JEL Classification: O3; O30; O31 https://doi.org/10.35945/gb.2021.11.010

THE IMPACT OF AN INNOVATION ECONOMY ON THE ECONOMIC GROWTH OF THE COUNTRY

SALOME DANELIA

PhD student

Ivane Javakhishvili Tbilisi State University, Georgia

salome.danelia@tsu.ge

Abstract. At the turn of the XX-XXI centuries, the rapid pace of the current economic globalization process has accelerated the transition of countries to the post-industrial stage of development, the main features of which are knowledge and innovation. The article aims to identify the innovation economy determinants affecting economic growth and comprehensively examine the impact of innovation economy on the country's economic growth.

Relevance of the topic. At the end of the twentieth century, the process of globalization of the world's economy has accelerated the transition of countries to the post-industrial development stage, the main features of which are knowledge and innovation. Despite the theoretical assessments, practically no comprehensive study has been conducted of the impact of the innovation economy on the country's economic growth in the Georgian economic literature to this day. Consequently, the determinants of the innovation economy affecting economic growth have not been identified. Due to the above, the formation of an innovation economy at the current stage of Georgia's development is gaining particular urgency as the most crucial economic growth factor.

The Scientific Novelty of the Research. Based on the results of the regression equation (dependent variable Gross Domestic Product (GDP) per capita) in the article, a positive correlation has been found between only a few variables of the innovation economy and the dynamics of GDP in the Eastern Partnership and EU countries. The regression equation results regarding the dynamics of the GDP of these countries indicate that both the export and import of information and communication technologies are in positive correlation with the GDP per capita. As for the high-tech exports, patent applications of residents and non-residents, research and development costs (GDP %), trademark applications, industrial design, and foreign direct investment per capita, these figures are not correlated with GDP.

KEYWORDS: INNOVATION ECONOMY, GROSS DOMESTIC PRODUCT, ECONOMIC GROWTH.

For citation: Danelia, S., (2021). The Impact of an Innovation Economy on the Economic Growth of the Country. *Globalization and Business, №11,* 80-86. https://doi.org/10.35945/gb.2021.11.010

INTRODUCTION

The purpose of this article is to determine the impact of innovative economics' variables on the dynamics of GDP on the example of the Eastern Partnership (Georgia, Azerbaijan, Armenia, Moldova, Belarus, Ukraine) and EU member states.

Based on the above purpose, we have determined the study's objectives:

• Identify the variables of the innovation economy that stimulate the economic growth of the country;

• Identify & analyze the correlation between the growth dynamics of GDP and the variables of the innovation economy.

The study's object is the problems of innovation economy in the Eastern Partnership and EU member states.

The study's subject is to calculate the regression equation results (dependent variable per capita of GDP) for each variable in the innovation economy of the Eastern Partnership and EU countries to determine and evaluate the correlation of the variables.

The theoretical-methodological bases of the research of innovation economy are the works of Georgian and foreign scientists-researchers. Noteworthy among Georgian scientists are the publications of the professors: A. Silagadze, V. Papava, G. Gaganidze, R. Gvelesiani, E. Mekvabishvili, S. Gelashvili, R. Abesadze, L. Bakhtadze, G. Bedianashvili, Sh. Veshapidze, T. Zubiashvili, M. Tukhashvili, M. Chikobava, T. Shengelia, A. Abralava, R. Shengelaia, G. Jolia, etc.

Among the foreign scientists, the fundamental works of the following authors are crucial: I. Schumpeter, N. Kondratiev, R. Solow, K. Freeman, B. A. Lundvall, R. Nelson, f. Nixon, U. Gibson, J. Cantwell, D. Merceris, M. Schweizer, H. Etskovitsi, L. Leidensdorf, R. Florida, B.A. Ludwal etc.

The study is also based on the materials and legislative

acts of the World Bank, Eurostat, National Statistics Office of Georgia, Georgian, and foreign profile ministries.

The paper uses research analysis and synthesis, regression, correlation, and other methods.

The scientific novelty of the study is an attempt to comprehensively examine the relationship between the innovation economy' variables and the economic growth in the Eastern Partnership and EU countries. Based on the results of the regression equation (dependent variable GDP per capita):

• Based on the analysis of the GNP dynamic in the Eastern Partnership and EU countries, a positive correlation has been revealed between only a few variables of the innovation economy. The regression equation results regarding the dynamics of the GDP of these countries indicate that the export of information and communication technologies and the import of information and communication technologies are in positive correlation with the GDP per capita. In contrast, high-tech exports, patent applications of residents and non-residents, research and development costs (GDP %), trademark applications, industrial design, and foreign direct investment per capita are not correlated with GDP.

THE RELATIONSHIP BETWEEN INNOVATION VARIABLES AND ECONOMIC GROWTH

Recently, studies have been actively conducted worldwide to identify the variables of innovation and the main factors of economic growth.

It is well known that the economic growth in different countries, depending on their geographical or historical factors, is characterized by heterogeneity. Economic dynamics is a variable, which is related to cyclical changes. Economic dynamics is not just an ascending process; therefore, its rates can also be zero and negative. However, it is mainly characterized by an upward trend, which is a necessary precondition for a country's economic development. Furthermore, a country's economic development also depends on the increase in the number of factors of production and the qualitative improvement of these factors, since qualitative and non-material factors, in turn, increase economic wealth.

According to the classic economists Adam Smith (1776) and David Ricardo, economic growth is also influenced by population growth, capital growth, improving the international distribution of labor, and the economy's institutional framework. According to J. Keynes - a famous representative of the theory of economic growth in the XX century who has founded the new economic theory Keynesianism, there is only one factor that contributes to the growth of domestic income - the accumulation of capital. Meanwhile, the authors of the neoclassical model of economic growth focus on increasing physical capital, natural resources, labor, investment, and productivity.

In the post-industrial era, in addition to the traditional factors, the variables of the innovation economy are also being considered as factors affecting economic growth. In our paper, we analyze the impact of innovation economy variables on economic growth. The concept of economic innovation is defined as "the final stage in the evolution of the world economy, which changes the outdated traditional economy, radically changes existing views on the form and structure of national wealth, the criteria for accumulation efficiency and public reproduction" (Lich G., 2006).

According to the Austrian economist Josef Aloe Schumpeter (Schumpeter, 1883-1950), economic development is the process of implementing "new combinations," in the latest models, a knowledge-based economy is considered the primary determinant of the country's economic growth, in other words, in the technological development of developing countries, investments are considered to be the main anti-crisis measure. It is also important to note a study by the American researchers B.A. Lundvall (1992) and R. Nelson (1992) that analyzes the possible connections between innovation and economic growth. It is also interesting to consider the study by an American scientist Robert Solow (1956), according to which economic growth is achieved only based on exogenous technological changes, which increases productivity. According to R. Solow, the state must focus on developing and implementing institutional changes, which he considers to be a stimulus for innovation and knowledge.

THE DATABASE AND METHODOLOGY

The study mostly uses World Bank data to construct regression models. In the econometric model, the regression equation results for each variable (dependent variable - GDP per capita) were calculated, and the correlation of the variables was estimated.

We used the innovation economy factors for the study:

• Quantity of ICT (Information and Communication Technologies) goods export;

• Volume of import of information and communication technology goods (10% of total import of goods) (ICTGI);

• High technology export, which includes products with high R&D intensity, which mainly belongs to the group of the aerospace industry, computers, pharmaceuticals, scientific instruments, and electrical appliances;

• Patent applications (number) for non-residents;

• Patent applications for residents (number);

• Research and development costs (GDP%);

• Trademark applications for non-residents (Trademark applications, direct non-resident);

• Trademark applications for residents (direct resident);

• Trademark applications in total (Trademark applications, total);

• Industrial design applications for non-residents;

• Industrial design applications for residents;

• Foreign Direct Investment (FDI).

While studying the determinants of innovation on GNP dynamics in 2011-2019, to calculate the correlation coefficients, we used the data of the Eastern Partnership and EU Innovation Economy variables.

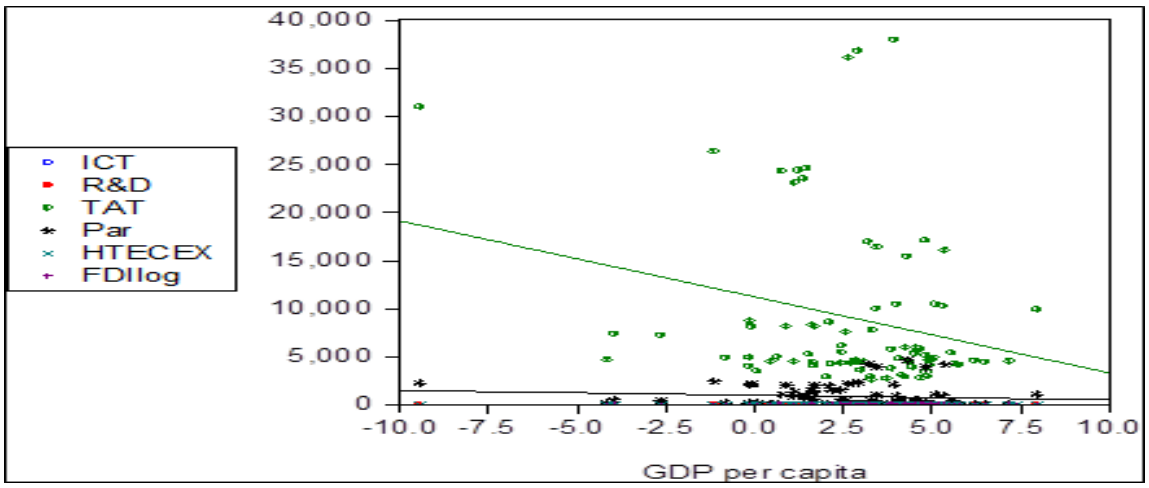
Table №1 shows the impact of innovation economy variables on economic growth, where economic growth variables

Table 1: Results of the regression equation (dependent variable of GDP per capita)

Total panel (unbalanced) observations: 111				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ICT	0.07	0.14	0.48	0.63
R_D	-0.85	0.47	-1.81	0.07
TAT	0.00	0.00	-0.68	0.50
PAR	0.00	0.00	0.73	0.47
HTECEX	0.03	0.11	0.25	0.80
FDILOG	-0.66	0.51	-1.28	0.20
C	9.35	4.55	2.05	0.04
R-squared	0.11	Mean dependent var		2.89
Adjusted R-squared	0.05	S.D. dependent var		2.56
S.E. of regression	2.49	Akaike info criterion		4.72
Sum squared resid	642.35	Schwarz criterion		4.89
Log likelihood	-254.94	Hannan-Quinn criter.		4.79
F-statistic	2.05	Durbin-Watson stat		1.18
Prob(F-statistic)	0.06			

Source: World Bank www.worldbank.org/, calculated via STATA (28.02.2021).

Figure 1 Results of the regression equation (dependent variable of GNP per capita)



Source: The author's calculations via the software package - STATA (28.02.2021)

Table 2: The Results of the Regression Equation (dependent variable per capita GDP)

Variables	Coefficient	Std. Error	t-Statistic	Prob.
PAR	-0.0004	0.000217	-1.82539	0.0703
C	3.101641	0.315109	9.843086	0
R-squared	0.025764	Mean dependent var		2.736684

Source: The author's calculations via the software package - STATA (28.02.2021)

are per capita of GDP, and innovation variables are: export of information and communication technologies, research and development, trademark patent application (resident), high-tech exports, FDI (foreign direct investments) - the volume (logarithmic). As shown from the table, R2 is equal to 0.11, which means that the independent variables explain the dependent variable by 11%.

Figure 1 proves that exports of information and communication technologies positively impact economic growth, although this variable is not statistically significant. The other variables that also have positive, albeit little impact on economic growth, are trademark, patent application (resident), high-tech exports, foreign direct investments. In contrast, research and development have a negative impact on economic growth.

Table 2 shows the impact of patent applications on economic growth. To be precise, the application for patents has a small but negative impact on economic growth. R2 is 0.026, which means that the independent variables explain the dependent variable by about 3%.

Table 3 shows that the number of trademark applications does not affect economic growth. To be precise, the application for patents has a small but negative impact on economic growth. This variable is statistically significant. R2 - is 0.06. This means that the independent variables explain the dependent variable by about 6%.

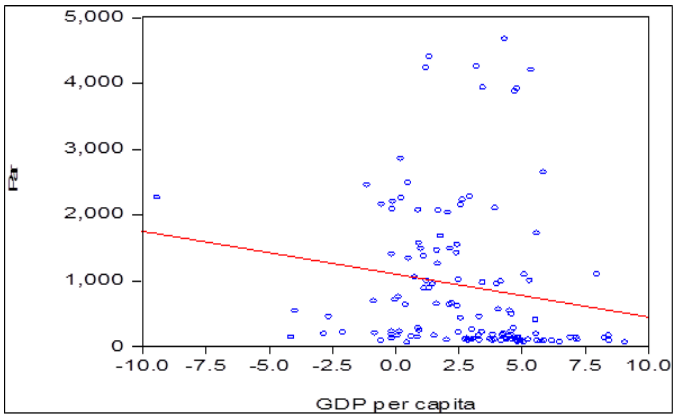
Figure 3 shows the result of a regression equation where the number of trademark applications does not affect economic growth.

Table 4. shows the impact of exports of high-tech goods on economic growth. As can be seen from the table, exports of high-tech goods are in negative correlation with economic growth. However, this variable is not statistically significant. R2 is 0.01. This means that the independent variables explain the dependent variable by about 1%.

Table 5 shows that exports of information and communication technologies have an impact on economic growth. As can be seen from the table, this variable has a positive impact on economic growth. However, this variable is not statistically significant. R2 is 0.006. This means that the independent variables explain the dependent variable by about 0.06%.

Table 6 shows the impact of research and development on economic growth. As shown by the table, this variable is negatively correlated with economic growth, and this variable is statistically significant. R2 is equal to 0.06. This means

Figure 2. The results of the regression equation (dependent variable per capita GDP)



Source: The author's calculations via the software package - STATA (28.02.2021)

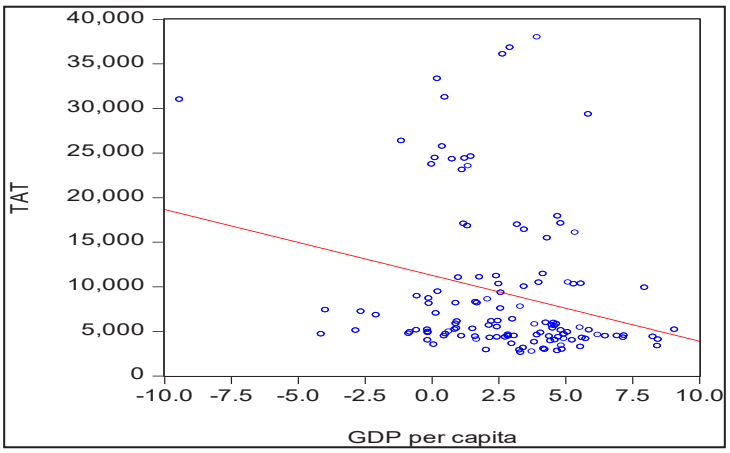
Figure 2 shows the result of the impact of patent application on economic growth.

Table 3. The results of the regression equation (dependent variable per capita GDP)

Sample (adjusted): 2011 2018				
Periods included: 8				
Cross-sections included: 16				
Total panel (balanced) observations: 128				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TAT	-8.41	2.91	-2.887537	0.0046
C	3.515308	0.360306	9.756444	0
R-squared	0.062066			

Source: The author's calculations via the software package - STATA (28.02.2021)

Figure 3. The results of the regression equation (dependent variable per capita GDP)



Source: The author's calculations via the software package - STATA (28.02.2021)

Table 4. The results of the regression equation (dependent variable per capita GDP)

Dependent Variable: GNP_PER_CAPITA				
Method: Panel Least Squares				
Date: 02/06/21 Time: 15:28				
Sample: 2011 2019				
Periods included: 9				
Cross-sections included: 16				
Total panel (unbalanced) observations: 143				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
HTECEX	-0.04	0.05	-0.89	0.38
C	3.24	0.51	6.36	0.00
R-squared	0.01			

Source: The author's calculations via the software package - STATA (28.02.2021)

Table 5. Results of the regression equation (dependent variable GDP per capita)

Dependent Variable: GDP_PER_CAPITA				
Method: Panel Least Squares				
Date: 02/06/21 Time: 15:07				
Sample (adjusted): 2011 2018				
Periods included: 8				
Cross-sections included: 16				
Total panel (unbalanced) observations: 127				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ICT	0.057257	0.065139	0.878992	0.3811
C	2.569808	0.331439	7.753495	0
R-squared	0.006143			

Source: The author's calculations via the software package - STATA (28.02.2021)

Table 6. Results of the regression equation (dependent variable GDP per capita)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R_D	-0.74	0.26	-2.89	0.00
C	3.43	0.36	9.61	0.00
R-squared	0.06			

Source: The author's calculations via the software package - STATA (28.02.2021)

Correlation – the Results

	GDP_PER_CAPITA	FDILOG	HTECEX	ICT	ICT01	IDANR	IDAR	PANR	PAR	R_D	TADNR	TADR	TAT
GDP_PER_CAPITA	1.00												
FDILOG	-0.21	1.00											
HTECEX	-0.06	0.27	1.00										
ICT	0.01	0.35	0.84	1.00									
ICT01	0.00	0.43	0.89	0.91	1.00								
IDANR	-0.17	0.28	-0.05	-0.08	-0.13	1.00							
IDAR	-0.20	0.09	-0.22	-0.31	-0.37	0.83	1.00						
PANR	-0.13	0.28	-0.13	-0.17	-0.23	0.86	0.85	1.00					
PAR	-0.26	0.52	0.11	0.00	0.05	0.75	0.58	0.73	1.00				
R_D	-0.24	0.32	0.57	0.25	0.44	0.08	-0.05	0.02	0.49	1.00			
TADNR	-0.23	0.19	-0.41	-0.35	-0.48	0.76	0.83	0.87	0.63	-0.19	1.00		
TADR	-0.05	0.40	-0.07	-0.07	-0.07	0.87	0.73	0.85	0.75	-0.01	0.73	1.00	
TAT	-0.12	0.35	-0.19	-0.18	-0.22	0.89	0.82	0.92	0.76	-0.07	0.87	0.97	1.00

Source: The author's calculations via the software package - STATA (28.02.2021)

that the independent variables explain the dependent variable by about 6%.

The table shows the correlation of innovation variables with GDP per capita. This means that the Export of Information and Communication Technologies (ICT) and Import of Information and Communication Technology Goods (ICT01) are positively correlated with GNP per capita, while High-tech Export (HTECEX), non-resident patent application (PANR), resident application (PAR), Research and Development Costs (R&D) (GNP%), Non-Resident Trademark Applications (TADNR), Resident Trademark Applications (TADR), Trademark Applications in Total (TAT), Industrial Non-Resident Design (IDAR), Industrial Design for Resident (IDARN) and foreign direct investment (FDILOG) per capita are not correlated with gross national product.

CONCLUSION AND RECOMMENDATIONS

The study results show that in the analysis of the relationship between the growth dynamics of the GDP in the given countries and the variables of innovation, in most cases, a relatively weak correlation is observed between the innovative economic factors and economic growth. However, the study's result is not an axiom and does not set to prove that a similar result could be obtained for all countries or regions. Maybe, for Eastern countries, there will be no correlation between the factors of the innovation economy and economic growth, and it may appear to be provoked by other determinants. We should also note the empirical studies, based on which there is a positive relation between innovation variables and economic growth, as evidenced by companies' constant aspiration to increase competitiveness in the process of globalization. It is based on these processes that we can conclude that technological progress is important for the company. In this case, the country's role can be achieved by promoting research and development, as well as prioritizing commercialization issues.

Based on the conducted research, we consider that the state should take the following measures:

- Institutional changes to improve the innovative and technological ecosystem, based on which technological projects will be commercialized, as well as promoting the attraction of investment in technological fields.

- Government support for R&D subsidies and tax incentives in the private sector.
- Financial support for the development of knowledge-based industries and services.

Based on the conducted research, we can conclude that in the Eastern Partnership and EU countries, when the government stimulates the growth of the innovation economy, it can accelerate presenting the country's competitive advantage, which will ultimately help accelerate the country's economic growth, attract high-tech investment, and encourage using expenses on research and development, and will ultimately positively reflect on the overall economic development of the country.

REFERENCES:

Abesadze, R., (2014). Innovations - a key factor in economic development. The Collection of the International Scientific-Practical Conference Materials, Current Problems in the Economics and Development of Economic Science, *Tbilisi, TSU, Publishing House of Paata Gugushvili Institute of Economics.*

Bedianishvili, G., (2017). Formation of Knowledge Economy and Innovative Entrepreneurship Policy: Institutional Aspects. *Scientific-Practical Journal - Globalization and Business*:10-17.

Charles I. Jones Paul Romer: Ideas, Nonrivalry, and Endogenous Growth. https://web.stanford.edu/~chadj/RomerNobel.pdf

Chikava, L., (2006). Innovation economy.

Danelia, S., (2020) The Importance of Knowledge-Based Economy Index in Georgia. *Journal of Economics.*

Allen, D. W. E., & Potts, J. (2016). How innovation commons contribute to discovering and developing new technologies. *International Journal of the Commons*, *10*(2), 1035–1054. DOI: http://doi.org/10.18352/ijc.644

Korres, G. M., & Stylianos Drakopoulos, S. (2009). Economics of Innovation: A Review in Theory and Models. *European Research Studies*, Vol. XII (3): 25-38. https://www.ersj.eu/repec/ers/papers/09_3_p3.pdf

European Economic

https://ec.europa.eu/economy_finance/publications/economic_paper/2013/pdf/ecp482_en.pdf

Innovation and Long Cycles of Economic Development - Professor Christopher Freeman - http://www.globelicsacademy.org/pdf/JoseCassiolato_2.pdf

Innovation economy: The Economic Doctrine for the 21st Century https://itif.org/innovation-economics-economic-doctrine-21st-century

Schumpeter, J. A. (1911). The theory of economic development. https://books.google.ge/books/about/The_Theory_of_Economic_Development.html?id=7p9fwYiDR20C&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false

Bakhtadze, L. and Danelia, S., (2019). The Major Determinants of Innovative Environment Formation in Georgia. Economic Alternatives, *University of National and World Economy, Sofia, Bulgaria*, issue 2:243-249, June.

OECD Economic Studies No. 33, 2001/II Growth Effects Of Education And Social Capital In The Oecd Countries. http://www.oecd.org/economy/growth/18452154.pdf

Papava, V., (2018). Downward and backward growth - the experience of EU post-communist countries and Georgia.

Papava, V., (2019) High-tech in the post-communist countries of the European Union.

Porter, M., Bjnd G., (1999). Innovative Capacity and Prosperity the Next Competitivenes Challenge in the Glabal Competition Venes Report. N.Y.:12;

Shengelia, T., (2012). Modernization and the society. Tbilisi, Universal. P. 236.

Silagadze, A., (2013). Modern Economic Aspects of Georgia. *Business-Injectioning. №4. "GTU". Tbilisi.*

The Schumpeterian Growth Paradigm https://www.brown.edu/Departments/Economics/Faculty/Peter_Howitt/publication/Schumpeterian_Paradigm.pdf

Uppenberg, K., (2009). Innovation and economic growth. https://www.econstor.eu/bitstream/10419/44901/1/61877890X.pdf