# INTERACTIONS OF ECONOMIC GROWTH, PRODUCTIVITY, INVESTMENT AND EMPLOYMENT IN THE CONTEXT OF LONG-TERM MACROECONOMIC DEVELOPMENTS[1]

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Key words: economic growth, productivity, investment, employment, growth trend, VAR model

***Introduction***

The issues of ensuring economic growth and economic development based on it, are of primary importance for any society. In this context, questions arise about what factors ensure economic growth in a particular country, whether these factors are based primarily on qualitative or quantitative growth, whether structural factors ensure the stability of economic growth, whether there are institutional mechanisms through which inclusiveness of economic growth and its transformation are ensured for the purposes of economic development and increasing the well-being of all layers and classes of society. These issues are more than relevant for countries with developing markets, one of which is the Republic of Armenia. This article discusses and analyzes the relationship and interactions between economic growth, productivity, investment and employment in the long-term development of the Armenian economy.

***Methodology***

To analyze the impact of employment, investment, and productivity on economic growth, a typical VAR model specification presented below was chosen, which allows to take into account the endogenous nature of the above variables in the modeling process.

$$\boldsymbol{Y_t} = \mu + \sum_{\boldsymbol{i=0}}^{\boldsymbol{p}} \boldsymbol{\phi_i} * \boldsymbol{Y_{t-1}} + \boldsymbol{X_t \Gamma} + \boldsymbol{\varepsilon_t}$$

$\boldsymbol{Y_t}$ - is the vector of endogenous variables at time t, $\overline{\mathrm{t} = 2006Q1{:}\,2024\mathrm{Q2}}$,
$\mu$ - vector of constants,
$\boldsymbol{\phi_i}$ - is the coefficient matrix of the lagged variables of the endogenous variables,
$\boldsymbol{X_t}$ - is the matrix of exogenous variables at time t, $\overline{\mathrm{t} = 2006\mathrm{Q1}{:}\,2024\mathrm{Q2}}$,
$\boldsymbol{\Gamma}$ - is the coefficient matrix of the exogenous variables,
$\boldsymbol{\varepsilon_t}$–is the random error of the model at time t, $\overline{\mathrm{t} = 2006\mathrm{Q1}{:}\,2024\mathrm{Q2}}$:

In the statistical sample of the modelling were included quarterly growth rates of real economic growth of the Republic of Armenia, employment, gross fixed capital formation, and labor productivity from 2006 to 2024. The calculations were made based on the databases of the Statistical committee and Central bank of the RA. The time series are stationary (stated by the Augmented Dickey-Fuller test) and seasonally adjusted. The

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phenomenon of autocorrelation and heteroscedasticity are absent in the model, as confirmed by the Lagrange multiplier test (LM-serial autocorrelation) and the White heteroscedasticity test. The analysis of inverse roots of characteristic polynomial also confirms the stability and stationarity of the VAR model itself (Chart 1).

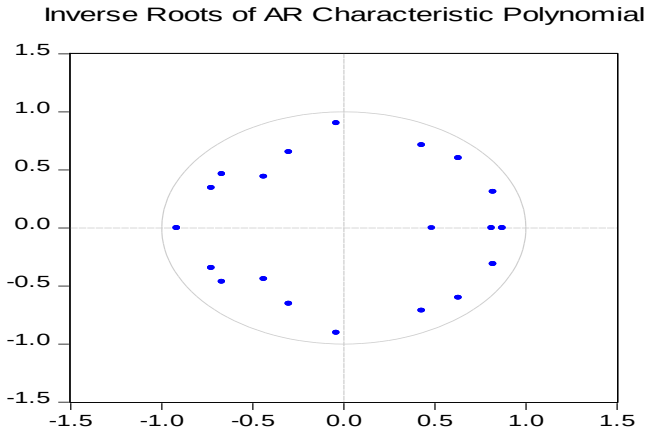


**Chart 1.** Inverse roots characteristic polynomial of the VAR model [1]

***Literature review***

In the economic literature, there are many approaches and viewpoints regarding the impact of structural and qualitative factors on economic growth, which place the main emphasis on increasing labor productivity through technological changes, creating new, highly profitable jobs through investment promotion, and encouraging progressive changes in the employment structure. This methodological trend has a key importance for the researchers of the issues of economic growth and development in recent decades. Some theorists [Luwis, 1954, 47-337] strongly assert that progressive structural changes lead to the redistribution of labor from low-productive sectors of the economy (agriculture, mining, etc.) to high-productive sectors, which leads to an increase in labor productivity and acceleration of economic growth. Vu Khuong also came to the same point of view, studying the experience of Asian countries, in particular, China [Khuong, 2017]. According to Simon Kuznets, the structural factors of economic growth can effectively affect productivity if they are combined with an adequate combination of economic, political and social conditions [Kusnez, 1971]. It can be noted that this classical approach is to a certain extent challenged by theorists of the new classical economic growth [Solow, 1956] or endogenous growth, who approach the problem from the opposite side. Accordingly, they insist that structural shifts do not affect economic growth in any way, rather, the opposite effect occurs, that is, economic growth, which is a consequence of productivity growth, capital accumulation and technological innovation, leads to certain structural changes in the economy [Lucas, 1988; Romer, 1994]. In reflecting on the structural

[1] The estimation was done by the author with the Eviews 12 software package .

driving factors of economic growth, a number of theorists give priority to manufacturing industries, emphasizing that they have a cumulative and multiplier effect on other sectors of the economy, leading to accelerated economic growth and increased competitiveness of the economy [Libanio, Sueli, 2011]. In this context, researchers in this field note that a higher level of elasticity of demand for products from high-tech manufacturing industries and greater export potential make it possible to improve the country's balance of payments, thereby creating favorable conditions for the development of other sectors of the economy [Tregenna, 2009, 433-466]. According to theorists of another modern paradigm of economics, the interactions between structural shifts in the economy and economic growth are determined by the rules of coevolution, that is, developments are determined by interdependent causal relationship between two factors. [Savioti, Pyka, 2008, 167] .

***Scientific novelty***

Within the framework of the research, the relations and interactions of the main factors determining the economic growth of RA were studied using the VAR-modeling toolkit, which made it possible to give a quantitative dimension to the analysis of this issue.

***Analysis***

From the study of the long-term structure of RA economic growth, it is obvious that economic growth has had an extensive nature since the beginning of the 21st century.

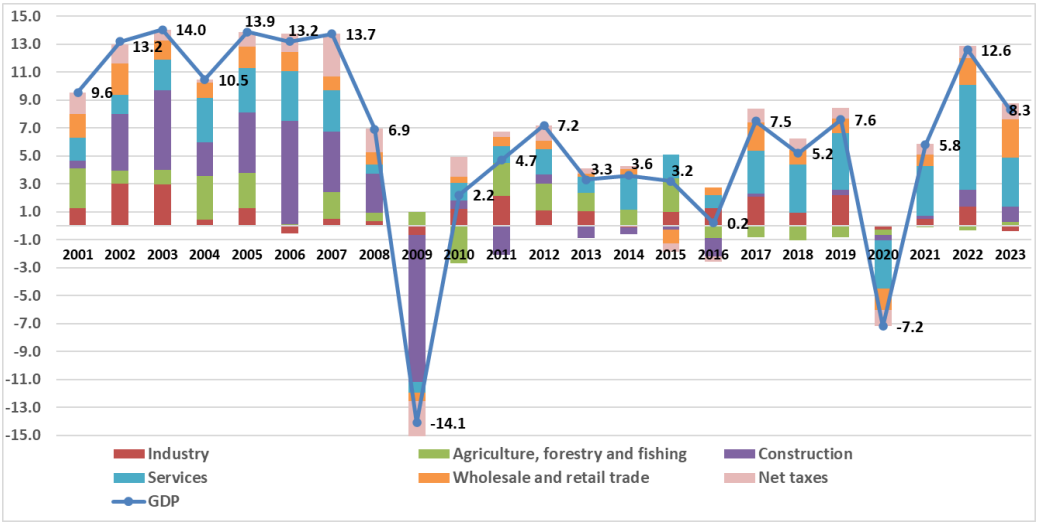


**Chart 2.** The structure of RA economic growth in 2001-2023 [1]

At the pre-crisis stage, construction accounted for a significant share in the structure of economic growth: on average for 2001-2008 - 11.9%. The contribution of construction to economic growth was about 3.9%, followed by services - 2.3%, agriculture - 1.6%, trade:

[1] The calculations were made by the author based on the database of Statistical committee of the RA https://armstat.am/am/?nid=202

1.4%. Later in 2008-2009, in the conditions of the global financial crisis and 14.1% economic decline, the largest negative contribution of the construction was also obvious - about 10.5%. As for the post-crisis recovery, during 2009-2015 period, when the economy grew by an average of 1.4%, the largest contribution to economic growth was made by the services sector by an average of 1.3 percentage points, and agriculture by 1.1 percentage points, industry by 0.8 percentage points, construction continued to maintain a trend of negative contribution on average by 1.9 percentage points. In 2016-2023, the growth structure did not undergo significant changes. In the structure of on average economic growth of 5%, services provide 2.8 percentage points contribution, trade by 1.1 percentage points, industry and construction more modestly, they account for 0.9 and 0.2 percentage points contribution. It is noteworthy that structural changes in the economy over the past two decades have not led to an increase in the share of the most productive and value-added generator industries in the structure of economic growth, but, on the contrary, services and trade are the leading ones and the main drivers of growth structure.


**Chart 3.** Trends in productivity and real economic growth in 2006-2024 [1]

As for the structure of industry, the situation is also problematic here, since in 2016-2023, from, on average, 0.9 percentage points of its contribution to economic growth, about 0.2 percentage points comes from the mining industry and 0.7 percentage points of the manufacturing industry, the structure of which is dominated by low-productive subsectors: production of food products, tobacco products, alcoholic beverages - an average of 63% in 2016-2023, and the high-tech and highly productive industries, such as the chemical industry and chemical products, the main production of pharmaceuticals and medicine, computers, electronic, electrical, optical equipment have a fairly modest share, they account about 5% of the total. At the same time, if we consider the trends of real

[1] The chart was made by the author based on the database of Statistical committee of the RA https://armstat.am/am/?nid=202

economic growth and productivity growth, then the trends are the reflection of the above-mentioned realities[1] (Chart 3). In particular, it can be noticed that during the observed period, the trend of real economic growth remained in the potential range of 4.5-5%, while the trend of productivity growth showed continuous downward dynamics, which is essentially due to the deterioration of the economy's structure. It is in this context that there is a need to analyze and evaluate the interactions between real economic growth and productivity growth, simultaneously evaluating the dimensions and trends of the influence of other factors determining economic growth. In order to evaluate the dynamic effects of variables included in VAR model used in research, the impulse response functions of the model with the above men-tioned specification were considered (Chart 4):

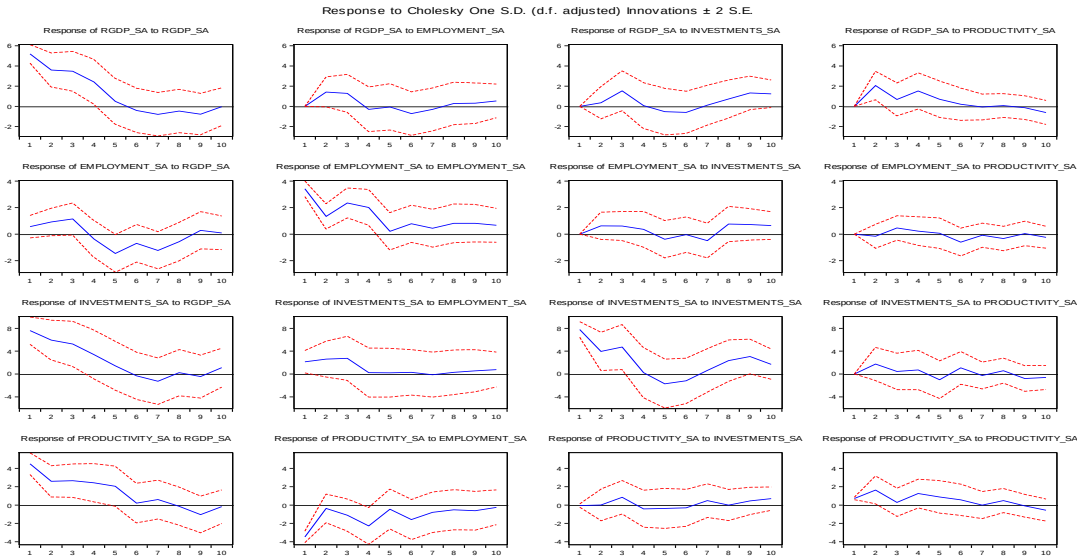


**Chart 4.** Impulse-response functions of the VAR model describing the interactions of employment, investment, productivity, economic growth [2]

The study of impulse response functions allows us to make the following conclusions:

➢ As a result of a 1 standard deviation positive productivity shock, real GDP growth reaches its peak response 2 quarters later, which is 2.1 percentage points. If we normalize the above effect by relating the obtained result to the size of the standard deviation of productivity, it can be stated that the maximum effect as a result of the shock is about 0.28 times more than the usual standard deviations of productivity, which is relatively higher than the effect of investment and the effects of comparable employment. In particular, the maximum impact of investments on real economic growth is achieved after 3 quarters, in the amount of 1.5 percentage points (about 0.09 times more than the usual standard deviations of investments), and in the case of employment, after 2 quarters, in

[1] https://statbank.armstat.am/pxweb/hy/ArmStatBank

[2] The estimation was done by the author with the Eviews 12 software package.

the amount of 1.4 percentage points (about 0.29 times more than the usual standard deviations of employment). The above-mentioned quantitative effects can also be documented by studying the variance decomposition of real economic growth, from which it becomes clear that from the 2nd quarter following the shock, in addition to the lagged inertial component of real economic growth, the effects of productivity materialize and persist with the greatest weight among the variables included in the model and the impacts of investment and employment are manifested in the medium term horizon (Chart 5).

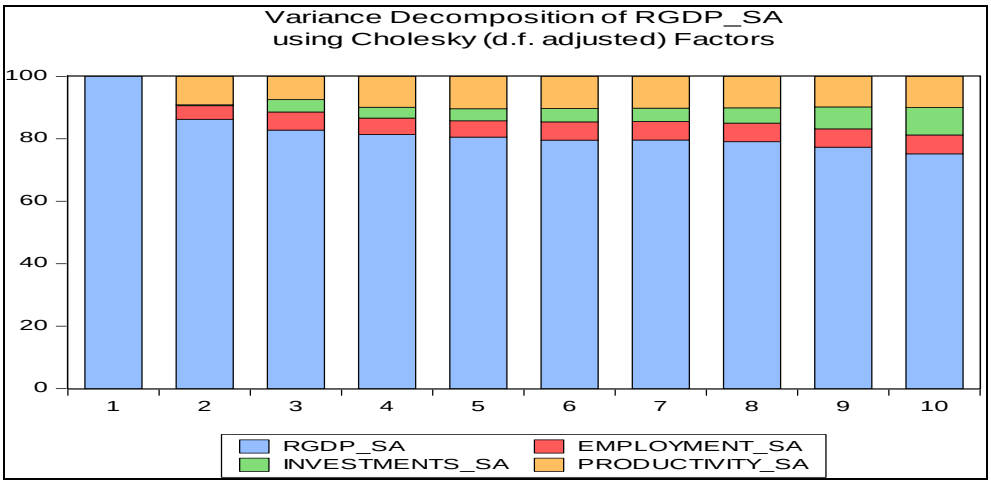


**Chart 5.** The variance decomposition of the real economic growth of RA [1]

➢ As for the effects of other variables included in the model, it can be noted that, as a result of a positive shock of 1 standard deviation of investment, productivity responds after 3 quarters, registering an increase of 0.8 percentage points (normalized 0.05). And here, investments also respond to employment and productivity shocks with a reverse effect, registering growth, respectively, by a maximum of 2.7 (standardized: 0.6) and 1.7 (standardized: 0.2) percentage points.

➢ One more remarkable macroeconomic feedback effect can be observed in the model. A positive shock of 1 standard deviation of economic growth leads to an increase in productivity by a maximum of 4.6 (normalized: 0.6) percentage points, which in turn can lead to an increase in investment in the above mentioned proportion.

***Conclusion***

The study of long-term growth trends of the economy of the Republic of Armenia shows that structural shifts in the economy during the last two decades did not lead to an increase in the share of highly productive industries with high share of value added in the structure of the economic growth, but the opposite processes occurred and the main drivers in the growth structure were services and trade with a low share of value added. As a

[1] The estimation was done by the author with the Eviews 12 software package.

result of the analysis carried out within the framework of the research, it was stated that during the period under review (2006-2024), the economy of the Republic of Armenia maintained stable its real potential economic growth, while the trend of labor productivity in the same period tended to decrease due to the qualitative deterioration of the structure of the economy and the increase in the share of industries with low value added. At the same time, quantitative analysis has revealed that the relationships between economic growth, productivity, investment and employment are quite significant and endogenous, and an increase in each of the above mentioned factors can lead to both accelerated economic growth and with the feedback effect economic development with an increased labor productivity and employment growth.

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**Interactions of economic growth, productivity, investment and employment in the context of long-term macroeconomic developments**

*Key words: economic growth, productivity, investment, employment, growth trend, VAR model*

The aim of this article is to discuss the relationship between economic growth, productivity, investment and employment in the economy of the Republic of Armenia by using econometric and mathematical toolkits. The study examined long-term quantitative and qualitative changes in the structure of the RA economy and their impact on economic growth, productivity, investment and employment dynamics. The study showed that during the period under review, although a stable trend of economic growth was maintained in the RA economy, the trend of labor productivity, which determines the quality of this growth, was negative, which is associated with the ongoing deterioration of the structure of the economy, in particular, declining share of industries with a high share of value added and high productivity and reducing the influence and of these type of industries. In parallel, the relationship and interaction of real economic growth, productivity, investment and employment were studied using quantitative assessment toolkit.