INVESTMENTS AND TAXES IN ARMENIA (1997–2008)

INVESTĪCIJAS UN NODOKĻI ARMĒNIJĀ (1997–2008)

Nina KUTSANYAN,

Anaida VIRABIAN

PhD students, Yerevan State University
1 Alex Manougian st., Yerevan, 0025, Armenia

Vahram BAGHDASARYAN

Professor, Dr. Head, Department of Informatics and Economics
Vanadzor State Pedagogical Institute

Phone: +37410-589198; e-mail: NKutsanyan@gmail.com

Abstract. Present paper investigates the effect of changes in investment and taxes on the economic growth. Using quarterly data from 1997 to 2008 for Armenian economy we showed that the effect of the increase in investment and taxes on real GDP is positive or negative. The interrelation between GDP and investment is studied using the approach based on the development of VAR model. The analysis of this model allowed studying the behaviour of curves representing GDP and investment. In fact, we showed that the GDP curve is stable and oscillated and the investment curve is stable and none oscillated. Furthermore, we evaluated the impact of investment changes by 1% on the GDP growth which was equal to 0.4%. Then the model representing interrelation between GDP and taxes allowed evaluating the effect of tax changes by 1%. The findings allowed evaluating the effect of growth in investment and taxes depending on the GDP growth rate. Simultaneously, VAR system allowed evaluating the changes in GDP on the investment growth.

Keywords: Gross Domestic Product, investment, taxes, growth, rate, regression, vector auto regression system.

1. Introduction

The effect of investments and taxes on the total economic growth is one of the topical problems in theoretical macroeconomics. Neoclassical and Keynessian models of economic growth allowed studying the effects of investments and taxes on the economic growth. However, for countries in the period of change these problems are to be investigated. Particularly, these problems remain unsolved for Armenian economy, especially, at the stage of transition, therefore, the need for the new area of study emerged.

The **aim** of study is to revise the effect of changes and increase in investment and taxes on the GDP growth in Armenian economy. The behaviour of curves representing investment rates, GDP rates, investment/GDP ratio rate and taxes is studied and the interrelation between these variables is investigated.

The **task** of the study is: to evaluate the effect of increase of investment and taxes on GDP in Armenian economy.

The corresponding qualitative and quantitative research **methods** based on econometric modelling using quarter data of Armenian economy since 1998 have been studied for the development of vector auto regression models.

2. Growth

The growth of the Armenian economy since the collapse of Former Soviet Union has been promising. Figure 1 represents Armenian GDP growth rate since 1997. After a strong surge in 1998 – 1999 the GDP growth rate decreased in 2000 and over the following decade it recovered rapidly.

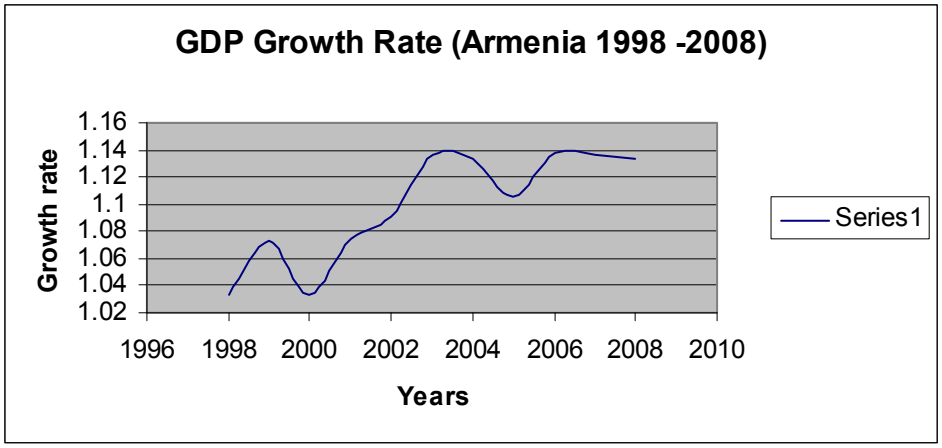

Figure 1. GDP growth rate (Armenia 1998 – 2008)
Source: Yearbook of National Statistical Service of the Republic of Armenia

In fact, GDP growth rate per capita in Armenia has become higher since 2000, although, the downturn in early 1991-1994 didn't facilitate the economy reach the income levels of 1988. Figure 2 illustrates the rate of Armenian GDP per capita within the period of time from 1997 right up to the year 2008. However, the rate at which the GDP per capita increased in 2000 became slow in 2004.

Let us denote as *GDPPC* -GDP per capita.

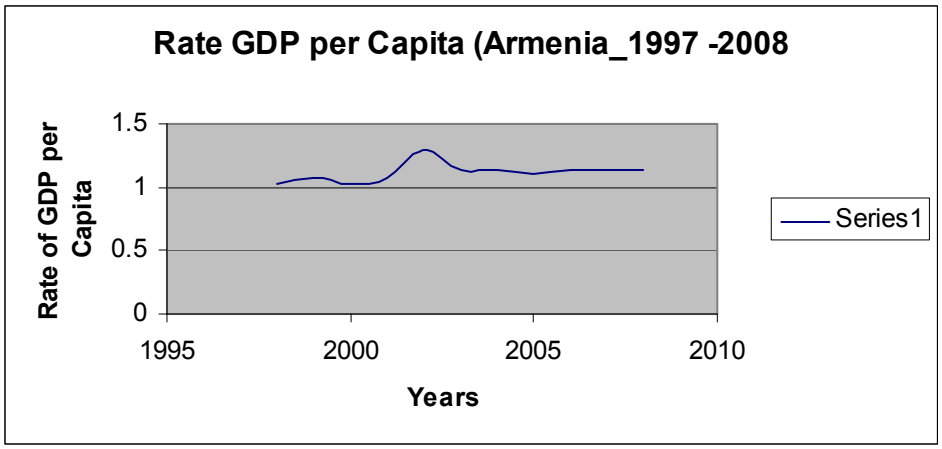

Figure 2. GDP per capita growth rate (Armenia 1998 – 2008)
Source: Yearbook of National Statistical Service of the Republic of Armenia

The short - term volatility represents medium – term trends. The linear trend GDP per capita rate given by (1) shows that the growth rate has a tendency to increase over time.

$$GDPPC_t = 0.009t + 1.04 \quad (1)$$
$$(4.93)\ (74.48)$$

where $R^2 = 0.91, F = 34.35$ and t-statistics of the regression coefficients is given in brackets.

2. Investment

As the investment rate is the key determinant of exploring the economic success of the economy we'll study the nature of the investment in the Republic of Armenia since 1997. It's known that fast - growing countries are the ones that invest substantial portion of their GDP, and countries that do not succed in their growth are those that fail the investment. According to the neoclassical growth model of Solow (1956) one of the key determinants of growth is the investment rate. Figure 3 shows that the investment rate in Armenian economy since 1996 particularly was not so low. It fluctuated, increased in 1998 – 1999, experienced a downturn in 1999-2000 and reached its peak in 2003. Finally, there was oscillation in 2004 – 2008. The highest investment/GDP ratio is recorded in: Q4 2002, Q1 and Q2 2003, and Q4 2007. The investment/GDP ratio was equal 6%. Nevertheless, it's impossible to suggest that 6% investment/GDP ratio is high. For example, comparing with other developing countries this ratio is too low. At the same time we should suggest that the investment/GDP ratio recorded for Q4 2002, Q1 and Q2 2003, and Q4 2007 corresponds to the rate of positive rate of the GDP growth. Accordingly, the investment rate

being a key determinant of the growth rate of the economy corresponds to the GDP growth rate behaviour.

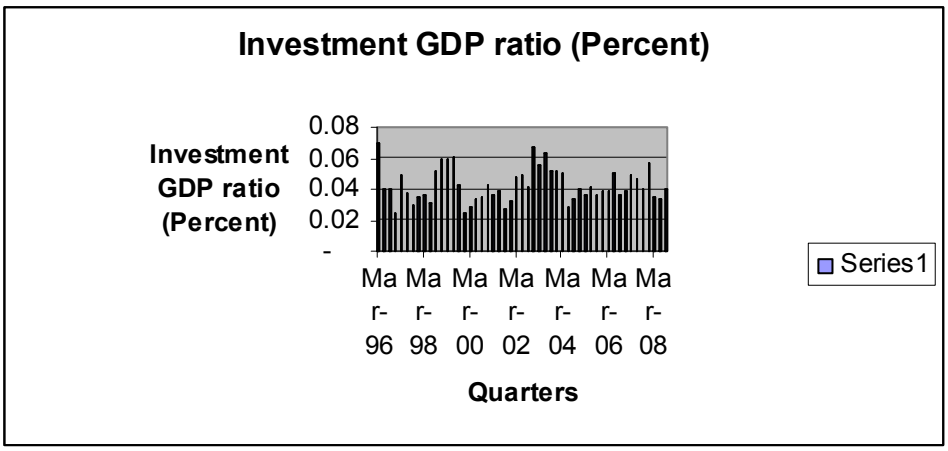

Figure 3. Investment GDP ratio (Percent) (Armenia 1998 – 2008)
Source: Yearbook of National Statistical Service of the Republic of Armenia

We showed that the investment rate fluctuated during 1997 – 2008 and increased slightly in Q1 1998 (25. 9%), Q3 2003 (19. 3%), Q1 2006 (23. 9%) and Q1 2007 (17. 1%). The growth of the investment rate has been facilitated by the growth of the GDP rate in the corresponding quarters.

Foremost we note that the growth of the investment rate arises after the overall growth rate soars and becomes positive. Above all, the investment rate reached its peak in the stated periods, when the growth rate was at record levels.

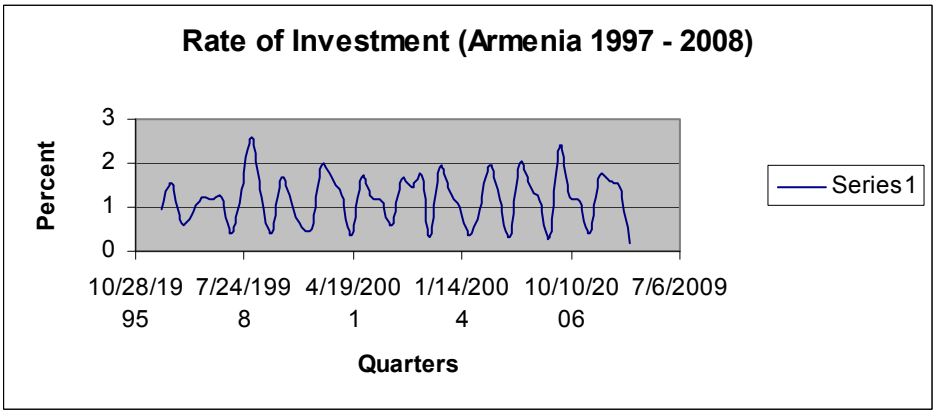

Figure 4. Investment rate (Percent) (Armenia 1998 – 2008)
Source: Yearbook of National Statistical Service of the Republic of Armenia

Similarly, the growth in the investment rates that appears in the periods of growth of the GDP rate was the consequence, not the cause of the growth performance at the end of the second decade.

Subsequently, despite the small growth in investment, investment rates can be compared with international standards.

2.1. Investment and GDP

Empirical literature devoted to the study of the investment and its impact on the economic growth implies:" in regard to the growth, it is not the overall level of investment that really matters, but its quality and efficiency". According to Doppelhoffer et al. (2002) public investment is one of the robust determinants of the economic growth rate. Following his suggestion we also studied the influence of the public investment on Armenian economic growth. It allowed studying economic consequences of the public investment.

The interrelation between LnGDP and LnInv is given in the equation (2)

$$LnGDP = 0.42LnInv + 8.75 \quad (2)$$

(3.46) (7.58)

where $R^2 = 0.92, F = 52.81$ and t-statistics of the regression coefficients is given in brackets.

Therefore, $GDP = Inv^{0.42} e^{8.75}$ (3)

From (3) follows that the increase by 1% of the investment provides 0.4% increase of the GDP.

2.2. VAR system

Vector auto regression system representing the interrelation between GDP and investment is given in the system (4) – (5).

$$LnGDP_t = 0.49LnGDP_{t-1} + 0.47LnGDP_{t-2} + 0.007LnInv_{t-1} + 0.42LnInv_{t-2} + 8.5 + \xi_t \quad (4)$$

(3.41) (-2.3) (3.03) (2.9) (3.7)

where $R^2 = 0.93, F = 35.24$ and t-statistics of the regression coefficients is given in brackets.

$$LnInv_t = 0.8LnGDP_{t-1} - 0.26LnGDP_{t-2} + 0.25LnInv_{t-1} + 0.04LnInv_{t-2} - 0.2 + \zeta_t \quad (5)$$

(7.1) (-5.4) (4.4) (2.4) (3.2)

where $R^2 = 0.92, F = 47.34$ and t-statistics of the regression coefficients is given in brackets.

Characteristic functions of the equations (4) and (5) are the following equations:

$$\begin{aligned} \lambda^2 - 0.49\lambda - 0.47 = 0 \\ \mu^2 - 0.25\mu - 0.04 = 0 \end{aligned} \quad (6)$$

respectively.

From (6) follows that eigenvalues of the system (6) are:

$$\lambda_1 = 0.24 + 0.64i, \lambda_2 = 0.24 - 0.64i, |\lambda| = 0.69$$
$$\mu_1 = 0.57, \mu_2 0.07. \quad (7)$$

Thus, we can suggest that from (7) follows that the GDP growth is stable and oscillated and the investment growth is stable and none oscillated.

The reforms at the end of the XX century and the first decade of the XXI century led Armenian economy in the right direction in a sense that the investment behaviour is stable and none oscillated.

3. Taxes and growth in Armenia

The effect of taxes on aggregate economic activity is studied in Neoclassical and Keynessian literature and following this study we could suggest that higher taxes reduce economic activity, even though there is less agreement on the exact mechanisms that generate this outcome Eaton (1981), Dotsey (1990), Kims (1998). The goal of this chapter is to contribute to the empirical side of the question and to the approach that analyses annual data from 1997 – 2008 of Armenian economy. We explore the effects on income taxes and developed regression models representing the dependence of GDP on income taxes.

We start with the simplest dynamic approach that relates growth and the tax rate. This model is similar to the empirical specification in Romer and Romer (2007):

$$LnGDP_t = \sum_{j=0}^{5} b_j LnTax_{t-j} + \xi_t \quad (8)$$

Thus, after some calculations we could present the regression model (8) as the model

$$LnGDP_t = -0.1LnTax_t + 0.15LnTax_{t-1} + 0.58LnTax_{t-2} + 0.09LnTax_{t-3} - 0.08LnTax_{t-4} + 0.17LnTax_{t-5} + 4.06 + \xi_t \quad (9)$$

where $R^2 = 0.93, F = 57.7$ and t-statistics of the regression coefficients is:

3.2, -4.04, 3.51, 6.65, 4.05, -5.79, 3.66 for coefficients

-0.1, 0.15, 0.58, 0.09, -0.08, 0.17 4.06 of the regression equation (9).

From (9) follows

$$GDP_t = (Tax_t)^{-0.1}(Tax_{t-1})^{0.15}(Tax_{t-2})^{0.58}(Tax_{t-3})^{0.09}(Tax_{t-4})^{-0.08}(Tax_{t-5})^{0.16}e^{4.06} \quad (10)$$

Consequently, if for example Tax_{t-1} is increasing by 1% than GDP_t is increasing by $(1.01)^{0.58}$ which is equal 1.0058 or GDP_t is increasing up to 0.58%.

Following the approach of Perotti (1999) and Blanchard and Perotti (2002) we revise the model (8) to:

$$LnGDP_t = \sum_{j=1}^{5} a_j LnTax_{t-j} + \zeta_t \quad (11)$$

Thus, after some calculations we could present the regression model (11) as the model

$$LnGDP_t = -0.07LnTax_{t-1} + 0.24LnTax_{t-2} + 0.62LnTax_{t-3} + 0.08LnTax_{t-4} - 0.056LnTax_{t-5} + 4.11 + \zeta_t \quad (12)$$

where $R^2 = 0.92, F = 42.7$ and t-statistics of the regression coefficients is: 3.17, -5.72, 2.71, 7.2, 3.86, -2.58

From (12) follows

$$GDP_t = (Tax_{t-1})^{-0.07}(Tax_{t-2})^{0.24}(Tax_{t-3})^{0..62}(Tax_{t-4})^{0.08}(Tax_{t-5})^{-0.056}e^{4.11} \quad (13)$$

Consequently, if Tax_{t-2} is increasing by 1% than GDP_t is increasing by $(1.01)^{0.24}$ which is equal 1.002391or GDP_t is increasing to 0.24%.

Conclusions and proposals

The Armenian economy has suffered for about twenty years of slow down in regard to growth. The economic crisis caused by the collaps of former Soviet Union generated numerous problems in Armenian economy. The downturn in the investment rate in the economy was, probably, a consequence of this slowdown. New market economy institutions and economic reforms are of great importance in order to recover the economy which persists to collapse. According to international standards the investment was not so impressive. However, the presence of public investment allowed the economy to recover and provide the gradual and positive growth. On the other hand occurrence of political, social and military conflicts throughout the region caused difficulties concerned with attraction of private international investments.

The introduction of new technologies is a significant aspect in facilitating the attraction of private international invetsments as well as in finding new ways and opportunities for the use of information technologies in the economy.

Establishment of new institutions and implementation of economic reforms should allow the economy to introduce the tax law, differentiate taxes and include the diversity in taxes. Therefore, the diversification of taxes is one of the topical problems for the country while recovering after a deep economic collapse and the slow down of the economy.

Bibliography

1. Blanchard, O.J. and R. Perotti (2002). An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output, Quarterly Journal of Economics 117: 1329 – 1368.
2. Doppelhoffer, G., R. Miller, and X. Sala-i-Martin. The Determinants of Economic Growth. A Bayesian Averaging of Classical Estimates (BACE) Approach. Mimeograph. Columbia University, August 2002.
3. Dotsey M., (1990). The Economic Effect of Production Taxes in a Stochastic Growth Model. American Economic Review 1990; 80; 1168-1182.
4. Eaton J., (1981) Fiscal Policy, Inflation and the Accumulatioon of Risky capital. Review of Economic Studies 1981; 48; 435-445.
5. Kims S.J., (1998) Growth Effect of Taxes in an Endogenous Growth Model; to what extent do Taxes Affect Economic Growth? - a Puzzle. Journal of economic Dynamics and Control 1998; 23; 125-158.
6. Perotti R., (1999). Fiscal Policy in Good Times and Bad. Quarterly Journal of Economics 1999; 114; 1399-1436.
7. Romer C.D., Romer, D.H. (2007) The Macroeconomic Effects of Tax Changes; Estimates Based on a new measure of Fiscal Shocks. NBER working paper 2007; 13264.

Summary

The new approach for the study of the impact of increases in investment and taxes on the economic growth of developing country is studied. As a case study the Armenian economy is investigated. Developed models allowed evaluating the effect of changes in investment and taxes on the GDP growth and the study of the behaviour of curves representing rates of GDP, investment and taxes.