IMPACT OF PUBLIC DEBT ON ECONOMIC GROWTH FOR THE CASE OF ALBANIA

Oltjon Bejaj
oltjonbejaj@gmail.com

ABSTRACT

The purpose of this study is to investigate the long- and short-run impact of public debt as well as government expenditures on economic growth in Albania, using annual time series data, covering the period 1993–2021. To accomplish this task is used the Vector Error Correction Method (VECM). The results of the study reveal that between public debt and economic growth exists an inverse long-run relationship. In the long run, public debt has a negative impact on GDP growth, whereas government expenditures positively affect the economic growth. Regarding the short run results there exists a positive relationship between public debt and economic growth. The evidence of this paper will contribute to the existing literature regarding the relationship between these variables and can help policymakers to undertake sound policy measures.

1. INTRODUCTION

The main aim of this paper is to estimate the relationship between public debt and economic growth in Albania. This relationship is one of the most discussed issues. The debate has become even more active as a result of the global financial crisis and debt crisis in some of European countries, focusing more on the efficiency of fiscal policies and the consequences that the increase in public debt brings.

The structure of the paper is given below: the next section is an overview of the pattern of public debt and GDP growth, while the third and fourth parts deal with relevant existing research in this field and the methodology, respectively. In the fifth section, are presented the conclusions and recommendations.

2. OVERVIEW OF PUBLIC DEBT AND GROWTH IN ALBANIA

Public debt (also known as a national debt) is owed by a central government. One of the methods of financing government operations and investments, but not the only one, is public debt. Another method for financing own operations is the issuance of money through monetary policies, and in this case, there is no need to pay interest. The second method, although results in a reduction of interest costs, cannot result in the elimination of this debt, and on the other hand, it brings hyperinflation if used not under restricted rules. Based on the data collected from the Albanian Ministry of Finance and Economy, the stock of Public Albanian Debt is planned to be about 1.40 billion Lekë for 2022, with an increase of 78.6 billion. Cost per capita per inhabitant is 496.04 All or 4.099 euro.

The public debt in 2020 figures have increased by 10 percent compared to a year ago, reaching the sum of 111.6 billion ALL (see Figure 1). Until September 2021, an increase of 57.9 billion leks was reported compared to the total

stock in 2020. Referring to statistics, the cost of debt per capita increased by 31% from 2017 to September 2021. Every Albanian citizen is expected to pay a cost of 117 343 leks more referring to the public debt in 2021. In 2019, the Albanian government faced the November earthquake and the Covid-19 pandemic, which continued for more than two years. These phenomena caused an increase in expenses during 2020 to deal with the reconstruction of buildings destroyed by the earthquake as well as financing governments' packages to deal with the pandemic. Another side effect was the low realization of income due to the lack of normal functioning of different mechanisms.

Figure 1. Performance of Public Debt Stock in nominal value (in millions of ALL) and change on annual basis in%, 2000 – 2022
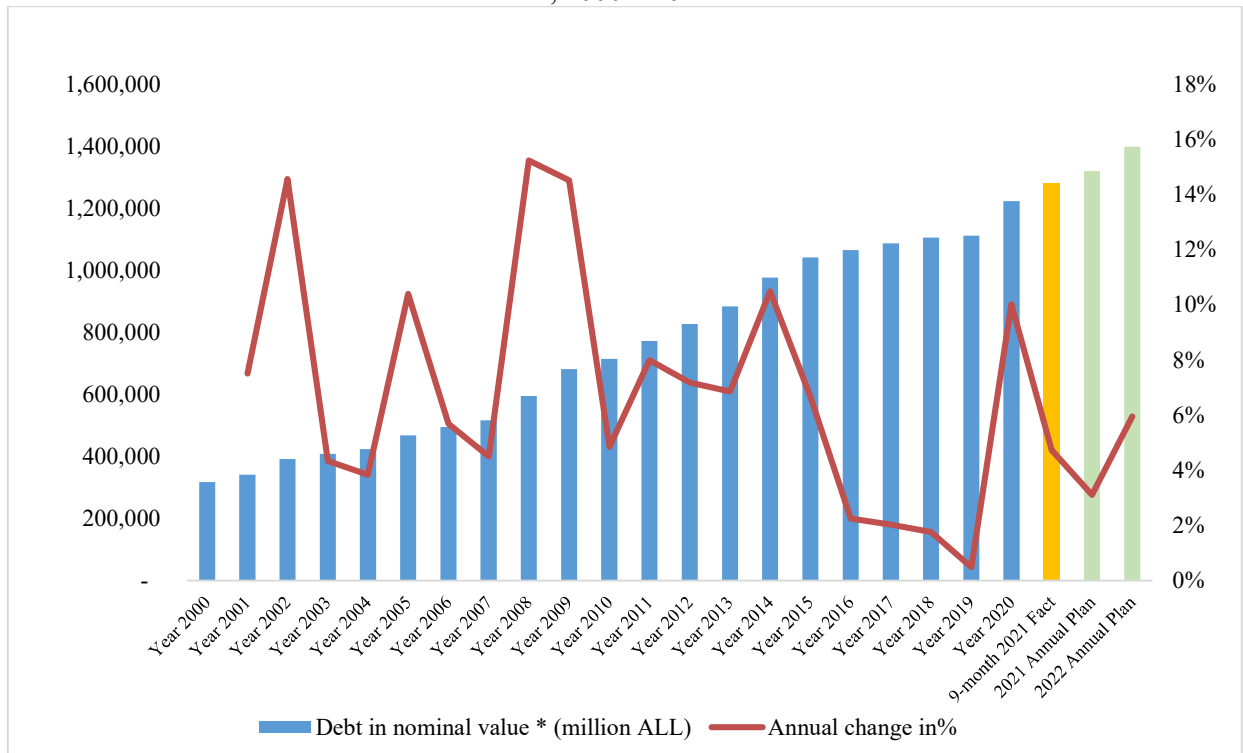
Source: Ministry of Finance and Economy

The increase in expenses and the decrease in income further deepened the deficit, thus causing an increase in public debt. The above refers to the statistics through which was reported that the realization of income was 7.5% lower in 2020 compared to 2019, while expenses were 9% higher (see Figure 2).

Figure 2: Share of public debt as a percentage of GDP, 2000 -2022
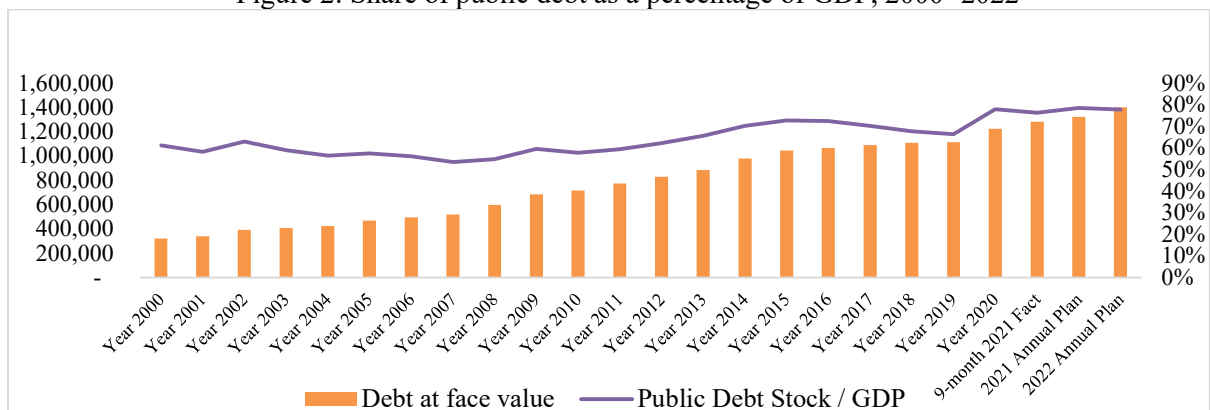
Source: Ministry of Finance and Economy (2021), Debt Indicators

76

Referring to the Balkan region, the country with the lowest public debt is Kosovo with 22.4% of GDP, while the country with the highest public debt is reported to be Montenegro with 90.7% of GDP (see Figure 3). Albania ranks second in the region according to this classification.

Figure 3. Countries of the Region by weight of Public Debt in% of GDP 2016-2021
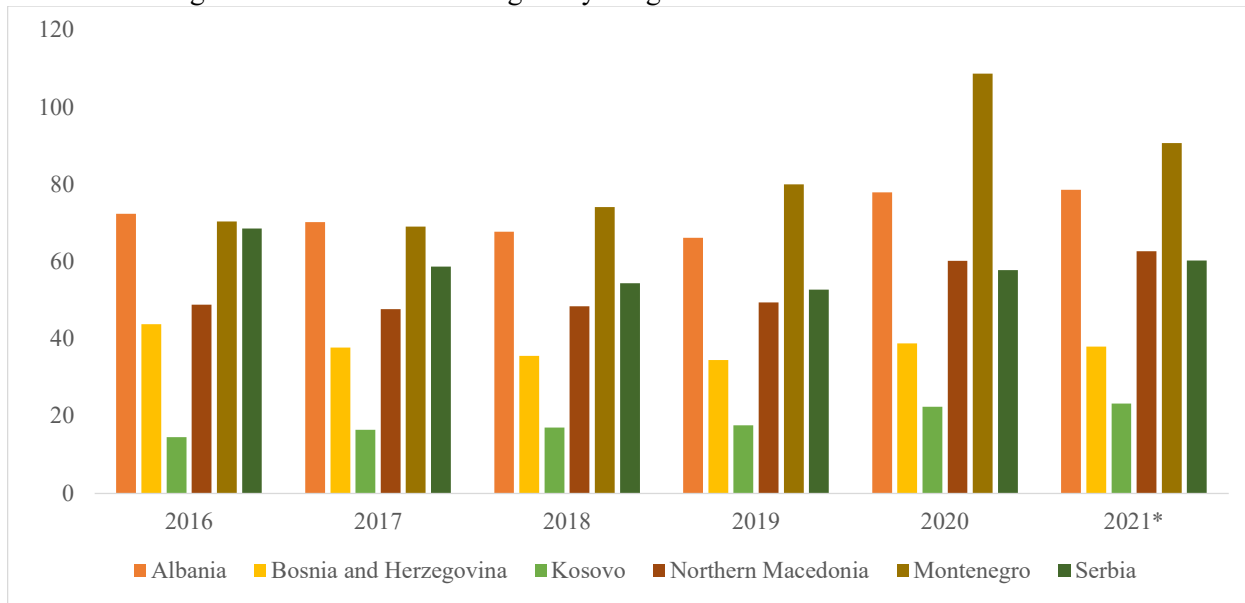
Source: Ministry of Finance and Economy,
For the countries of the region, data are taken from the World Bank.

For 2021 and 2022, data on debt costs are planned and reported in official publications of the Ministry of Finance and Economy. For 2022, the structure of the public debt stock is projected to be 54.4% domestic debt and 45.6% external debt. Over the years there has been an increasing trend of External Debt in the Public Debt portfolio, where for 2020 it is 47.4% of the total compared to 28.5% in 2007. This also means potential risks from exchange rate fluctuations or interest rates (see Figure 4).

Figure 4. Weight of Domestic and External Debt ot Public Debt
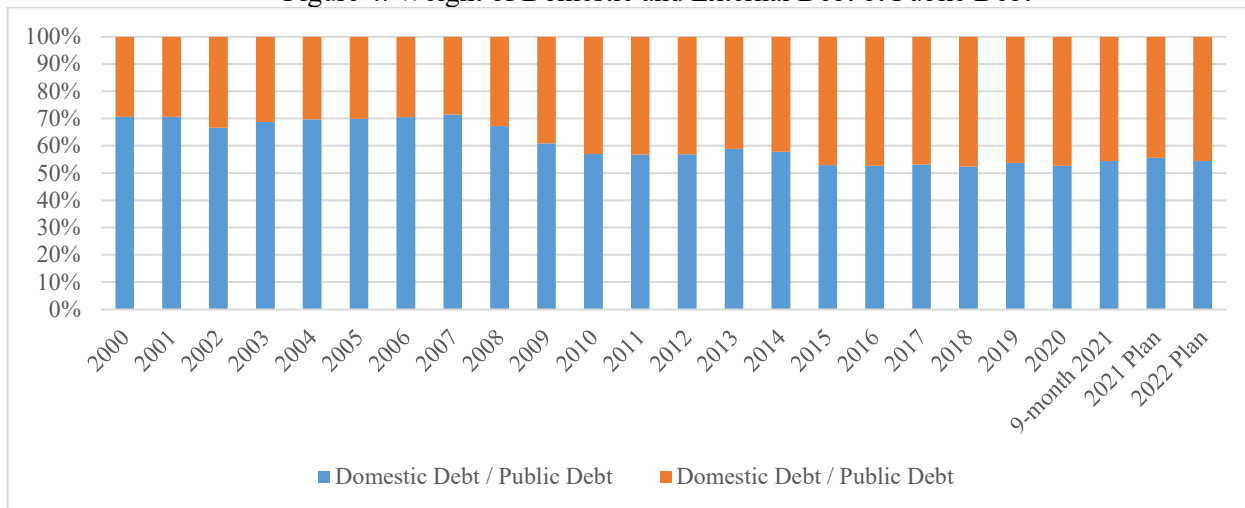
Source: Ministry of Finance and Economy, 2021

The cost of Public Debt is calculated as the sum of the Internal and External Debt interest paid by the State under outstanding loan agreements, each year. The performance of the c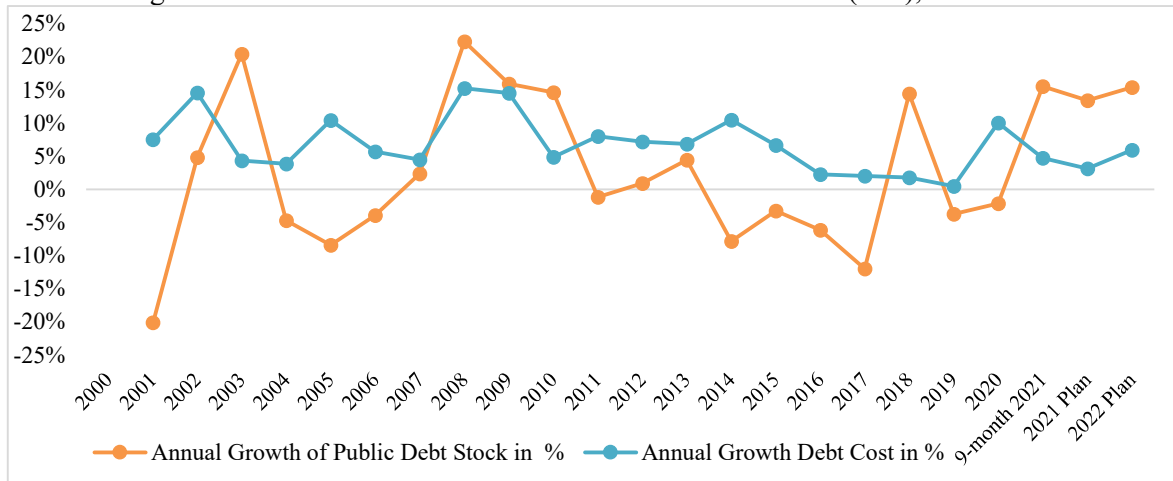ost of public debt has fluctuated over the years because of increasing public debt stock, changing interest rates, or exchange rate fluctuations. Specifically, for 2022, a higher increase in the cost of debt is planned compared to the increase in public debt, respectively by 15.4% and 6% each more compared to 2021, as noted in the Figure 5.

Figure 5. Annual Growth of Public Debt Stock vs. Debt Cost (in%), 2000-2022

Source: Ministry of Finance and Economy

The cost of Public Debt, referring to interest expense is presented with significant fluctuations over the years. The years 2000-2010 appear with low changes in the total cost of public debt, but with an increasing trend. While during the years 2010-2020, there is a greater fluctuation in the cost of public debt, with a downward trend since 2013. This decline in interest expenses is experienced as a result of an interest rate decrease in international markets, as noted in the Figure 6. In cases where the interest rate paid on public debt decreases, its cost is reduced.

Figure 6: Interest Rate Performance, Eurozone, and US (%)
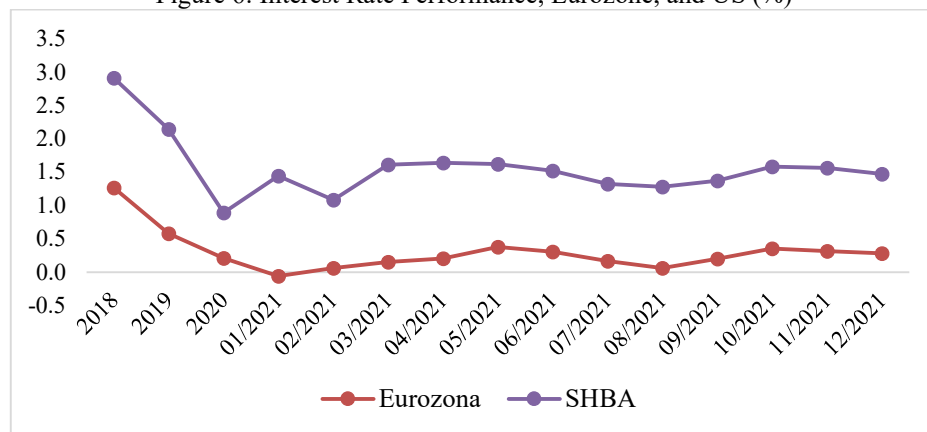
Data Source: World Bank

To measure the economic growth of a country, region, or global growth, nominal or real terms can be used. The difference is that inflation is also included in nominal terms. The increase in the ability and possibility of a country to produce more goods and services compared to a certain period is called economic growth.

Figure 7. Albania GDP Per Capita and GDP growth rate 1993-2021

Data Source: World Bank

The sum of the gross value, which includes all products produced by residents in the reporting economy, adding product taxes and deducting subsidies, makes up the gross domestic product (GDP). Its calculation is not taking into consideration deduction for asset depreci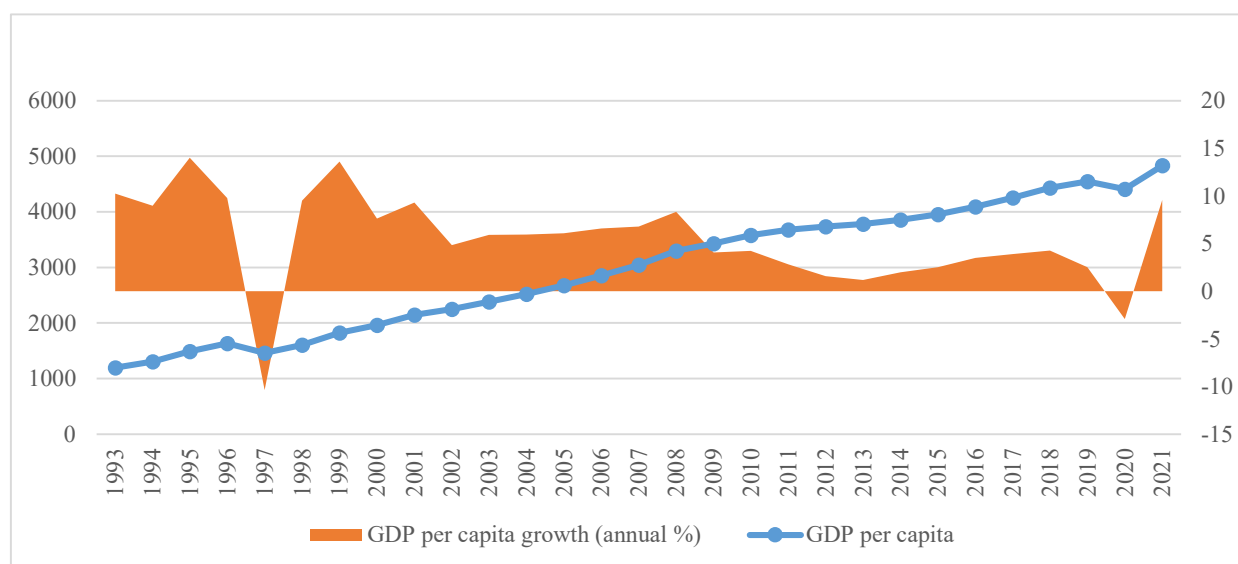ation or degradation of natural resources. As shown in Figure 7, the trend of GDP growth has been positive from 2016 to 2018 and negative until 2020. Referring to the data of the World Bank in 2018 GDP growth rate (4.07%) faced an increase of 0.27 % and in 2017 GDP growth rate (3.8%) experienced a 0.49% increase from 2016. From 2017 to 2020 the Gdp growth rate declined respectively in 2019 a 1.9% decline and in 2020 a 5.48 % decline. As for GDP per capita, it is calculated based on total GDP divided by the medium population.

GDP is the sum of the gross value, which includes all products produced by residents in the reporting economy, adding product taxes and deducting subsidies. Its calculation is not taking into consideration deductions for asset depreciation or degradation of natural resources. Albania's GDP per capita has experienced an increase from 2016 to 2019 and a decrease to 2020. Based on figures sourced by World Bank Gdp per capita in 2017 (4,451 $) increased by 9.87% from 2016. This increase has been respectively 16.63 % and 1.35% in 2018 (5,284 $) and 2019 (5,356$). The trend of the following year was contrary when Gdp per capita declined by 2.62 % in 2020 (5,215 $) from 2019.

2.1 Relationship between Public debt and Economic Growth in Albania

Albania marked the worst year in terms of the level of public debt in 2021 (see Figure 8), the year in which the Albanian government opened the bag to finance the reconstruction process. However, public debt did not convert to economic growth and did not have the famous "multiplier effect". The increased debt did not bring significant improvement in the labor market either, according to the latest data published by the Ministry of Finance and the Institute of Statistics.

According to public data, the debt of Albanian taxpayers reached 1.38 trillion ALL at the end of 2021, with a shocking increase of 158 billion ALL or 1.3 billion euros. Under normal circumstances, such a dramatic increase in public debt should have caused the "multiplier effect", the multiplier effect of money invested by public authority once it has circulated in the economy more than once. The multiplicative effect is a concept invented by economist John Maynard Keynes nearly a century ago. According to Keynes, if the public authority puts a lek into circulation in the form of an investment, the beneficiary of that lek will spend it further to purchase other goods and services and the second beneficiaries will also spend it further, ending, the total economy added to be greater than 1. The data show that the public debt spent by the Rama government not only has not brought a multiplier effect, but this effect is negative. While public debt increased by ALL 158 billion, Gross Domestic Product increased by ALL 151 billion. The negative effect is even more severe than it seems. 2021 is the year after the crisis caused by the new coronavirus

pandemic. During this year, part of the private sector economy that could not work during 2020 returned to work. Consequently, not all economic growth of ALL 151 billion was produced by the increase in public debt.

Figure 8. GDP And Public Debt 1993-2021
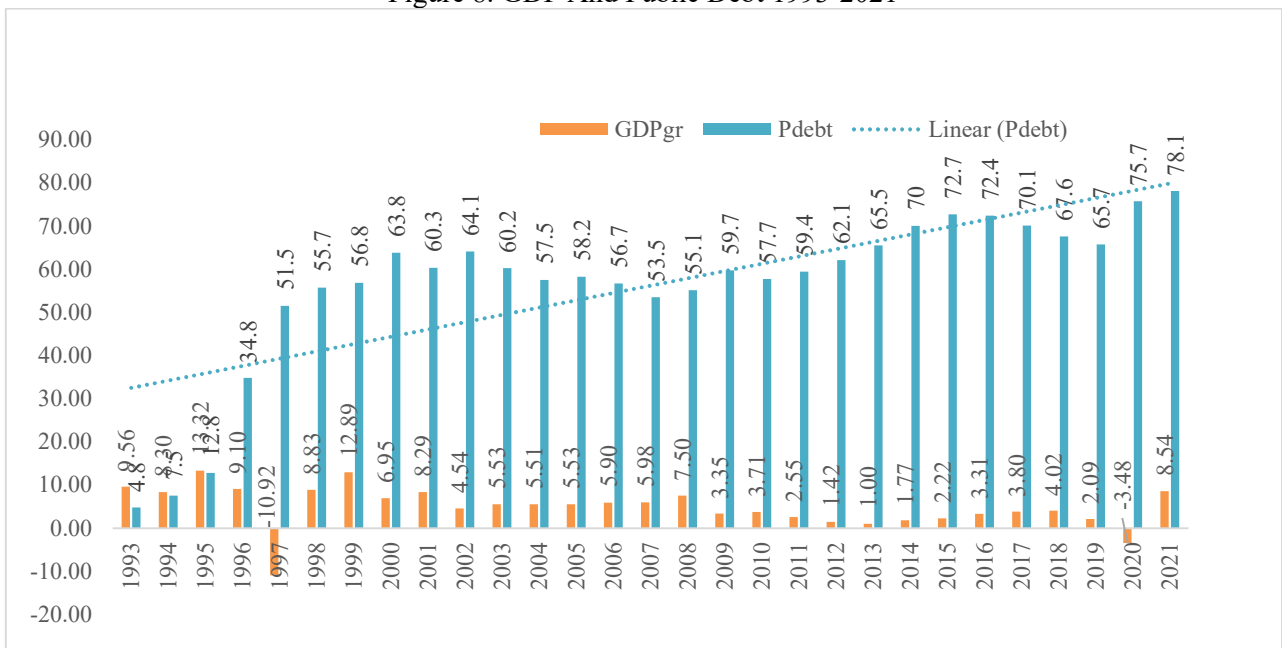
Source Data: Ministry of Finance Albania, World Development Indicators

3. LITERATURE REVIEW

Many authors had given their contributions to studying the relationship between economic growth and national debt. The authors used different types of models with panel data and concluded that external debt negatively affect economic growth for debt values above 35-40 percent of GDP (Pattillo et al, 2002). They confirmed that there was a non-linear relationship between these two indicators, in the form of the Laffer curve (Reinhart et al, 2012). In another later study, Pattillo et al. (2004) again tested the non-linear effects of debt on economic growth considering a larger number of developing countries (61) for the same period (1969-1998). The econometric results brought evidence that proved that a high public debt negatively affects economic growth. This impact was proven to come through the negative effect on the factor of accumulation of physical capital and the total productivity of production factors. To obtain the above results, the author has employed the OLS model, instrumental variables, and GMM model.

Based on data for the period 1970-2020 for 59 developing countries and 24 developed economies, Alfredo Schclarek (2004) found that there is a negative linear relationship between external debt and economic growth. Kumar and Woo (2010), proved that between economic growth and the initial level of public debt exists a non-linear negative relationship. In the United States of America (USA) Patrizio Lainà (2011) studied this relationship but in dynamic dimensions. For her studies, she focused on a period from 1959-2010 and employed methodological methods such as SVAR, VECM and Granger causality test, reaction impulse test. Empirical evidence was founded that the effect of public debt on economic growth is positive in short term and negative in the long ones. This study also concludes that in case of the negative trend of total debt, it is very difficult to have economic growth.

Many other researchers have identified a positive effect of public debt on economic growth. Abbas and Christensen (2007) attempted to study the role of domestic debt in economic growth. Dates for this study were sourced for the period 1975-2004 for 93 countries with low income. Using different econometric models such are OLS, GMM, and fixed effects results were shown that in countries with low income exists a significant relationship between domestic debt and economic development.

Another study that has on focus impact of domestic debt on the economy is written by authors Maana et al. (2008). This study used data for the period 1996 to 2007 in Kenya. The OLS method chosen for analysis shows that the

relationship between economic growth and the regressor is positive but statistically insignificant. Because of the short period for which are collected data, only ten observations, and not the appropriate methods used for analyses, this study is not very reliable. On the other hand, for Pakistan country, Sheikh et al. (2010) explored the linkage between domestic debt and economic growth. Through OLS econometric model which was used to analyze data collected for Pakistan from 1972 to 2009 investigated that exist the positive impact of domestic debt stock on economic growth.

Unlike Sheikh et al. (2010), Uzun et al. (2012) used the ARDL model to study the relationship between debt and economic growth for transition countries, in the period 1991-2009. The authors expressed that in long term there is a positive impact of debt on economic growth.

Referring to the achievements of authors mentioned in the review of the literature is shown that public debt can have a negative or positive impact on economic growth. The following tables present the authors divided into two groups based on the results of their studies on the positive or negative relationship between debt and economic growth.

Table 1. The negative impact of debt (domestic/external) on economic growth

Authors / Year	Object of study	METHODOLOGY	Conclusions
Chatherine Pattillo, Helene Poirson, Lucca Ricci, (2002)	Relationship of external debt and economic growth for 93 developing countries for the period 1969-1998	Dynamic models are used for econometric analysis using panel data.	A non-linear relationship resulted from empirical evidence which tested the relationship between two indicators included in the model.
Chatherine Pattillo, Helene Poirson, Lucca Ricci, (2004)	The channels through which public debt affects economic growth, for 61 developing countries for the period 1969-1998	Evaluation of the standard growth model is made with the employment of OLS, instrumental variables, and the GMM model.	The econometric results brought evidence that proved that a high public debt negatively affects economic growth. This impact was proven to come through the negative effect on the factor of accumulation of physical capital and the total productivity of production factors.
Schclarek (2004)	The role of external debt on economic growth from the period from 1970 to 2002 for 59 developing countries.	For econometric analysis are employed GMM and data panel models.	This study has explained that there was a linear negative impact of external debt on economic growth, after studying 59 developing countries and 24 industrialized countries, for the period 1970-2002.
Kumar and Woo (2010)	They have studied the impact of public debt on economic growth in the long- run and relied on a panel of 38 developed and developing countries over a period of four decades (1970-2010).	OLS and linearity testing are used for exploring the impact between dependent variables and regressor.	They confirmed a negative non-linear relationship between the initial level of public debt and economic growth.
Patrizio Lainà (2011)	This paper studied the relationship between public debt and economic growth in dynamic dimensions. For the aim of the study, dates were collected for the period from 1959-2010.	The methodology used was SVAR, Granger causality test, reaction impulse test, VECM, etc	Empirical evidence had found that the effect of public debt on economic growth is positive in short term and negative in the long ones. This study also concludes that in case of a negative trend of total debt, it is very difficult to have economic growth.

Table 2. The positive impact of debt (domestic/external) on economic growth

Authors / Year	Object of study	Methodology	Conclusions
Abbas and Christensen (2007)	This paper has attempted to study the role of domestic debt in economic growth. Dates for this study were sourced for the period 1975-2004 for 93 countries with low income.	Different econometric models such are OLS, GMM, and fixed effects are used for analysis.	In countries with low income exist a significant relationship between domestic debt and economic development.

Maana et al. (2008)	The economic impact of domestic debt on the Kenyan economy, for the period 1996-2007.	OLS method is used for the analysis.	Domestic debt growth has a statistically insignificant positive effect on economic growth
Sheikh et al. (2010)	Impact of domestic debt on economic growth in Pakistan, for the years 1972-2009.	The methodology used for econometric results is OLS.	Domestic debt stock has a positive impact on economic growth
Uzun et al. (2012)	The relationship between debt and economic growth for countries in transition, for the period 1991-2009.	ARDL; stationarity test, CADF test, and LM tests are employed for studying this relationship.	There is a positive relationship between debt and economic growth in the long run

4. DATA DESCRIPTION AND METHODOLOGY

The empirical analysis is carried out using annual time series data for Albania that spans 1993 to 2021. A total of four macroeconomic variables were employed in the analysis. The data description and sources of each of the variables are presented in Table 3.

Table 3. Data Description and Source

Variable	Definition	Data source
GDP growth	GDP growth (annual %)	WDI
Pdebt	Public debt, total (% of GDP)	WDI
GOVE	General government expenditure (% of GDP)	WDI

Source: WDI

The impact of public debt on economic growth has been extensively studied and debated especially within the framework of the neoclassical growth theory. The econometric model for exploring this relationship is:

$$GDP_t = a + B_1 Pdeb_t + B_2 GovE_t + u_{1t} \tag{1}$$

4.1 Research Methodology

For econometric analyses is employed VECM model. Before choosing this model some tests are made to have clear evidence if this model is the appropriate one or not. First, the series are tested for stationarity using unit root tests. In case series are stationary in their levels the VAR model should be used for estimating the coefficients.
The first step of the analysis is to determine whether the data are stationary and how many times each variable must be differentiated to obtain stationary series. The main test and the one most used for this purpose is the Dicky-Fuller (ADF) test. Through this test, the order of integration of each variable in the model is verified.

4.2 Cointegration test

The next step in this analysis refers to the application of the Johansen test, which will be used to determine the number of cointegrating vectors between the variables included in the model. The importance of this test lies in the fact that it assumes a long-term relationship between the variables. This test has proven to be more suitable than other tests such as Engel and Granger Causality because it allows one to discover and explain the long-term relationship between variables.

5. RESULTS AND DISCUSSION

Unit root test – The stationarity of time series was tested through the use of ADF tests and the results show that the time series are stationary in their level, i.e., are I(0). The results are displayed in the Table 4.

Table 4 Unit root test results /ADF Test

Variable	Statistic	p-value	Integration Level
GDP growth	-4.7	0.0001	**I(0)**
Public debt	-3.28	0.0155	**I(0)**
General government expenditure	-3.656	0.0048	**I(0)**

Source: Author's calculations

In the series of GDP growth, public debt and government expenditures we can reject the presence of a unit root, because the test statistics in absolute value is greater than 1% critical value, even at a 1% level of significance. Therefore, we conclude that VAR analysis can be performed on these three-growth series without differencing. Thus, worth concluding that all variables are stationary and are integrated of order I(0). However, every VAR model can be specified in the form of VECM by differencing the variables and introducing error correction terms. However, VECM is used only in the presence of cointegrating or long-run relationships. If there is no cointegration or if the variables are stationary, the VAR model should be applied.

Lag Length Selection is used to select the optimal number of lags for each variable. The tests used for the same aim are FPE, AIC, HQIC and SBIC. In this analysis AIC is the criteria chosen to select optimal number of lags and based on the results 3 lags are used.

Table 5 Johansen Cointegration Test

Variables: gdp growth, public debt, governmet expenditure			
Trend assumption: Constant Trend			
Number of cointegrating vectors	**Eigenvalue**	**Trace Statistic**	**0.05 Critical value**
r<=0		44.0058	29.68
r<=1	0.58454	20.2897	15.41
r<=2	0.50386	1.3652*	3.76
r<=3	0.04931		

Author's calculations
H0: no cointegration equation. Ha: Cointegration
Rejection at the 5% level. Reject the null hypothesis if the Trace and Max statistics >5% critical value, otherwise, fall to reject the null hypothesis.

For choosing a number of the cointegrated equations is used trace statistics (see Table 5). Trace statistics for r=0 and r=1 had respective values of 20.2897 and 15.41 which are greater than their critical values, so the null hypothesis is rejected for each value of "r" 0 or 1. Contrary at r=2 trace statistics =1.3652 is less than the critical value of 3.76 and in this manner is not allowed the rejection of the null hypothesis. Trace statistics for r=2 reveal that are two or fewer cointegration equations. For estimating Johansen method accept the first r for which the null hypothesis is accepted, so r=2 is the number of equations cointegrated between variables of the model. The existence of the long-run relationships between variables is explained by the cointegration test (see Table 6). This test shows that exists among variables a long-run relationship and the appropriate model for econometric analyses is the (VECM) mechanism. The VECM model is used for estimating both short and long-runs.

Table 6 Cointegrating equations

Equation	Parms	Chi2	P>chi2	
_cel	2	31.43198	0.0000	

Log-Run Relationship				
beta	coef	Std.Err	Z	P>|z|
GDP growth	1			
Public debt	4.92478	2.886234	1.71	0.088
Government expenditure	-108.106	43.18123	-2.5	0.012
_cons	838.6078			

Source: Author's calculations

Table 7 Normally test (JB) Jarque-Bera

Equation	chi2	df	Prob>chi2
D_GDP growth	1.587	2	0.45223
D_Public debt	0.101	2	0.95082
D_Government expend	0.591	2	0.74422
ALL	2.279	6	0.89236

Source: Author's calculations

Table 8 Stability Condition/Eigen Values

Eigen-Values	Eigen -Values	Modulus
1		1
1		1
0.5101885	0.222104i	0.556437
0.5101885	(-)0.222104i	0.556437
-0.2438882	0.4482707i	0.510322
-0.243882	(-)0.4482707i	0.510322

Source: Author's calculations
The VECM specification imposes 2 unit moduli.

The Eigen-values and their modules are shown in the table 8, in which it is evident that two of the roots have the value "1" and two real roots are close to 0.5, although theoretically, it is not possible to know how close to 1 these roots are. The results once again strengthen the theoretical treatment by concluding that the predicted cointegrated equation can be not stationary.

Figure 9. Stability test
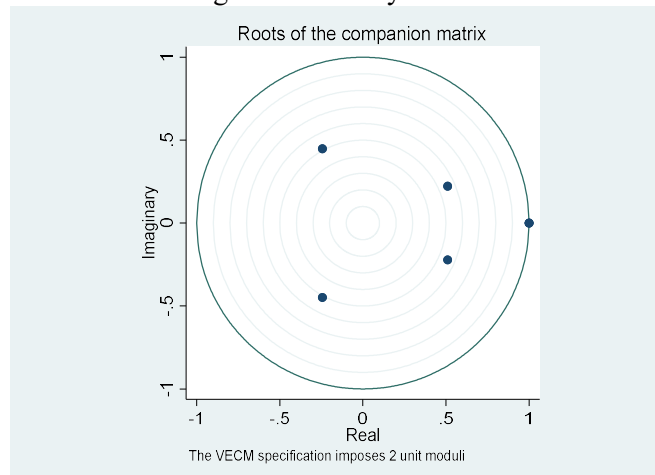
Authors' calculation

In Figure 9 the real component is placed on the x-axis, while the imaginary one is on the y-axis. The graph shows the Eigenvalues, which represent the combinations of the real and imaginary components. Although the information is the same as in the table, the graph shows visually how close the roots with a modulus of approximately 0.5 are to the unit circle.

6. CONCLUSION

The impact of public debt on economic growth is a macroeconomic issue that has been intensively debated based on its complexity. Economic theories express that based on its structure public debt can simulate or slow down economic growth and this depends also on the allocation of borrowed resources. Higher public debt means an increase in long-term interest rates which discourages private investments, higher inflation rates, and not stable taxes which in the future lead to uncertainty in economic and social life (Kumar and Woo 2010).

This study investigated the long- and short-run impact of government debt and government expenditure on economic growth in Albania using annual time series data covering the period 1993–2021. To accomplish this task is used VECM model.

This study emphasized a list of important findings which can help policymakers. The results in the first model of the study reveal that between public debt and economic growth exists an inverse long-run relationship. In the long run, Public debt has a negative impact on GDP growth which is significant at level 10% corresponding with findings such as Patrizio (2011), while government expenditure has a positive impact, statistically significant at level 5%. Public debt and general government expenditure have asymmetric effects on GDP growth in the long run.

Public debt and government expenditure have a positive and significant relationship with GDP growth in the short run. Public debt is significant at level 5% while government expenditure is significant at 0.1% level.

For reducing public debt government should draft programs with specific structures. At first in the short and medium term should be defined optimal public debt. Secondly, negatively affecting factors should be ranked and specific measures needed to be taken to soften their impact on public debt. Thirdly experts should forecast which will be the effects of a rise or decline in public debt on economic growth and other indicators. All that is emphasized previously need a good enough coordination of Monetary and Fiscal policy.

REFERENCES

Abbas, S, and Christensen, E (2007): The Role of Domestic Debt Markets in Economic Growth: An Empirical Investigation for Low-income Countries and Emerging Markets, IMF Working Paper, ff 20-23 URL:http://www.imf.org/external/pubs/ft/wp/2007/wp07127.pdf

Schclarek, A. (2004): "Debt and Economic Growth in Developing and Industrial Countries", f 15 URL:http://ief.eco.unc.edu.ar/files/workshops/2006/7marzo06_DebtGrowth.p df

Kumar, M. and Woo, J., 2010. Public debt and growth. Available at SSRN 1653188.

Lainà, P., 2011. Dynamic effects of total debt and GDP: A time-series analysis of the United States.

Maana, I., Owino, R. and Mutai, N., 2008, July. Domestic debt and its impact on the economy–The case of Kenya. In *13th Annual African Econometric Society Conference in Pretoria, South Africa from 9th to 11th July* (Vol. 40, No. 346-598).

Pattillo et al. (2002): "External debt and growth", ff 9-20 URL: http://www.imf.org/external/pubs/ft/wp/2002/wp0269.pdf

Pattillo et al. (2004): "What Are the Channels Through Which External Debt
    Affects Growth?", f 23URL:http://www.grips.ac.jp/teacher/oono/hp/docu01/paper06.pdf

Reinhart et al. (2012): "Debt Overhangs: Past And Present", ff 24-26
    URL:http://bluelineinv.com/images/Debt_Overhangs_-_Past_and_Present.pdf

Umaru et al, (2013): "External Debt and Domestic Debt Impact on the Growth of the Nigerian Economy", f 72
    URL:http://ijsse.com/ijer/sites/default/files/papers/2013/v1i2/4-paper.pdf

Uzun A. et al. (2012): "The Impacts of External Debt on Economic Growth in Transition Economies", *Chinese Business Review*, ISSN 1537-1506, May 2012, Vol. 11, Nr. 5, ff 491-499
    URL:http://www.davidpublishing.com/davidpublishing/Upfile/6/3/2012/2012
    060368154401.pdf

Sheikh M. et al. (2010): "Domestic Debt and Economic Growth in Pakistan: An Empirical Analysis", *Pakistan Journal of Social Sciences* (PJSS), Vol. 30, Nr. 2 (December 2010), ff. 373-387 URL:
    http://www.bzu.edu.pk/PJSS/Vol30No22010/Final_PJSS-30-2-14.pdf

APPENDIX

```
+----Optimal Lag
-------------------------------------------------------------------------+
  |lag |    LL      LR      df    p      FPE       AIC      HQIC     SBIC    |
  |----+----------------------------------------------------------------------|
  |  0 | -166.138                      151.04    13.531   13.5716   13.6773  |
  |  1 | -141.399   49.479    9  0.000  43.2325  12.2719   12.4342   12.857   |
  |  2 | -124.545   33.708    9  0.000  23.9521  11.6436   11.9276   12.6675  |
  |  3 | -104.781   39.528*   9  0.000  11.1422* 10.7825*  11.1882*  12.2451* |
  |  4 | -102.261   5.0407    9  0.831  22.7658  11.3009   11.8282   13.2023  |
  +----------------------------------------------------------------------
                        Johansen tests for cointegration
Trend: constant                                    Number of obs =      27
Sample:  1995 - 2021                                          Lags =       2
--------------------------------------------------------------------------
                                                     5%
maximum                                   trace   critical
  rank     parms       LL      eigenvalue statistic  value
    0       12    -182.31078               44.0058    29.68
    1       17    -170.45274    0.58454    20.2897    15.41
    2       20    -160.99052    0.50386     1.3652*    3.76
    3       21    -160.30789    0.04931
```

```
Vector error-correction model (the model is supposed only with one equation of cointegration)

Sample:  1995 - 2021                           Number of obs    =        27
                                               AIC              =   13.88539
Log likelihood = -170.4527                     HQIC             =     14.128
Det(Sigma_ml) =  61.09914                      SBIC             =   14.70129

Equation           Parms     RMSE     R-sq     chi2    P>chi2
-----------------------------------------------------------------
D_gdpgr               5     4.08957   0.6676  44.17884  0.0000
D_pdebt               5     4.55433   0.5922  31.94872  0.0000
D_gove                5     .729098   0.5496  26.84158  0.0001
-----------------------------------------------------------------
```

```
           |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------+----------------------------------------------------------------
D_gdpgr    |
     _ce1  |
      L1.  |  -.0028322   .0049004    -0.58   0.563    -.0124368    .0067725
           |
    gdpgr  |
      LD.  |  -.2289561   .1542131    -1.48   0.138    -.5312082     .073296
           |
    pdebt  |
      LD.  |   .3918852   .1768158     2.22   0.027     .0453327    .7384378
           |
     gove  |
      LD.  |   5.565022   .9535973     5.84   0.000     3.696006    7.434039
           |
    _cons  |  -.7925664    .954399    -0.83   0.406    -2.663154    1.078021
-----------+----------------------------------------------------------------
D_pdebt    |
     _ce1  |
      L1.  |  -.0169365   .0054573    -3.10   0.002    -.0276327   -.0062404
           |
    gdpgr  |
      LD.  |    .150016   .1717388     0.87   0.382    -.1865859    .4866178
           |
    pdebt  |
      LD.  |   .3542659   .1969102     1.80   0.072    -.0316709    .7402028
           |
     gove  |
      LD.  |  -1.737799    1.06197    -1.64   0.102    -3.819222    .3436235
           |
    _cons  |   .1866509   1.062863     0.18   0.861    -1.896521    2.269823
-----------+----------------------------------------------------------------
D_gove     |
     _ce1  |
      L1.  |   .0041686   .0008737     4.77   0.000     .0024563     .005881
           |
    gdpgr  |
      LD.  |  -.0275944   .0274935    -1.00   0.316    -.0814806    .0262919
           |
    pdebt  |
      LD.  |  -.0008433   .0315231    -0.03   0.979    -.0626275     .060941
           |
     gove  |
      LD.  |  -.0558141   .1700097    -0.33   0.743    -.3890269    .2773988
           |
    _cons  |   .2198651   .1701526     1.29   0.196    -.1136278    .5533581
----------------------------------------------------------------------------

  Cointegrating equations

 Equation          Parms     chi2     P>chi2
 ------------------------------------------------
 _ce1                  2   31.43198   0.0000
 ------------------------------------------------

  Identification:  beta is exactly identified

             Johansen normalization restriction imposed
----------------------------------------------------------------------------
      beta |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------+----------------------------------------------------------------
 _ce1      |
    gdpgr  |          1           .        .       .            .           .
    pdebt  |    4.92478   2.886234     1.71   0.088    -.7321347     10.5817
     gove  |  -108.1062   43.18123    -2.50   0.012    -192.7399    -23.4726
```

```
      _cons |    838.6078               .          .          .                  .                     .
-------------------------------------------------------------------------------
```

Jarque-Bera/ JB-Normally test

```
+---------------------------------------------------------+
|           Equation |        chi2   df   Prob > chi2 |
|--------------------+------------------------------------|
|            D_gdpgr |        1.587    2      0.45223     |
|            D_pdebt |        0.101    2      0.95082     |
|             D_gove |        0.591    2      0.74422     |
|                ALL |        2.279    6      0.89236     |
+---------------------------------------------------------+
```

Eigenvalue stability condition

```
+-----------------------------------------+
|        Eigenvalue       |   Modulus    |
|-------------------------+---------------|
|           1             |          1   |
|           1             |          1   |
|    .5101885     +.222104i |   .556437    |
|    .5101885   -  .222104i  |   .556437     |
|  -.2438882 +  .4482707i  |   .510322    |
|  -.2438882 -  .4482707i  |   .510322    |
+-----------------------------------------+
```
The VECM specification imposes 2 unit moduli.