Determinants of Economic Growth in Republic of North Macedonia : An Empirical Study

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Abstract
Economic growth is an increase in the production of goods and services over a specific period. Gross domestic product (GDP) is the best way to measure economic growth. It takes into account the country's entire economic output. It includes all goods and services that businesses in the country produce for sale. It doesn't matter whether they are sold domestically or overseas. Of more importance is the growth of the ratio of GDP to population (GDP per capita), which is also called per capita income. An increase in per capita income is referred to as intensive growth.The current study tried to examine contribution of four major sectors (agriculture, industrial and services sector and labor force participation rate) of the economic growth in the Republic of North Macedonia, using Pearson test for correlation and hypothesis testing. The study used the time series data set from 1996 to 2019. As a indicator of economy performance we used GDP growth per capita (annual%). From the hypothesis testing we can conclude that there is significant correlation between GDP per capita growth as a dependent variable with agriculture and services, while there is not statistical significant correlation between dependent variable and variables labor force and industry. In order to determine the strength and direction of the relationship between GDP per capita and agriculture and services we use the correlation coefficient, ρ (rho). Estimations confirmed that relationship between GDP per capita and agriculture is moderate and positive, while correlation between GDP per capita and services is weak and positive, which means, increasing in agriculture and service will result in increase in GDP per capita, and vice versa.

Key words: correlation, determinants of economic growth, GDP per capita, hypothesis testing, Pearson coefficient

1. Introduction

Gross domestic product (GDP) at market prices is the final result of the production activity of the resident producer units and it is the sum of gross value added of the various institutional sectors or the various activities at basic prices plus value added, import duties less subsidies on products (which are not allocated to sectors and activities). [1]. According to the estimated data, the growth rate of Gross Domestic Product (GDP) in the first quarter of 2019 is 4.1%. In this quarter, the highest growth was recorded in the sectors: Agriculture, Forestry and Fishing [2]

Industrial sector has a big influence in the structure of GDP. Industry has one of the most important places in the development of the economy in the Republic of North Macedonia. The fast development of industry is one of the most important drivers of economic growth.

In line with the positive developments in the real economy, in 2018 most of the labor market indicators point to the continuation of favorable trends. At the same time, the implementation of active employment measures continued in 2018, as additional support for employment growth [3]

We also have to take into account that faster productivity growth in the service sector contributes to sustained and balanced growth in economy.

The purpose of our research is to examine how agriculture, industry, employment rate and services affect GDP growth per capita.

The remainder of the paper proceeds as follows: In Section 2 we consult relevant literature dedicated on this topic. Section 3 presents data and methodology. The main results and discussions are presented in section 4 and the final section concludes the study.

2. Literature review

There is a large part of economic theory analyzing the determinants of economic growth.

A study carried out in Nigeria analyze the contribution of the agriculture sector in economic growth. This study used time series data from 1970 to 2010. Researcher used Ordinary Least Square econometric technique for empirical estimations. The results revealed that agricultural production and economic growth had positive relationship[4].

Another study examined the causal relationship between agriculture sector, industrial sector, services sector and gross domestic product in Bangladesh's economy. Researcher used time series data ranging from 1972 to 2008. Granger causality test was used to examine the causal relationship among major sectors of the economy. The empirical results showed that the long run relationship existed among these three sectors and economic growth [5].

An Indian study examined the dynamic and static causality between the major sectors of the economy and gross domestic product. For empirical findings, researcher used time series data from 1950 to 2009. The researcher used the Variance Decomposition framework, Impulse response and Engle Granger techniques for analysis. The results showed that GDP and income had a long run relationship. Causality results showed that services sector caused gross domestic product and industrial sector, and agriculture sector. Impulse response test results showed that innovation in any sector had a positive impact on gross domestic product, but innovation in agriculture sector had a positive impact on industrial sector and the services sector [6].

3. Data and Methodology

This section identifies the sources of our data, presents the data,describes the dependent and independent variables and explain method that we use to analyze the impact of different types of sectors that have contribution on GDP per capita growth.

In this paper we examined the contribution of four major sectors (agriculture, industrial and services sector and labor force participation rate) on the economic growth of the Republic of North Macedonia, using Pearson test for correlation and hypothesis testing, using World bank database [7].

As a indicator of economy growth we have used GDP growth per capita (annual%)

The first step in our research regarding the determination of GDP per capita is the presentation of the descriptive statistics of our dependent variable in the period 1996-2008.

Table1 Descriptive statistics of GDP per capita annual growth (1996-2008)

N	Valid	23
	Missing	0
Mean		2,52
Std Dev		2,24
Minimum		-3,45
Maximum		6,36
Percentiles	50(Median)	2,78

As we can see on the table above the mean value of GDP per capita growth is 2,52% annually, while the minimum value is -3,45%, and the maximum value 6,36%. The standard deviation is 0,47%.

For estimating Pearson coefficient, as well as for hypothesis testing we use statistical package PSPP. In addition to the strength and the way of correlation between analyzed variables, we have tested the statistical significance of the relation. The condition to use Pearson correlation is that all variables should be normally distributed. For this purpose at the beginning, we apply Kolmogorov – Smirnov test for normal distribution of all the variables [8]. Result from the test are presented below:

One-Sample Kolmogorov-Smirnov Test

		GDP per capita growth (annual %)	Labor_force	Services	Industry	Agriculture
N		23	23	23	23	23
Normal Parameters	Mean	2,52	62,75	2,26	3,82	,28
	Std. Deviation	2,24	1,84	3,95	6,08	8,45
Most Extreme Differences	Absolute	,13	,16	,17	,13	,20
	Positive	,06	,12	,17	,13	,19
	Negative	-,13	-,16	-,15	-,13	-,20
Kolmogorov-Smirnov Z		,60	,77	,80	,64	,96
Asymp. Sig. (2-tailed)		,860	,588	,547	,800	,315

As we can see from the results above, all variables are normally distributed, because the significance value of all of them is greater than o,o5, which provide direction to continue with our analysis

4. Hypothesis testing

In order to determine the relation between GDP per capita on the one hand and labor force, agriculture, industry and services on the other hand, as well as the strength and direction of the relationship we use the following hypotheses:

H_1 : There is no relation exists between the GDP per capita and agriculture

H_2 : There is significant relation between GDP per capita and agriculture

H_3 : There is no relation existing between GDP per capita and labor force

H$_4$: There is significant relation between the GDP per capita and labor force

H$_5$: There is no relation exists between the GDP per capita and industry

H$_6$: There is significant relation between GDP per capita and industry

H$_7$: There is no relation exists between the GDP per capita and services

H$_8$: There is significant relation between the GDP per capita and services

The results are presented below:

H$_1$: There is no relation exists between the GDP per capita and agriculture

H$_2$: There is significant relation between GDP per capita and agriculture

Table2.Pearson correlation: GDP per capita growth (annual%) and Agriculture, forestry and fishing, value added (annual % growth)

		GDP per capita growth (annual%)	Agriculture, forestry and fishing, value added (annual % growth)
GDP per capita growth(annual%)	Pearson Correlation Sig. (2-tailed) N	1,00 23	0,53 0,009 23
Agriculture, forestry and fishing, value added (annual %growth)	Pearson Correlation Sig. (2-tailed) N	0,53 0,009 23	1,00 23

We are interested in the value of significance (2-tailed), which is less than 0.05. If the significance value is less than 0,05 we have to reject the null hypothesis that there is no statistically significant correlation between GDP per capita growth (annual%) and Agriculture, Forestry and Fishing, value added (annual% growth), and conclude that there is significant correlation between this variables.

H$_3$: There is no relation existing between GDP per capita and labor force

H$_4$: There is significant relation between the GDP per capita and labor force

Table 3.Pearson correlation GDP per capita growth (annual%) and Labor force participation rate, total(%of total population ages 15-64)

		GDP per capita growth (annual%)	Labor force participation rate, total (%of total population ages 15-64)
GDP per capita growth(annual%)	Pearson Correlation Sig. (2-tailed) N	1,00 23	0,07 0,746 23
Labor force participation rate, total(%of total population ages 15-64)	Pearson Correlation Sig. (2-tailed) N	0,07 0,746 23	1,00 23

The significance value is 0,746 and we have to accept the null hypothesis that there is no statistically significant correlation between GDP per capita growth (annual%) and labor force.

H_5 : There is no relation exists between the GDP per capita and industry
H_6 : There is significant relation between GDP per capita and industry

Table 4.Pearson correlation GDP per capita growth (annual%) and Industry (including construction), value added (annual% growth)

		GDP per capita growth (annual%)	Industry (including construction), value added (annual% growth)
GDP per capita growth(annual%)	Pearson Correlation Sig. (2-tailed) N	1,00 23	0,16 0,459 23
Industry (including construction), value added(annual% growth)	Pearson Correlation Sig. (2-tailed) N	0,16 0,459 23	1,00 23

The significance value is 0,459 and we have to accept the null hypothesis that there is no statistically significant correlation between GDP per capita growth (annual%) and industry annual % growth.

H_7 : There is no relation exists between the GDP per capita and services
H_8 : There is significant relation between the GDP per capita and services

Table 5.Pearson correlation GDP per capita growth (annual%) and Services, value added (annual% growth)

		GDP per capita growth (annual%)	Services, value added (annual% growth)
GDP per capita growth(annual%)	Pearson Correlation Sig. (2-tailed) N	1,00 23	0,37 0,084 23
Services, value added (annual% growth)	Pearson Correlation Sig. (2-tailed) N	0,37 0,084 23	1,00 23

The significance value is 0,084 and it is greater than 0,05%, but we can accept significance on 0,1% and we can reject the null hypothesis that there is no statistically significant correlation between GDP per capita growth (annual%) and services at 10% leve of significancel.

From the hypothesis testing we can conclude that agriculture and services have significant relation with GDP per capita, on 5% and 10% respectively.

We continue our estimation with determine the strength and direction of this relationship. For this purpose we use the correlation coefficient, ρ (rho), a popular statistic for describing the strength of the relationship between two variables.

Pearson coefficient, is the covariance of two variables divided by the product of their standard deviation. Person coefficient can be calculated using the formula below [8] :

$$r = \frac{n\,\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{n(\Sigma x^2)-(\Sigma x)^2}\ \sqrt{n(\Sigma y^2)-(\Sigma y)^2}}$$

(1)

Where:

n – number of data

y- dependent variable

x- independent variable

The coefficient is a value between +1 and -1, where +1 indicates a perfect positive relationship, -1 indicates a perfect negative relationship and 0 indicates that no relationship exist.

For more precise determination of correlation strength in our paper, we use the classification of the correlation intervals made by Evans [9][1]

Table 6. Correlation between GDP per capita (annual % growth) and Agriculture, forestry and fishing, value added (annual % growth)

Category	Statistic	Value	Asymp.Std.Error	Approx.T
Ordinal by Ordinal	**Spearman Correlation**	0,37	0,18	1,83
Interval by Interval	**Pearson's R**	0,53	0,13	2,86
N of valid Cases		23		

Table 7. Correlation between GDP per capita (annual % growth) and Services, value added (annual% growth)

Category	Statistic	Value	Asymp.Std.Error	Approx.T
Ordinal by Ordinal	**Spearman Correlation**	0,38	0,17	1,90
Interval by Interval	**Pearson's R**	0,37	0,16	1,82
N of valid Cases		23		

According to Evans (1996) correlation between GDP per capita and agriculture is moderate and positive, while correlation between GDP an services is weak and positive, which means, increasing in agriculture and service will result in increase in GDP per capita, and vice versa.

Below we presented a Scatterplot chart, for variables GDP per capita and Agriculture which is typically used chart when we want to display the relationship between two variables.
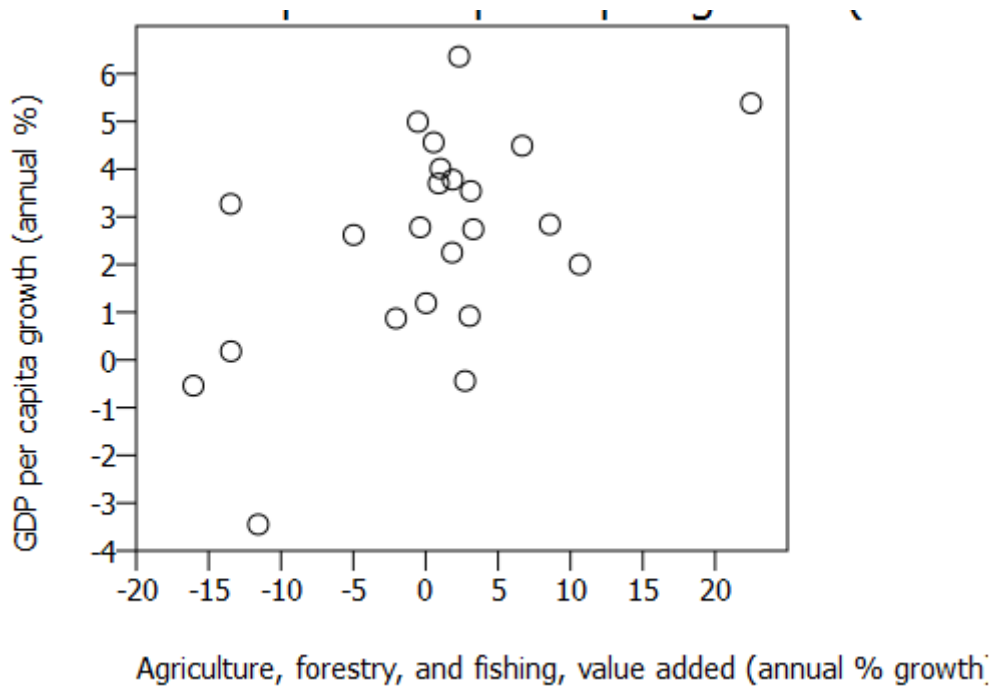
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[1] r 0-019 very week correlation

r 0,20-0,39 weak correlation

r 0,40-0,59 moderate correlation

r 0,60-0,79 strong correlation

r 0,80-1,0 very strong correlation

Graph 1. Relationship between GDP per capita growth (annual%) and agriculture, forestry and fishing, value added (annual % growth) presented by Scatter plot chart

The chart above concludes the previous obtained results from correlation intervals, that there is positive correlation between the GDP per capita growth and Agriculture annual growth.

5. Conclusion

In our paper we try to find the interdependence between GDP per capita growth and agriculture, industry, labor force and services in the Republic of North Macedonia and to observe direction and strength of that relationship. For this purpose we use the statistical package PSPP, using annual data for the period 1996-2018, taken from World bank database.

The results from hypothesis testing show that there is significant relation between GDP per capita growth with agriculture and services with 5% and 10% level of significance, accordingly. We don't find relationship between GDP per capita with industry sector and labor force.

In order to quantifying strength and the direction on the relationship between GDP per capita and agriculture and services we use correlation coefficient Pearson. The results show that correlation between GDP and agriculture is moderate and positive, while correlation between GDP and services is weak and positive.

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