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Economic Growth, Domestic Savings and Fixed Capital Investments: Analysis for Caucasus and Central Asian Countries

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ABSTRACT

This study examines whether there is a long-term relationship between gross domestic savings, fixed capital investments and economic growth in 7 Caucasian and Central Asian countries, and the causality relationship between the variables. The empirical evidence covering the period between 1993 and 2017 suggests that there is a cointegration relationship in the model where economic growth is the dependent variable. According to the panel VECM Granger causality analysis, domestic savings are the causality of economic growth. Furthermore, economic growth was found to be the causality of fixed capital investments and domestic savings was also found to be the causality of fixed capital investments. According to the findings, policy recommendations that will allow domestic savings to reach a sufficient level for investments are needed to be developed for the economies of countries to be able to attain the goal of sustainable growth. Thus, the decisions to be taken by policymakers in collaboration with economists will enable domestic savings to be used in investments.

INTRODUCTION

Savings promote capital formation. Furthermore, savings lead to new and improved techniques that help economies with large scale of production, enhance labor productivity, and increase know-how. Savings would thus lead to the efficient use of existing scarce resources; an increase in national production, income and employment; and help solve the problems of inflation, unemployment, balance of payments, poverty and inequality. In addition, savings save the economy from the burden of external debt and take society to a higher level of prosperity. Adequate savings in developing countries reduce poverty and are also the key to economic development. Moreover, it is noteworthy that the slow rate of development in third-world countries is often due to the low levels of national savings, which limit their capacity to invest in capital formation. This leads to a lower level of economic growth and development compared to other countries that are able to provide sufficient savings. Savings are, therefore, generally considered the main source of economic growth (Jagadeesh, 2015).

In the classic model of Lewis (1955), the key to growth is an increase in investments and savings. An economy is divided into two sectors which are agriculture and industry. Due to low productivity in the agricultural sector, people turn to the industrial sector where they can generate more income. This outcome would increase savings, providing more funds to increase economic growth. Harrod (1939) and Domar (1946) also emphasized the importance of savings and investments as the drivers of growth. Essentially, this model should be able to increase growth by increasing the national savings levels of a country. It should be noted that since some of the savings are used in lieu of old capital, not all savings would lead to growth. Solow (1956) stated that the rate of savings only leads to short-term growth and that long-term growth depends on technological progress. A permanent increase in the rate of savings would initially increase capital stock and thus lead to an increase in production per worker in the short term. However, in subsequent periods, increased savings would only suffice to cover capital depreciation per worker due to the reduced returns. Therefore, although the economy would reach a higher level of stability in the long run, the growth rate would be zero (Nguyen and Nguyen, 2017).

For the national economy, it is important to look at the factors that affect the level of the gross domestic savings and to improve the economic growth of the country. Gross domestic savings offer a significant relationship between past, present and future economic growth. Economic growth is the main objective of every country. Citizens of developed countries live a more comfortable life and enjoy greater prosperity than citizens of developing countries. Reducing poverty, unemployment and inflation, and raising the level of per capita income is the main objective of every country (Kazmi, 1993; Khan et al., 2018).

Pagano (1993) concluded that stable growth depends on the percentage of savings directed to investment. In other words, growth is expected to benefit from higher gross domestic savings and, hence, a higher volume of investment (Hassan et al., 2011). By creating appropriate economic policies against the crisis, which is one of the biggest obstacles to stable growth, it ensures that the problems and the crisis process are defined accurately and in a timely manner.

According to the World Bank database, in 1993 Tajikistan had the highest rate of gross domestic savings with a rate of 65.03% among all Caucasian and Central Asian countries. This was followed by Turkey and Kazakhstan with rates of 18.01% and 15.22%, respectively. In 2017, on the other hand, Kazakhstan had the highest rate of gross domestic savings with a rate of 37.23%. This was followed by Azerbaijan and Turkey with rates of 30.86% and 26.45%, respectively.

Examining the causality between domestic savings and economic growth is quite important. It provides useful information about which economic variables should be controlled by policymakers and the relevant authorities to reach the desired level of targeted variable(s) (Sajid and Sarfraz, 2008). For example, if the results of the causality test indicate that domestic savings drive economic growth and lead to economic growth, the government and policymakers can design or use policies that will encourage the mobilization of savings to achieve higher economic growth. On the other hand, if the econometric analysis reveals the opposite, policymakers will endeavor to remove barriers and accelerate economic growth in order to raise the level of savings (Abu, 2010).

The motivation of this study is to examine the cointegration and causality relationship between gross domestic savings, fixed capital investments and economic growth in seven Caucasian and Central Asian countries. This is particularly important as it has critical policy implications for developing economies with relatively low levels of gross domestic savings. The study is comprised of four sections. In the second section, the findings of current studies in the literature are discussed. In the third section, the data set is defined and the methods used in the empirical study are introduced. In addition, the results of the empirical findings are discussed. The final section provides the conclusion and political recommendations.

1. LITERATURE REVIEW

Katircioglu and Naraliyeva (2006) investigated the cointegration and causality relationships between economic growth, domestic savings and foreign direct investments in Kazakhstan using quarterly data for the period between 1993 and 2002. In the findings, a cointegration relationship was found in the

model where economic growth was dependent. A 1% increase in foreign direct investments would increase economic growth by 0.62%, while a 1% increase in domestic savings would increase economic growth by 0.28%. According to the causality analysis, there is a two-way causality between foreign direct investments and domestic savings. In addition, domestic savings are the causality of economic growth and foreign direct investments are again the causality of economic growth. Tang and Tan (2014) empirically analyzed the relationship between savings and economic growth in Pakistan for the period between 1971 and 2011. According to the findings, a cointegration relationship was identified, and the elasticity coefficient of the savings was found to be positive and significant. A two-way causality between savings and economic growth was identified based on the causality analysis.

Sekantsi and Kalebe (2015) investigated the relationship between savings, investments and economic growth in Lesotho for the period between 1970 and 2012. The results revealed that there was a cointegration relationship between the variables. In addition, a causality relationship from economic growth towards savings in the short term, and a causality relationship from savings towards economic growth in the long term were identified. Moreover, there is a causality relationship from investments towards economic growth both in the short and long term. In their study on East Africa for the period between 1981 and 2014, Elias and Worku (2015) investigated the relationship between gross domestic savings and economic growth. Through empirical findings, they concluded that economic growth in Ethiopia and Uganda was the causality of gross domestic savings.

Siaw et al. (2017) examined the economy of Ghana for the period between 1970 and 2013. In the study which investigated the relationship between domestic savings and economic growth, they found a cointegration relationship in the model where economic growth was dependent. The other findings indicated that domestic savings increased economic growth in the long term, but had a negative, yet insignificant impact on economic growth in the short term. Bolarinwa and Obembe (2017) analyzed the relationship between gross domestic savings and economic growth in six Sub-Saharan African countries for the period between 1981 and 2014. According to the findings, economic growth is the causality of gross domestic savings in Ghana and Burkina Faso. In Liberia, Niger and Sierra Leone, gross domestic savings are the causality of economic growth. In Nigeria, no causality relationship was identified between economic growth and gross domestic savings.

Rosado and Sánchez (2017) investigated Ecuador for the period between 1975 and 2015. According to the results of the econometric analysis, they found a causality from the rate of savings towards economic growth. Patra et al. (2017) analyzed the relationship between savings and economic growth in India for the period between 1951 and 2012. Based on the empirical findings, it was concluded that economic growth is the causality of savings in the short term. Tang and Tan (2017) investigated the causality relationship between savings and economic growth in East Asian countries for the period between 1970 and 2011. Based on the results of the empirical analysis, they concluded that savings in East Asian countries are the causality of economic growth. Keho (2018) examined the relationship between domestic savings and economic growth in West African countries for the period between 1981 and 2014. The findings revealed that economic growth is the causality of domestic savings in Guinea-Bissau and Nigeria. In addition, domestic savings in Benin, Gambia, Mali, Niger and Senegal are the causality of economic growth. A two-way causality between domestic savings and economic growth was identified in Ghana. Hussain and Saaed (2018) investigated the relationship between economic growth and gross domestic savings in the United Arab Emirates for the period between 1980 and 2013. In the study a cointegration relationship was found and it was concluded that gross domestic savings have a positive and significant effect on economic growth.

2. DATA SET, METHODOLOGY AND IMPLEMENTATION

The gross domestic savings (GDS), fixed capital investments (GFI) and economic growth (GDP) data of seven Caucasian and Central Asian countries (Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkey) were used in the study. In the empirical study conducted for the period of 1993-2017, the data was obtained from the World Bank database.

2.1 Methodology and Implementation

The purpose of an empirical study is to estimate the cointegration and causality relationships between variables. The stationarity of the variables must be analyzed to be able to identify the methods that would allow the estimation of the cointegration and causality relationship. For this purpose, the Levin et al. (2002) (LLC), ADF (Augmented Dickey-Fuller) Fisher and Im et al. (2003) (IPS) tests were used to be able to test the stationarity of the variables used. The null hypothesis of the tests is "there is a unit root in the variable", while the alternative hypothesis is "the variable is stationary".

Table 1. Results of the Panel Unit Root Test

	LLC		*ADF-Fisher*		*IPS*	
	Stat.	*Prob.*	*Stat.*	*Prob.*	*Stat.*	*Prob.*
LEVEL						
GDP	0,430	0,667	7,868	0,896	0,553	0,710
GDS	-0,626	0,266	15,777	0,327	0,208	0,582
GFI	-0,232	0,408	13,787	0,466	-0,275	0,392
1. DIFFERENCE						
ΔGDP	-4,786	0,000	38,586	0,000	-3,412	0,000
ΔGDS	-13,542	0,000	127,961	0,000	-13,092	0,000
ΔGFI	-5,748	0,000	52,960	0,000	-5,262	0,000

*, and ** refer to significance levels of 1% and 5%, respectively.

The results of the panel unit root test are presented in Table 1. According to the LLC unit root test, the test statistics of the GDP, GDS and GFI variables at level are 0.430, -0.626 and -0.232, respectively. Since the H_0 hypothesis cannot be rejected in any of the three test statistics, the variables are unit rooted at level. Taking the first difference in the variables revealed that the test statistics of the GDP, GDS and GFI variables were 4.786, -13.542 and -5.748, respectively. The null hypothesis was rejected, and the alternative hypothesis was accepted at a significance level of 1%. For this reason, based on the LLC unit root test, the GDP, GDS and GFI test statistics were found to be stationary at the first difference. According to the ADF-Fisher unit root test, the test statistics of the GDP, GDS and GFI variables were 7.868, 15.777 and 13.787, respectively. Based on the test statistics, it was concluded that all three variables were unit rooted at level. Taking the first difference of the variables revealed that the test statistics of the GDP, GDS and GFI variables were 35.568, 127.961 and 52.960, respectively. According to the test statistics, the null hypothesis was rejected for all three variables and the alternative hypothesis was accepted at a significance level of 1%. Therefore, according to the ADF-Fisher unit root test, the variables are stationary at their first difference. According to the IPS unit root test, the test statistics of the GDP, GDS and GFI variables at level are 0.553, -0.208 and -0.275, respectively. The null hypothesis could not be rejected for any of the three variables and the variables were considered to be unit rooted. Taking the first difference of the variables revealed that the test statistics of the GDP, GDS and GFI variables were -3.412, -13.092 and -5.262, respectively. Therefore, taking the first difference of the variables resulted in the rejection of the H_0 hypothesis and the acceptance of the alternative hypothesis at a significance level of 1%. According to the LLC, ADF-Fisher and IPS unit root tests, the GDP, GDS and GFI variables were found to be stationary at level I(1).

After confirming that the variables are stationary at level I(1), panel cointegration tests were used to test whether there was a long-term relationship between the internally identified variables. Seven different test statistics were used in the Pedroni (1999, 2004) panel cointegration test. The critical values in this test were determined by the Monte Carlo simulation. The Kao (1999) test was also used in the study to enable testing of the cointegration relationship. Kao (1999) developed a panel test for cointegration,

which can be considered as a generalization of the DF and ADF tests. For both tests, the null hypothesis is “there is no cointegration relationship”, and the alternative hypothesis is “variables are cointegrated”.

Table 2: Panel Cointegration Tests Results

Pedroni Cointegration Test (GDP Bağımlı Değişken)	
Within dimensions	*t- statistics*
Panel v-statistics	0.310
Panel ρ - statistics	-0.924
Panel PP- statistics	-2.079**
Panel ADF- statistics	-2.962*
Between dimensions	
Group ρ - statistics	1.108
Group PP- statistics	-2.433*
Group ADF- statistics	-2.458*
Kao Cointegration Test (GDP Bağımlı Değişken)	
ADF	-4.797*

Note: **, and ** refer to the existence of a cointegration relationship at significance levels of 1% and 5%, respectively.*

The results of the panel cointegration tests are presented in Table 2. The Pedroni (1999, 2004) panel cointegration analysis is tested by applying seven different test statistics. In three of the seven test statistics (Panel v-statistics, Panel ρ - statistics and Group ρ - statistics), the H_0 hypothesis could not be rejected, while the H_0 hypothesis was rejected and the alternative hypothesis was accepted in the remaining four test statistics (Panel PP-statistics, Panel ADF- statistics, Group PP- statistics, Group ADF-statistics). The findings showed that, according to the Pedroni (1999, 2004) panel cointegration test, it was concluded that the variables would act together in the long term. The results of the Kao (1999) panel cointegration test are also presented in Table 2. The Kao test statistic was found to be -4.797. Since the null hypothesis was rejected and the alternative hypothesis was accepted at a significance level of 1% based on this test, it was identified that the variables would act together in the long term.

The Pooled Mean Group Estimator (PMGE) limit test model developed by Pesaran et al. (1999) was used in the study.

$$\Delta GDP_{it} = \varphi_i + \sum_{k=1}^{p} \delta_{ij} \Delta GDP_{i,t-j} + \sum_{k=1}^{p} \gamma_{ij} \Delta GDS_{i,t-j} + \sum_{k=1}^{p} \omega_{ij} \Delta GFI_{i,t-j} + \beta_{1ij} GDP_{i,t-1} + \beta_{2ij} GDS_{i,t-1} + \beta_{3ij} GFI_{i,t-1} + \varepsilon_{it} \quad (1)$$

where, $\varphi_i$is the error correction parameter, i=1,2...N is the cross section units, and T=1,2...N is the time period. The null hypothesis of the test is “there is no cointegration relationship”, and the alternative hypothesis is “variables are cointegrated”. In the ARDL model, the Schwarz information criterion was used and a maximum lag length of 4 was chosen. The optimal lag length chart is provided below.

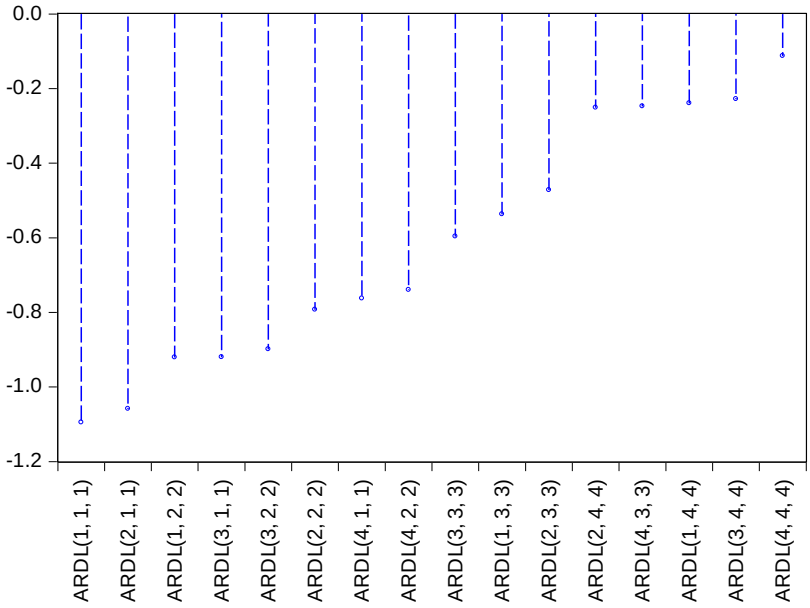

Figure 1. The optimal ARDL model choice based on the Schwarz information criterion.

Given the fact that the components of economic growth have different effects on economic growth in the short and long term, these effects need to be estimated. The first step of the panel ARDL test is to find the optimal lag and test the model based on this lag. As shown in Figure 1, the lowest criterion of Schwarz is ARDL (1,1,1). Therefore, the ARDL (1,1,1) was found to be the optimal model.

Table 3. Results of the Panel ARDL Test

	Stat.	*Prob.*
LONG RUN COEFFICIENTS		
GDS	0,021*	0,000
GFI	0,828*	0,000
SHORT RUN COEFFICIENTS		
C	0,920**	0,012
GDS	-0,001	0,562
GFI	0,265*	0,000
ECM (-1)	-0,183**	0,012
Hausman specification test: Chi-square = 5.312	Prob = 0.070	

*, and ** refer to significance levels of 1% and 5%, respectively.

Table 3 shows the estimation results of the general form of research within the framework of the ARDL (1,1,1) model. According to the long-term coefficients, the coefficients of the GDS and GFI variables are positive and statistically significant at a level of 1%. The GDS coefficient suggests that its impact on economic growth will be very weak. Any change in the GDS and GDI variables will affect economic growth in the same direction in the long term. According to the short-term coefficient estimation, the GDS coefficient was found to be negative and statistically insignificant. The GFI coefficient, on the other hand, was estimated to be 0.265 in the short term and was statistically significant. Based on theoretical expectations, the error correction coefficient (ECM) was between -1 and 0 and was statistically significant. 18.3% of the deviations are anticipated to recover in the next period and approach balance in the long term.

If there is evidence of cointegration between the variables, the short- and long-term causality relationship is determined using the vector error correction model (VECM) Granger causality test (Granger, 1969). The VECM can be written as:

$$(1-L)\begin{bmatrix} GDP \\ GDS \\ GFI \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} b_{11i} & b_{12i} & b_{13i} \\ b_{21i} & b_{22i} & b_{23i} \\ b_{31i} & b_{32i} & b_{33i} \end{bmatrix} X \begin{bmatrix} GDP_{t-1} \\ GDS_{t-1} \\ GFI_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \end{bmatrix} + ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \quad (2)$$

above, $1-L$ is the lag operator, ECT_{t-1} is the lagged error correction term, β_j (j=1,2,3) refers to correction coefficients and ε_{jt} (j=1,2,3) refers to error correction terms. In order to interpret long-term causality, the ECM_{t-1} coefficient must be significant and between -1 and 0. The fact that the ECM_{t-1} coefficient is negative and statistically significant indicates that the effect of a shock that may occur in the variables will continue to have a diminishing impact and so will balance itself out again in the long term.

Table 4.VECM Granger causality test results

Dependent Variable	*ΔGDP*	*ΔGDS*	*ΔGFI*	*Long-run (p-value) ECT_{t-1}*	*Direction of causality*
ΔGDP	-	3,004 (0,083)	0,240 (0,623)	-0,121 [-2,834]	GDS→GDP
ΔGDS	0,108 (0,741)	-	0,956 (0,328)	-7,277 [-2,383]	-
ΔGFI	3,580 (0,058)	8,777 (0,003)	-	0,510 [4,549]	GDP→GFI, GDS→GFI

Notes: p-values are presented in parentheses, while t-statistics are shown in bracket.

Table 4 presents the results of the VECM Granger causality test. According to the short-term causality findings, the null hypothesis that gross domestic savings are not the causality of economic growth was rejected, and gross domestic savings were found to be the causality of economic growth. The null hypothesis that economic growth is the causality of fixed capital investments was also rejected and the alternative hypothesis was accepted. Thus, economic growth is the causality of fixed capital investments. In addition, gross domestic savings were identified to be the causality of fixed capital investments in the short term. According to the results of the long-term VECM Granger causality test, the GDP coefficient was found to be -0.121 and statistically significant. Therefore, a long-term causality relationship from gross domestic savings and fixed capital investments to economic growth was identified. Since the test statistics of the GDS and GFI variables are not between -1 and 0, the test statistic was considered to be invalid.

CONCLUSION

In this study, the existence of a cointegration and causality relationship between domestic savings, fixed capital investments and economic growth was investigated in 7 Caucasian and Central Asian countries. Much of the empirical literature includes findings indicating that domestic savings and fixed capital investments will have a positive impact on the economy in the long term. If these variables really affect economic growth in the long term, then there should be a cointegration relationship where economic growth is a dependent variable. In this study which includes a cointegration relationship between the variables, the cointegration coefficients of the variables of domestic savings, fixed capital investments and economic growth were estimated using the panel ARDL method. Findings show that the elasticity coefficients of domestic savings and fixed capital investments are positive and significant in the long term.

The causality relationship between the variables was analyzed by the panel VECM Granger causality test. Findings showed evidence that the short-term and long-term domestic savings are the causality of economic growth. As domestic savings are the causality of economic growth, the rise in savings in the Caucasian and Central Asian countries will have a positive impact on economic growth. According to this result which is in line with the literature, savings were identified to be a necessary element for growth, particularly in developing countries.

Another result in the causality analysis is the empirical evidence that domestic savings are the causality of fixed capital investments. Policymakers need to raise domestic savings, and take the necessary steps for such savings to be converted into investments. The policies, which will be put into effect by policymakers who should act together with economists, would increase their country's level of development and reduce external dependence for capital requirements.

As economic growth increases, investors' confidence in the economy will also increase, raising fixed capital investments. For this reason, the responsibility of policymakers at this point is to identify and implement balanced and positive policies for sustainable economic growth. It should be ensured that both domestic and foreign investors invest in the country, particularly through policies that would encourage investors. It should be noted here that domestic investors need to be protected while developing policies that will attract foreign investors. If domestic investors are not protected in our globalized world, the economies will grow based only on foreign resources in the long term, which could lead to a number of economic and political risks.

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