
AN EMPIRICAL ANALYSIS OF DETERMINANTS OF ECONOMIC GROWTH OF REPUBLIC OF NORTH MACEDONIA

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Abstract: Every country's aim is to reach prosperous, innovative, competitive and dynamic knowledge- based economy with sustainable economic growth capable for providing higher standards of living to its population. The rise of GDP in real terms entails enlargement of economic resources that not only meets the current economic needs but also affords a better future for next generations. In fact, a key determinant of economic growth is investment, both in physical and human capital, having influence on the improvement of competitiveness, employment and productivity, which in turn contribute to GDP growth. However, during the last decade North Macedonia features with a remarkable upsurge of concern about sustainability of economic growth. Thus, the main goal of this paper is to empirically analyze the main determinants that promote the economic growth of the country. For that purpose quarterly data are utilized for the time period 1999Q1-2017Q4. The research method consists to the time series econometric techniques, using Vector Error Correction Method (VECM) and Johansen co-integration test for investigating both short term and long term determinants.

Keywords: Determinants, Economic growth, Sustainable, VECM, co-integration

1. INTRODUCTION

It is well known that the primary focus of developing countries is to implement policies that will provide prosperous, innovative, competitive and dynamic knowledge- based economy with sustainable economic growth capable for providing higher standards of living to its population. To meet this goal the policy makers need to recognize the factors affecting growth in order to undertake adequate measures that will spur the economy. In that perspective many researchers have investigated the determinants of economic growth through empirical studies. However, the existing literature reveals different growth determinants for developed countries and different for emerging and transition countries. For instance, Levine and Renelt (1992) using an extreme-bounds analysis, found that very few variables are robustly correlated with growth. In contrast, Sala-i-Martin (1997) built weighted averages of OLS coefficients and found that some are fairly stable across different specifications. Richer countries invest more in R&D and in turn have positive effects on growth. The technology investments have positive long run effects to many developed economies. Whereas for transition and less developed economies using the endogenous growth models is found that institutional variables used as instruments also impact growth. Therefore, this studies' aim is to examine the determinants of economic growth for the case of North Macedonia.

The rest of the paper is structured as follows: the second section explores a brief literature review; the third section explains the methodology, empirical approach and data that are used for the empirical results. The fourth section reveals the empirical findings, while in the last section are given the conclusions of the study.

2. BRIEF LITERATURE REVIEW

In the 1960s, the growth theory was based generally on the neoclassical model developed by Ramsey (1928), Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965) as cited by Barro (1996). Barro emphasizes that a characteristic of neoclassical model that is common for many researches is the convergence. The lower the starting level of real per capita gross domestic product (GDP) the higher is the predicted growth rate. The convergence in the neoclassical model is originated from the diminishing returns to capital. Economies that have less capital per worker (relative to their long run capital per worker) tend to have higher rates of return and higher growth rates. The convergence is condition because the steady state levels of capital and output per worker depend on the savings rates, the growth rate of population, and the production function that may vary across economies. Recent extensions of the model suggest the inclusion of additional factors of cross-country variation, especially government policies

with respect to levels of consumption spending, protection of property rights, and distortions of domestic and international markets.

A variety of studies have addressed the issue of economic growth empirically, mostly using either cross-country or panel data approach. In this track, Barro (1996) in a cross country empirical study for 100 countries finds a strong support of conditional convergence. His findings advocate that for a given starting level of real per capita GDP, the growth rate is enhanced by higher initial schooling and life expectancy, lower fertility, lower government consumption, better maintenance of the rule of law, lower inflation, and improvements in the terms of trade. He also finds that growth is negatively related to the initial level of real per capita GDP.

Gallup et al. (1998) analyze variables used by Barro and Lee (1993), and find a strong relationship between initial levels of health and economic growth, using life expectancy at birth as their basic measure of overall health of the population. They conclude that improved health is associated with faster economic growth. However, after using the average total years of education of the adult population as their main measure of education, they are unable to find a statistically significant relationship between initial levels of education and subsequent economic growth in their sample of countries. According to Levine and Zervos (1993), countries that have more students enrolled in secondary schools grow faster than countries with lower secondary school enrollment rates. Brunetti et al. (1998) noted that education, measured by secondary school enrollment, is positively related to growth. Martin and Xavier (1997) also support the view that various measures of education are positively related to growth.

Dollar (1992) investigated the sources of economic growth in 95 developing countries, covering the period 1976-1985. Using a cross-sectional regression analysis, the study results showed that real exchange rate variability and the index of real exchange rate distortion were negatively and significantly associated with long-run economic growth: the investment rate was positively and significantly associated with economic growth.

Moudatsou (2003) suggested that FDI inflows have a positive effect on economic growth in European Union countries both directly and indirectly through trade reinforcement over the period 1980-1996. Recently Chirwa and Odhiambo (2016) conduct a qualitative study of the existing empirical literature on the key macroeconomic determinants of economic growth in developing and developed countries. The study reveals that the determinants of growth are different for both groups of countries.

In developing countries the key macroeconomic determinants of economic growth include foreign aid, foreign direct investment, fiscal policy, investment, trade, human capital development, demographics, monetary policy, natural resources, reforms and geographic, regional, political and financial factors. In developed countries, the study reveals that the key macroeconomic determinants that are associated with economic growth include physical capital, fiscal policy, human capital, trade, demographics, monetary policy and financial and technological factors.

3. METHODOLOGY AND DATA

The determinants of economic growth of Macedonia are firstly analyzed by various model specifications estimated by OLS method, in view of the time series stationary properties and then is used the VECM methodology. As dependent variable is considered the real GDP growth, whereas as potential determinants are considered the initial GDP per capita, household consumption (CONS), gross fixed capital formation (GFCF), gross investments (INVEST), labor force participation rate (LFPR), trade openness (OPENES), government expenditures (GOVEXP) and consumer price index (CPI). A Vector Error Correction Method (VECM) is formulated to reintroduce the information lost in the differencing process, thereby allowing for long-run equilibrium as well short-run dynamics. The empirical model consists of the following vector of variables:

$$Y = [\ln(\text{GDPC})_{t-1}, \ln(\text{CONS}), \ln(\text{GFCF}), \ln(\text{GOVEXP}), \ln(\text{INVEST}), \ln(\text{LFPR}), \ln(\text{OPENES}), \ln(\text{CPI})]$$

The general form of the VECM is written as:

$$\Delta Y_t = \delta + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Phi_i \Delta Y_{t-i} + \varepsilon_t$$

where Δ is the differencing operator, such that : $\Delta Y_t = Y_t - Y_{t-1}$; Π is the coefficient matrix for Y_{t-1} , $\Pi = \alpha\beta$, where α represents the coefficient of adjustment to the equilibrium or the error correction term (loading parameters) and β represents the cointegration vectors, $\beta x Y_{t-1}$ that captures the long-run relationships (cointegration equations). When we find the rank of cointegration we find, $r = \text{rank}(\Pi)$, the number of cointegrating vectors β_i .

The VECM method suggests that if cointegration has been detected between series we know that there exists a long-term equilibrium relationship between them so we apply VECM in order to evaluate the short run properties of

the cointegrated series. In case of no cointegration this method is not required, thus we directly precede to Granger causality tests to establish causal links between them.

The cointegration rank shows the number of cointegrating vectors. For instance a rank of two indicates that two linearly independent combinations of the non-stationary variables will be stationary. Johansen and Julius (1990) determine the rank using the Maximal-Eigenvalue and Trace statistic test, calculated using the maximum likelihood estimates of the cointegrating vectors.

The data used in the empirical study are provided from three main sources such as State Statistical Office, National Bank and Ministry of Finance.

4. EMPIRICAL RESULTS

4.1. Time Series Properties of the Variables

Augmented Dickey Fuller (ADF) and Philip-Perron (PP) tests are utilized to examine the order of integration for all selected variables. This test is used to determine if the time series are stationary or non-stationary. Time series are usually non-stationary²⁷. One should do is to make them stationary by taking first or second differences.

The results suggest that the null hypothesis of a unit root cannot be rejected for all variables in levels at 5% significance level or lower. However, the null hypothesis of a unit root is rejected when the ADF test is applied to the first difference for all the variables at 5% significance level. This concludes that all the variables are integrated of order one, I(1), (see Table 1). As the result show, the variables are non-stationary in all their levels. To determine the order of the integration, one needs to test the unit-root in the first difference of the variables. In the first difference the above variables become stationary. The optimal test result comes up with a trend in regression and 10 lags into the ADF test.

Table 1. Augmented Dickey-Fuller and Philip -Perron Test for Unit Root

Variables	Test	t-statistic	p-value	t-statistics	p-value	Decision
		Levels		First Difference		
<i>ln</i> (RGDP)	ADF	-0.910	0.785	-4.190***	0.000	I(1)
	PP	-1.428	0.569	-3.327**	0.020	
<i>ln</i> (GDPC)t-1	ADF	-1.060	0.730	-3.215**	0.016	I(1)
	PP	-1.451	0.696	-5.920***	0.000	
<i>ln</i> (CONS)	ADF	-1.829	0.540	-3.696**	0.003	I(1)
	PP	-1.924	0.231	-4.221***	0.000	
<i>ln</i> (GFCF)	ADF	-1.364	0.599	-3.096**	0.027	I(1)
	PP	-2.080	0.253	-4.150***	0.000	
<i>ln</i> (GOVEXP)	ADF	-1.914	0.325	-3.568**	0.046	I(1)
	PP	-1.977	0.296	-7.618*	0.000	
<i>ln</i> (INVEST)	ADF	-0.927	0.779	-3.800**	0.002	I(1)
	PP	-1.412	0.576	-8.102***	0.000	
<i>ln</i> (OPENES)	ADF	-0.795	0.820	-3.814**	0.003	I(1)
	PP	-2.081	0.252	-8.444***	0.000	
<i>ln</i> (LFPR)	ADF	-0.689	0.849	-5.503***	0.000	I(1)
	PP	-2.073	0.255	-7.895***	0.000	
<i>ln</i> (CPI)	ADF	-0.523	0.887	-2.956**	0.039	I(1)
	PP	-0.993	0.344	-8.393***	0.000	

Notes: **represents rejection of null hypothesis at the given 5% critical value. The 5% critical value is -2.937; *** represents rejection of null hypothesis at the given 1% critical value. The 1% critical value is -3.453

Source: Author's calculations

²⁷ Non-stationary data, as a rule, are unpredictable and can't be modeled or forecasted. Also, the non-stationary data has a variable variance and a variable mean over time. There exists different types of non-stationary processes for example, random walk, cycle and deterministic trends (trends that are constant, positive or negative) independent of time for the whole life of the series and combinations of the three. Stationary data, as a rule, are predictable and has a constant variance independent of time and a constant mean. If variables are stationary, or I (0) and co integrated, we can estimate a regression relationship between the levels of those variables without fear of encountering a spurious regression.

4.2. Regression Results

This section represents the regression results estimated through OLS. Based on the results the criteria of conditional convergence is met, since the coefficient of initial GDP per capita is statistically significant at 5% level of significance and with negative sign, meaning that the economies that have less capital per worker (relative to their long run capital per worker) tend to have higher rates of return and higher growth rates. Other growth determinants are consumption, investments and government spending since they all are statistically significant and with positive signs as expected. Also trade openness is statistically significant at 10% level of significance. Concerning labor force participation and gross fixed capital formation are not statistically significant (see Table 2 below). When the consumer price index is added in the fifth model, its coefficient is statistically significant at 5% level of significance and the sign is negative.

Table 2. Regression results

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
<i>ln (GDPC)t-1</i>	-0.1992 (-3.91)***	-0.1929 (-2.12)**	-0.1793 (-1.92)**	-0.1722 (-1.82)*	-0.1983 (-2.29)**
<i>ln (CONS)</i>	0.6286 (5.15)***	0.6351 (5.18)***	0.6476 (5.22)***	0.6829 (5.17)***	0.6246 (5.49)***
<i>ln (INVEST)</i>	0.0301 (2.18)**	0.0309 (2.23)**	0.0292 (2.09)**	0.0281 (1.96)**	0.0430 (3.03)***
<i>ln (GOVEXP)</i>	0.1037 (1.89)*	0.1024 (1.86)*	0.095 (1.70)*	0.0969 (1.64)*	0.1138 (2.15)**
<i>ln (OPENES)</i>	-	0.02926 (2.21)**	0.0342 (1.64)*	0.03124 (1.60)*	0.0298 (1.56)*
<i>ln (LFPR)</i>	-	-	-0.4292 (-0.79)	-	-
<i>ln (GFCF)</i>	-	-	-	-0.3124 (-0.72)	-
<i>ln (CPI)</i>	-	-	-	-	-1.6512 (-2.52)**
<i>Constant</i>	-0.00282 (-0.3)	-0.00336 (-0.35)	-0.0055 (-0.55)	0.0687 (0.70)	0.0078 (0.79)

Notes: * represents rejection of null hypothesis at the given 10% critical value ** represents rejection of null hypothesis at the given 5% critical value. *** represents rejection of null hypothesis at the given 1% critical value; t-statistics are given in parentheses.

Source: Author's calculations

Based on the cointegration test there is one cointegrating vector, meaning that there exists a long run relationship between real GDP, consumption, investments, government expenditures, trade openness and prices. Since all the variables are non-stationary the VECM is appropriate method for estimating the long run and short run determinants of economic growth. Table 3 below represents the results of VECM for beta coefficients for long run relationship and alpha for the short run relationship. The results indicate that using this method the determinants of economic growth are households consumption, investments and prices, whereas in contrast to OLS the openness to trade and government spending are not statistically significant, however together with the previous variables in the cointegration test reveal one cointegrating vector.

Table 3. The estimated cointegrating vector applying the Johansen procedure

Variables	β	α
$\Delta \ln(\text{RGDDP})$	1.000	.17869 [0.081]*
$\Delta \ln(\text{GDPC})t-1$	-0.3981 [0.075]*	-0.4556 [0.000]***
$\Delta \ln(\text{CONS})$	0.2110 [0.000]***	0.2204 [0.040]**
$\Delta \ln(\text{INVEST})$	0.5736 [0.000]***	2.2092 [0.012]**
$\Delta \ln(\text{GOVEXP})$	-0.1658 [0.177]	-0.9424 [0.204]
$\Delta \ln(\text{OPENES})$	-0.1588 [0.2541]	0.8963 [0.186]

$\Delta \ln(\text{LFPR})$	-0.1338 [0.419]	-0.1687 [0.211]
$\Delta \ln(\text{GFCF})$	-0.0817 [0.575]	-0.3391 [0.343]
$\Delta(\text{CPI})$	0.6312 [0.038]**	-0.0296 [0.027]

Notes: β represents the cointegrating vector and α represents the adjustment parameter vector; 1.000 implies that the cointegrating vector is normalized with respect to the variable. Brackets denote p-value; *** and ** represent rejection of the null hypothesis at the given 1% and 5% critical value, respectively.

Source: Author's calculations

CONCLUSIONS

The purpose of this paper was to investigate the determinants of economic growth for the case of North Macedonia. Using the Ordinary Least Square (OLS) method we obtained that consumption, investment, government spending, trade openness and prices are significant determinants of economic growth. Beside these variables other considered variables are gross fixed capital formation as a proxy for physical capital, and labor force participation rate, but both were statistically insignificant. Based on VECM results i.e. beta and alpha coefficients that refer to the long and short run, respectively, government spending and trade openness are not statistically significant, however the cointegration test revealed one cointegrating vector that means there exist a long run relationship between considered determinants.

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