty and economic growth in Tunisia using properties of time series variables over the period 1990-2013 while applying the Ordinary Least Squares (OLS) method.

We are actually interested in this research in the issue of the human capital contribution to the process of involving young people in the labor market so as to reduce poverty and achieve a better productivity, a topic that has been rarely tackled in Tunisia.

The main findings show evidence of bidirectional causal relationship between GDP and POV and between GRA and ENR besides unidirectional causal relationship between GRA and UNP and also EXP and POV and between UNP and POV.

**Figure 1: The way linkages between Higher education, Unemployment, poverty and Economic growth.**



Our empirical results verified the hypothesis that higher education improves economic growth and unemployment grave poverty. In this study, we verified the existence of a positive effect of the ENR, GRA and POV on economic growth. However, the UNP and EXP have a negative influence on economic growth with only GRA statistically significant (see figure1).

Our findings show a positive relationship between economic growth and poverty rates, which contradicts the majority of economists who consider that economic growth, reduces poverty. This can be explained by the fact that most of the poor are working in poor conditions and a low payment. They operate their activities in very different framework mainly located in informal economies.

Most institutional economists agree that overall poor economic performance of the developing countries is connected with its weak institutions. In Tunisia, informal institutions prevail because formal institutions are ineffective.

Our results indicate a positive correlation between ENR and GRA, which shows that in administrative side, the Tunisian education system works well. Thus, the greater the number enrolled in tertiary education, the higher the number of graduates in active population.

Nevertheless, this policy of higher education expansion is accompanied by a serious problem of graduate unemployment. This shows that in Tunisia, the public effort for higher education does not result in a qualitative efficiency of the education system.

More precisely, there is a negative effect of higher education expenditure and graduate unemployment on economic growth. Actually, the greater the number of graduates accompanied by increasing expenses on higher education, the higher unemployment rate will be.

When the educational expenses per student are relatively high, the increase of the number of students per faculty will result in a rise of educational budgets per student; which implies an increase in unemployment rate. In fact, increasing of budgetary constraints exist within a context of rapidly increasing student enrollment, and the need to improve the quality of education to insure better employability of graduates.

This result appears mainly in the Tunisian labor market structure, in the important budgets devoted to employment and in huge investments in education. However, this procedure is not beneficial as it does help create jobs. As a consequence, in the Tunisian labor market, there is incompatibility between supply and demand, in other words, the global employment offer is much lower than the demand.

Persistent imbalances in the Tunisian labor market make the unemployment rate structural. However, the need to improve some social indicators, such as reducing the unemployment rate, is believed to be on of the major factors that can help reduce poverty. Furthermore, if access to employment actually helps avoid unemployment, it is not always possible to escape informal economy and poverty. In this study, the poverty level has a positive effect on economic growth. This is not surprising as poverty has regressed considerably in Tunisia since 1986 with the implementation of the structural adjustment program which was accompanied by several various social measures that helped limit its social impact.



On the basis of this study, the following policy recommendations can be made for enhancing higher educational institutions by building up a modern education system that could meet the challenges of modern society, ensure better employability of graduates and ameliorate their individual productivity which leads to the increase of income and the reduction of instability.

To ensure sustainable growth and increase employability of graduates, it is recommended that governments and private sectors should improve the quality of education and enhance human capital development.

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