ECONOMIC LOSS OF ARTSAKH DUE TO BLOCKADE

EVALUATION REPORT

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INTRODUCTION

Artsakh has been under siege since December 12, 2022. The only "Road of Life" connecting Artsakh with the external world and feeding its economy has been closed by self-proclaimed Azerbaijani "eco-activists." It is absolutely unrealistic that these "eco-activists" from Azerbaijan, a country which lags significantly behind Armenia in ranking by international institutions on freedom of speech and environmental issues, are worried about the environmental problems of Artsakh, which follows the environmental regulations and norms of Armenia and is home to a society living according to democratic values.

Moreover, in 2017, Azerbaijan became the first country in the history of the **"Extractive Industry Transparency Initiative"** (EITI), an international organization in the mining sector, to have its status suspended, on the basis of Azerbaijan's crackdowns on civil society groups, restrictive laws, and failure to implement corrective actions.[1] These same problems, severe restrictions imposed on civil society, persist in Azerbaijan today, as evidenced by assessments from other bodies.[2] From the environmental protection standpoint, Azerbaijan's regulations lag remarkably behind Armenia's (and therefore also Artsakh's); in the Environmental Performance Index (EPI), Azerbaijan ranks 104th, whereas Armenia ranks 56th.[3]

Unlike Azerbaijan, Armenia was among 9 EITI member countries that received the highest rating for not only meeting the international standard in mining, but also exceeding the requirements. In addition, Armenia received a special award from the EITI Chairmanship.

At the time of the writing of this document, Artsakh's "Road of Life" is still closed, which has resulted in both economic as well as social costs for Artsakh. It is obvious that the closure of the "Road of Life" paralyzes Artsakh's economy, depriving it of the supply of essential resources and turning it into a classic autarky. Since Artsakh's economy is small, it does not have economies of scale and is not self-sufficient: each additional day of the blockade deepens the economic costs and intensifies social tension through the multiplier effect.

This document has been prepared at the request of the Government of Artsakh. An attempt has been made to estimate the economic losses of Artsakh due to the blockade. In order to produce the most accurate possible assessment of the problem, the team of economists has made its assessments using several methods, applying various toolsets (econometric and statistical assessment methods, methods of analyzing enterprise data and macroeconomic data correlation method, expert judgements based directly on GDP structure trends and fundamentals data) in order to further ensure the integrity of the results. Moreover, the estimated economic costs were broken down to a daily level of analysis, because it is not clear how long Azerbaijan's humanitarian crisis-creating actions will last or whether or not they will be repeated in the future. Apart from the assessment of economic costs, an attempt was made to also assess the burden of additional social costs, which will inevitably arise as a result of the collapse of economic structures due to unemployment and individuals' loss of income. In addition to this, the budgetary impact was also assessed, because, on the one hand, the budget will be deprived of taxes, which will lead to the inevitable failure to meet certain budgetary expenditures if the volume of financial allocations from Armenia remains unchanged, and on the other hand, the demand for expenditures will increase due to the need to mitigate the damages caused or withstand similar shocks in the future.

The results show that the total financial and economic losses of Artsakh due to the blockade (including tax cuts and additional primary minimum social spending) amount to **at least AMD 651 million (USD 1.6 million) per**

[1] Reference: https://eiti.org/countries/azerbaijan?fbclid=IwAR3QocQYX8ud_VHX2OsmPGqBAweAyws0lqpYMqHUBdP_QoXpxqlIsWzd1rw

[2] In the USAID, Civil Society Organizations Sustainability Index (CSOSI), legal and financial viability were assessed hindered by 6.3 points (2021).
Reference: https://storage.googleapis.com/cso-si-dashboard.appspot.com/Reports/CSOSI-Azerbaijan-2021.pdf?fbclid=IwAR1s5qD8gUm5KtPXjoRhX7pyKz0GXCU475FsvF4m_ENUH478DGqQ_SHIh9c

[3] Reference: https://epi.yale.edu/epi-results/2022/country/aze

day[4]. At the same time, it should be taken into account that the assessment of financial and economic costs or losses includes all types of costs, including loss in society's consumption (welfare) (part of these costs is not GDP, but society's consumption)[5]. If we apply this figure to the entire period of the blockade, which already exceeds 2 months, we will see that **Artsakh has already suffered economic damage in the amount of AMD 52 billion (USD 132 million)** [6]. It should be noted that as a result of the total closure of the economy and suspension of the operation of enterprises, **at least 16.2 thousand people will become unemployed** (mean value for 4 methods). F inancial compensation, in the amount of AMD 68,000, necessary to maintain a minimum standard of living for these individuals is covered in the calculations above as an additional financial burden on the state. [7] The daily financial burden is estimated at about **AMD 36 million (USD 92 thousand)**, and for the entire period of the blockade (calculated for 80 days), about AMD 2.9 billion (**USD 7.4 million**).

It should also be taken into account that as long as an individual was employed and received a salary that was several times higher than the unemployment benefit in the amount of AMD 68,000, then there has also been a **loss of social welfare**[8]. Thus, taking into account the loss of social welfare as well, the daily socio-economic losses of Artsakh are estimated at about **AMD 752 million (USD 1.9 million)** , whereas the cumulative losses from the day of the road closure till today amount to **about AMD 60.1 billion (USD 152 million)**.

Halting the main components of the economic system as a result of the blockade also means fewer **taxes and subsequent budget loss**, which will inevitably lead to the forced non-fulfillment of some expenditures if the volume of budget financing from Armenia remains unchanged. The loss of taxes is estimated at around **AMD 81 million (USD 205 thousand)** per day, and around **AMD 6.5 billion (USD 16.4 million)** for the entire period of the blockade (estimated to be 80 days).

The work completed and the above figures do not include two factors that are also important to mention, since taking them into account will further exacerbate the \ generated costs. More in-depth assessments of the latter will be conducted in the future.

1. **Depreciation (deterioration) of factors of production as a result of non-fulfillment of required expenditures.**

In economics, if two factors of production — i.e., human and physical capital — fail to receive the necessary maintenance , they begin to wear out faster, resulting in loss of ability to generate GDP in the future (loss of GDP potential). For instance, if an individual fails to consume food with the necessary amount of calories and / or does not receive medical care, he/she becomes exhausted, which affects his/her labor efficiency. Similarly, without sustaining the necessary maintenance for industrial infrastructure, a machine, equipment, or road fails and will require much greater capital investment in the future to restore what was lost. In other words, there is a decrease in the reserves of human and physical capital in the economy.

[4] The index is the weighted mean value of the scores obtained through 4 different methods. It should also be noted that this indicator includes the actual and potential losses (what Artsakh would have tomorrow if there was no halt of economic life today (missed benefit) and what Artsakh will inevitably have tomorrow due to being under today's blockade (residual loss)). For example, by the end of December, the number of actual unemployed people is not so large, because according to the requirements of the Labor Code, they can only be released from their jobs with a 2-month advance notice from the employer. Until then, people are considered formally employed (they are considered employed, but they are either on involuntary unemployment or vacation), but they are not actually working.

[5] For example, when a person receives a pension, which is then used to purchase imported goods and services, both flows are not GDP, but public consumption.

[6] Calculated for 80 days and AMD 68,000 per unemployed individual by calculating unemployment benefits. At the same time, the concept of "economic damage" includes all types of financial and economic losses, including non-fulfillment of expenses due to a reduction in budget taxes and the burden of additional social compensation.

[7] Moreover, Artsakh does not have its own means to cover this financial burden, and ceteris paribus , this will lead to additional debt for Artsakh and further deepening of the debt burden.

[8] The loss of social welfare, when a person is able to purchase additional goods and services, some of which are imported, for himself and his family members thanks to high income . The 2022 average wage index, i.e., AMD 255. 8 thousand, of Artsakh was used for the calculations.

*This part is still missing in the performed exercise; thus, it can be definitively stated that the daily prolongation of the blockade leads to additional **rehabilitation costs** for the economy of Artsakh in the future, which will result in substantial increases in the estimates provided above.*

2. **Creating buffers to avoid similar shocks in the future.** The experience of Artsakh throughout the last two years demonstrates that Azerbaijan regularly encroaches on the economic life of Artsakh by blocking gas, electricity, telecommunications, and, most recently, the road that is its lifeline . This will most likely continue episodically in the future as long as the Artsakh issue is under discussion. Therefore, at this time, it is necessary to form buffers, which in similar circumstances will minimize the social and economic costs to Artsakh's society. The focus of such expenditures can be the creation of additional alternative sources of energy, the creation of essential food reserves/supplies and necessary warehouses for their storage, the creation of fuel supplies and new infrastructure for their storage, the creation of essential medical supplies and warehouses necessary for their safe storage, etc.

It is obvious that the latter will require substantial financial expenditures, which may even reach hundreds of millions of dollars, but at the moment, they are neither estimated nor included in the indicators above.

In the next sections, the document is structured with the following logic: Section 1 presents the economic snapshot of Artsakh, its dynamics. Section 2 presents a brief description of loss estimation methods, which will allow the reader to get a general idea of what has been done to get the final estimates. The following Sub-Sections 2.1 to 2.4 detail the logic and approaches of each method, the numerical database used, and interpretations of the evaluation results. Sub-Section 2.5 presents the summary of the assessments made by all 4 methods and the received mean value. Sections 3 and 4 present estimates of additional social and budgetary losses, and Section 5 summarizes the final results of the work done. .

1. Economy of Artsakh

This section briefly presents the main economic indicators characterizing the economy of Artsakh and their dynamics over the last few years, from which the reader may gain a general understanding of the economic structure, developments, and current state of Artsakh.

In the pre-war period, the economy of the Republic of Artsakh developed at a fairly high pace, but as a result of the war, the economy experienced a decline for two years in a row. From 2015-2019, during the pre-war period, the economy of Artsakh had an average annual double-digit economic growth of around 11.2%. Moreover, from 2017-2019, economic growth was even higher, averaging 12.6% per year. This is primarily explained by the small size of Artsakh's economy. Basically, the economy of Artsakh is highly integrated with the economy of Armenia, and the economic growth of Armenia resonates deeper in the economy of Artsakh.[9] However, starting in 2020, bearing the disastrous consequences of the war, the economy of Artsakh experienced a decline for two years in a row. The rate of decline was 17.6% on average per year.

The biggest contribution to the decline of Artsakh's economy was made by the industrial and agricultural sectors, supplying 13.0 percentage points of the 17.6% decline index. From 2020-2021, 9.5 percentage points of the 17.6% average decline were due to the fall of the industrial sector, and 3.5 percentage points to the agricultural sector, which are mainly explained by the loss of Artsakh's economic territories and GDP potential. As a result of the hostilities, livestock units were reduced by about 50% and around 75% of arable land, 85% of pastures, about 90% of irrigated areas, and a significant part of orchards were left outside the control of the Republic of Artsakh. These dynamics also led to the decline of the service sector, which accounted for 5.3 percentage points in the 17.6% average annual decline of GDP. The only sector that has had a positive contribution is construction, due to government programs launched in 2021 to ensure housing for displaced people.

During **2022, the economy of Artsakh began to recover.** A significant high economic growth of 18.2% was recorded in January-September 2022. For nine months, the GDP amounted to AMD 199.6 billion (or USD 445.2 million).[10] However, the high growth rate was undermined by the blockade at the end of the year, as reflected in the 2022 index of economic activity (IEA). Thus, in December, the IEA decreased by 6%, while in October and November, the IEA growth rates remained high, comparable to the growth of the previous 9 months and amounting to 27.7% and 13.8%, respectively. Under these conditions, the annual GDP index , according to preliminary estimates, is about AMD 293.1 billion. [11]

Starting in 2022, the branches that had declined in the previous two years started to recover quickly in light of the relative stability prevailing in Artsakh[12]. In January-September 2022, there was a significant increase in the volume of industrial output amounting to 46.4% , at the expense of the growth of "Mining industry and operation of open pits" (96.2% real growth) and "Supply of electricity, gas, steam and good quality air" (16.7% real growth). The agricultural sector also recovered significantly . From January-September 2022, the gross agricultural product amounted to AMD 29.5 billion (USD 65.8 million), which increased by 18.8% year-on-year due to the real growth recorded in the fields of crop and livestock breeding (34.3 and 13.0% , respectively). As for the construction industry, compared to its high base in 2021, it still registered growth

[9] The economic developments of Artsakh and the RoA share a symbiotic dynamic : positive growth in the RoA leads to greater growth indicators in the economy of Artsakh, and vice versa. In order n ot to burden the document, we do not additionally present the macroeconomic indicators describing these developments.

[10] The indicators in USD, presented in this and subsequent texts, have been obtained using the average AMD/USD exchange rate of the Central Bank of Armenia for the relevant period.

[11] When preparing the material, there were no indicators for the GDP of Artsakh. T herefore, the annual estimate of GDP was derived by taking into account the GDP growth indicators of the previous 9 months and the GDP growth of the next 3 months (October-December).

[12] This refers to the conditions during the blockade and the relative absence of hostilities.

totaling 7.1% during the first 9 months of 2022 , and the volume of construction totaled about AMD 46.5 billion (USD 103.7 million).

Despite the high integration of the economy of Artsakh with the RoA economy, the former is nevertheless substantially different from a structural point of view. For example, the weight of services in the general economy of Artsakh is almost half that of Armenia (the average for 2019-2022 was 19.9% in Artsakh and 40.1% in Armenia). Instead, the weight of the public sector in the GDP of Artsakh is about 4 times greater than the same index for the RoA economy (from 2019-2022, the average in Artsakh was 24.1% and 5.6% in Armenia), which on one hand provides small fluctuations of the GDP indicator to exogenous shocks (in conditions of economic standstill, civil servants do not immediately leave the workplace), and on the other hand significantly burdens the budget[13]. As for the sectors concerning material production (industry, agriculture, construction), here the structure of Armenia's economy is inferior to Artsakh's. Consequently, the stop of economic life in Artsakh (due to Azerbaijan's artificial impediments[14]) leads to a greater negative fluctuation of the GDP (from 2019 - 2022, the average weight of the aforementioned sectors in Artsakh was 46.6% and 37.1% in Armenia).

[13] In Artsakh, education and healthcare are completely publicly funded, as opposed to Armenia. T hus, the public sector is larger in Artsakh. However, it is difficult to extract the indicators of public and private companies from the added values of the healthcare and education sectors in Armenia, and for comparability reasons, comparative indicators of the public sector have been taken.

[14] This refers to the situation when Azerbaijan cuts off the gas supply to Artsakh, closes the road, etc.

Table 1. GDP of the Republic of Artsakh, its structure and economic growth, 2019-2021

	GDP -by current prices, AMD bln				*GDP -Structure, %*				*Tempo of real growth, %*				Contribution to GDP surplus	
	2019	2020	2021	2022*	2019	2020	2021	2022*	2019	2020	2021	2022*	2020	2021
GDP, including:	**342**	**271**	**249**	**309**	**100**	**100**	**100**	**100**	***110.3***	***77.6***	***87.3***	***114.1***	**-22.4**	**-12.7**
Agriculture, forestry, and fishing	32.3	25.5	13.7	19.1	9.4	9.4	5.5	6.2	*96.4*	*77.4*	*48.7*		-2.1	-4.8
Mining industry and open pit operation	46.9	36.5	29.4	45.1	13.7	13.5	11.8	14.6	*96.2*	*77.0*	*50.3*		-9.2	-9.8
Manufacturing	28.5	10.6	10.1	8.9	8.3	3.9	4.1	2.9	*195.1*	*37.3*	*92.7*			
Supply of electricity, gas, steam, and good quality air	26.8	24.3	16.6	20.2	7.8	9.0	6.7	6.5	*114.1*	*90.2*	*68.6*			
Water supply, sewage, waste management, and recycling	0.4	0.4	0.6	0.6	0.1	0.2	0.2	0.2	*85.3*	*98.3*	*94.6*			
Construction	36.6	28.3	41.9	44.4	10.7	10.4	16.8	14.4	*123.2*	*77.2*	*149.9*		-2.4	5.2
Wholesale and retail trade, car and motorcycle repair	2.3	1.5	6.4	9.7	0.7	0.6	2.5	3.1	*109.0*	*66.1*	*77.4*		-6.4	-4.2
Organizing of accommodation and catering	1.2	2.7	4.4	4.3	0.3	1.0	1.8	1.4	*140.8*	*227.1*	*89.8*			
Information and contact	8.0	6.3	5.9	5.4	2.3	2.3	2.4	1.7	*113.0*	*78.1*	*106.2*			
Financial and insurance activities	31.1	29.8	26.9	33.0	9.1	11.0	10.8	10.7	*117.0*	*95.4*	*90.5*			
Public administration and defense, mandatory social insurance	79.8	70.0	61.6	69.8	23.3	25.8	24.7	22.6	*114.5*	*85.2*	*87.8*			
Education	17.7	15.9	15.7	15.4	5.2	5.9	6.3	5.0	*100.2*	*80.6*	*98.4*			
Health and social services to the population	12.0	10.1	11.0	12.1	3.5	3.7	4.4	3.9	*100.1*	*83.2*	*109.3*			
Culture, entertainment, and leisure	3.7	3.6	3.2	4.1	1.1	1.3	1.3	1.3	*100.7*	*96.9*	*86.7*			
Other branches	9.9	6.4	9.2	11.4	2.9	2.4	3.7	3.7	*106.3*	*82.2*	*97.4*			
Taxes on products (minus subsidies)	16.2	11.6	10.2	19.1	4.7	4.3	4.1	6.2	*69.2*	*58.5*	*78.9*		-1.9	-0.9
Value added (gross, at basic prices)	326.3	259.3	239.1	289.5	95.3	95.7	95.9	93.8	*113.0*	*78.5*	*87.6*		-20.5	-11.9
FISIM	-11.0	-12.6	-7.7	-5.1	-3.2	-4.6	-3.1	-1.6	*87.4*	*113.9*	*60.9*		-0.4	1.8

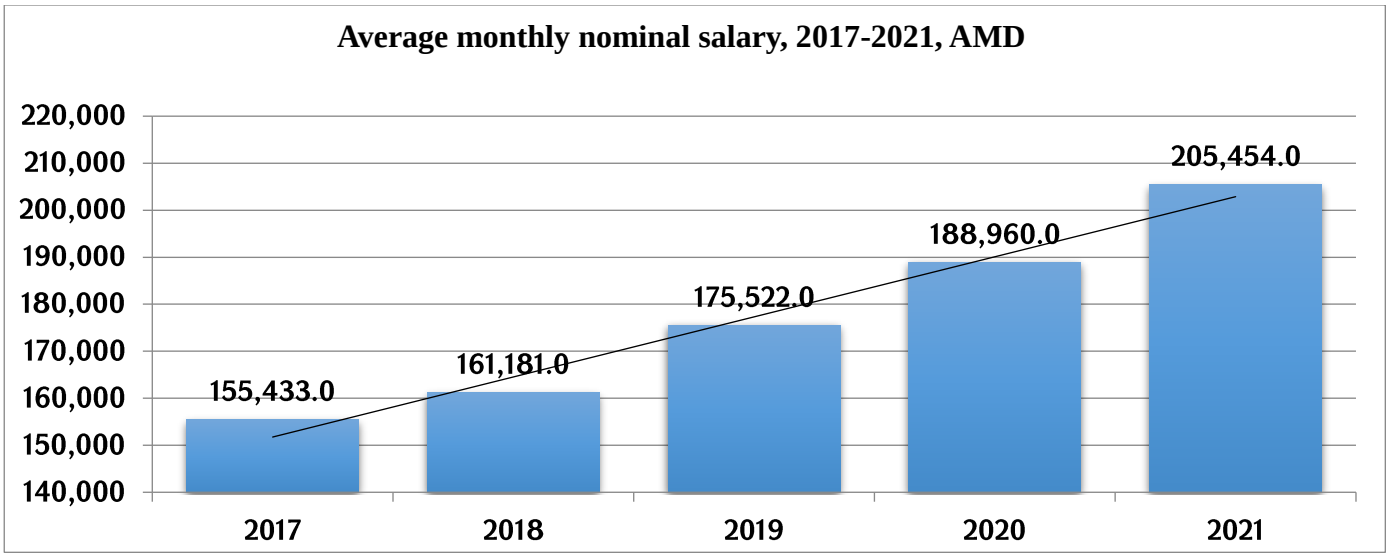
*** The indicator is an estimate.**

Labor Market

In post-war Artsakh, both the number and the weight of the economically active population in the total population decreased significantly, and the unemployment rate increased in 2021 vis-à-vis 2019. In 2021, the economically active population of Artsakh totaled 43.9 thousand, which is less than the same indicator in 2019 and 2020 by 28 thousand and 24.1 thousand, respectively. The weight of the economically active population in the total population in 2021 totaled 44.9% versus 52.3% in 2020, recording a drop of 7.4 percentage points. This points to the fact that after the war, it was mostly the employable population that left the country. At the same time, the unemployment rate increased, totaling 14.1% in 2021 versus 17.1% in 2020.

Most of those employed in 2021 were in the public sector (including the education and healthcare sectors, around 22.2 thousand people). Those employed in the public sector made up around 60% of the total employed but provided 35.4% of the GDP, which points to the low productivity of the post-war economy of Artsakh. The next largest sectors in terms of employment numbers are trade and services, where the number of employed is 4.5 thousand people, whereas industry employs around 4.3 thousand people.

Graph 1. Dynamics of average wages in the Republic of Artsakh



From 2017-2021, an average annual salary increase of 6.2% was recorded in the republic. Moreover, the salaries increased even during the recession years, which was partly due to the fact that employers created additional incentives to keep their employees in Artsakh. According to the results of the January-September 2022 period, the average monthly nominal salary totaled AMD 255,836.0.

External Sector

During the post-war period, the geographical structure of Artsakh's foreign trade significantly deteriorated.

In particular, the results from 2021 report that the Republic of Artsakh carried out foreign trade with 13 countries, versus 24 in the pre-war period .

In 2021, the foreign trade of the Republic of Artsakh decreased by 14.6% compared to the previous year. I mports decreased by 8.0% , amounting to USD 258.4 million, and exports by 28.1% , amounting to USD 98.5 million. In 2021, 98.7% of the foreign trade was with the Republic of Armenia, 0.7% with the Russian Federation and 0.6% with other countries.

From January-September 2022, the export volume totaled USD 170.5 million, increasing 3 times year-on-year. The volume of imports increased by 72.1% from January-September 2022 and amounted to USD 318.9 million. The high tempo of import and export indicators also points to the rapid recovery of the Artsakh economy in light of post-war declines.

2. Economic Losses Estimation and Estimation Methods

This section provides a detailed description of 4 methods for estimating socio-economic losses caused by Azerbaijan's blockade of Artsakh. As emphasized in the introduction, the application of various methods and tools to estimate the accrued costs aims at strengthening the reliability of the estimation. Moreover, the estimates obtained through the 4 methods were quite similar; hence their mean value will be presented below.

2.1. Economic Loss Estimation Method I (Estimating monthly GDP gap)

Description of the selected method and the database used

The quarterly GDP, as well as the monthly economic activity index (EAI) published by the National Statistical Service of the Republic of Artsakh, were used as numerical data for this estimation method.

To assess the economic loss suffered by Artsakh due to the blockade, we first estimated the country's potential GDP for 2022, which would have been achieved if not for the blockade (GDP is estimated based on trends, without taking into account the impact of the shock). The difference between the latter and the actual 2022 GDP figure was then calculated, representing the loss caused by the blockade (GDP gap estimate). Since the Q4 actual GDP indicators for Artsakh were not available at the time of preparing this document but the actual monthly indicators for economic activity[15] were, the first step was to estimate the actual GDP for Q4. The actual EAIs of Armenia were also used for this, as well as the monthly seasonality coefficients calculated for the monthly EAI. Since the economies of Armenia and Artsakh are fully integrated and in the same cycle (the correlation coefficient of economic growth (EAI) is 0.95), by applying the EAI monthly seasonality coefficients of Armenia to the actual monthly growth of Artsakh, we derived the quarterly EAIs. Next, taking the acceleration of Q3 and Q4 EAIs, as well as applying the EAI/economic growth mean coefficient, the estimated GDP growth index (discrete) for Q4 for Artsakh was calculated. The latter was also adjusted by price variable, and with the estimated nominal GDP growth index for Q4, we calculated the actual nominal GDP for Q4, which totals AMD 93.5 billion (whereas the actual estimated annual GDP totals AMD 293.1 billion).

In the second phase, it was necessary to assess the potential level of GDP in Q4, which would have been achieved if the trends of previous quarters had been preserved and there had been no blockade of the Artsakh economy in December. For this, the economic trends of Armenia were taken for approximation purposes[16], i.e., the growth dynamics of economic activity in Q3 and Q4. This dynamic was also extended to Artsakh's EAIs: for December 2022, instead of taking the actual contraction rate (-20.7% in compared to December 2021), we used the growth rate of 12.5% without shock, calculated using a new approximation. Then, we followed the same steps as in the first phase to derive the estimated Q4 GDP without shock. In the end, the difference between these two GDPs for Q4 is the GDP gap itself, or the amount of GDP that Artsakh lost as a result of the blockade in December. We divided the resulting nominal value by the number of days of blockade in December (December 12 to 31) to obtain the **primary loss of GDP per day**.

We should also note the economic theory which states that such economic losses also generate a loss of opportunities to create new value in the future. To be clear, if the roof of a house is damaged due to strong

[15] The EAI for December is exclusive of the shock.

[16] Here, we shall take into account that the integration of the economies of Armenia and Artsakh means that the economy of Armenia was also damaged due to the blockade of Artsakh. Therefore, if we use the trends in the RoA economy over the last 3 months of the year for approximation purposes, then it can be confidently asserted that the economy of Artsakh would have grown at the lowest approximate rates in December if it had followed the trends of the RoA economy.

winds, and the landlord leases out this house and benefits from the rent, then the landlord's loss is not only the cost of repairing the roof, but also the fact that he did not receive the amount payable during the entire repair period, i.e., he missed his profit. Thus, an attempt has also been made to estimate the missed profit or the multiplier effect of harm, as it is otherwise expressed in economic terms.

The annual growth of the Artsakh economy in 2023 without the impact of shock was estimated using the Holt-Winter s S moothing tool with the EViews toolset on the series of nominal growth indicators of the economy of Artsakh.[17] For 2022, a non-shock estimate was taken, i.e., the possible GDP in a no-blockade situation, and the Holt- Winter s estimate of economic growth was applied to it. As a result, the annual nominal GDP indicator was brought to the daily, which represents the **economic loss of Artsakh, taking into account the multiplier effect of the loss**.

Assessment Results

With this approach, it is estimated that the nominal GDP would have grown by 20.5% in Q4 of 2022 compared to the same quarter last year, but due to a 20.7% decline in economic activity (instead of 12.5% potential growth), the actual growth of nominal GDP in Q4 was around 8%. Therefore, it turns out that in Q4 of 2022, nominal GDP growth was lower than potential growth by 12.5 percentage points. The estimated loss in December 2022 was AMD 10.9 billion (about USD 27 million), or AMD 603 million drams (USD 1.5 million) per day (18 days of blockade). The latter is the primary effect of the estimated GDP loss, based on December indicators. When trying to take into account the multiplier effect (spread over 2023) in these estimates, we should note that December has a larger relative share in a year. Thus, when applying the seasonality coefficients, the loss for 2022 is estimated on average at AMD 447 million per day (USD 1.1 million). In addition, taking into account the 2023 estimated possible GDP growth of 12.3%, with the multiplier effect, the GDP loss is **AMD 502 million (USD 1.2 million)** per day on average.

2.2. Economic Loss Estimation Method II (Estimating GDP g ap by s ectoral s tructure)

Description of the selected method and database used

For this method, the actual sectoral GDP indicators for the first 3 quarters of 2022, published by the National Statistical Service of the Republic of Artsakh, as well as the Q4 GDP growth indicator, estimated by the previous method, were used as digital data. Since, through the first method, we already have the estimated nominal values of the GDPs for 2022 and 2023 without the impact of the shock, we computed the sector GDPs using the sectoral weights . In particular, to estimate the 2023 sectoral GDP, we used the GDP forecast derived through the first method, to which we applied the estimated 2022 sectoral structure of the economy . Then, the potential loss of each sector under the blockade environment was estimated through surveys of the companies representing each sector and based on expert judgment. For each sector, expert judgment of the possibility of carrying out activities under the conditions of the blockade was applied with a range from 0 to 1, where 0 meant that the operation of the company (companies) of the sector was completely stopped as a result of the blockade (e.g. , mining), and 1 that the operation of the given sector continued even during the blockade, e.g. , healthcare services; although this as well as other similar sectors did not stop operations, it was impossible to continue their activities at the same pace T he population's loss of income alone is sufficient to assume that the volume of output of such sectors will decrease . Moreover, in order to verify and strengthen

[17] The Holt-Winter s method allows for greater consideration of economic growth trends in recent years rather than in early years. In addition, the indicators of the war year (2020) and the following year (2021) were controlled (not taken into account) in order for the tool to give an accurate potential estimate.

these expert judgements, the turnover volumes extracted from the January 2023 reports of 453 large taxpayers of Artsakh, were also studied (the turnover consolidation of these enterprises in accordance with the NACE classification was also performed for December indicators, which is reflected in the description of method III below). The coefficients applied to each sector are presented in Table 1.

Table 2. Coefficients of expert judgment of the possibility of operation of individual sectors under blockade conditions

Sector	Possibility of maintaining the activity in 2023 (in the range 0 – 1, where 0 means the sector will stop operations completely)
Agriculture, forestry, and fishing	0.4
Mining industry and open pit operation	0
Manufacturing	0
Supply of electricity, gas, steam, and good quality air	0.3
Water supply, sewage, waste management, and recycling	0.6
Construction	0
Wholesale and retail trade; car and motorcycle repair	0.05
Transportation and warehousing	0.25
Organizing of accommodation and catering	1
Information and communication	0.8
Financial and insurance activities	0.8
Real estate activity	1
Professional, scientific, and technical activities	0.2
Administrative and support activities	0.8
Public administration and defense; mandatory social insurance	0.8
Education	0.8
Healthcare and social services of the population	0.8
Culture, entertainment, and leisure	0.1
Other maintenance services	0.5

Estimation Results

Using this method , the daily economic loss as a result of the blockade is estimated at around AMD 565 million (USD 1.4 million). In particular, the nominal GDP forecast for 2023 without the impact of the blockade is AMD 341.4billion (USD 862.3 million), while in the case of a complete shutdown of certain sectors and

a partial shutdown of the rest, the GDP will decrease by around AMD 207.1 billion (USD 523.1 million) . If we divide by the number of calendar days, the daily loss will be **AMD 567 million (USD 1.4 million)**.

2.3. Economic Loss Estimation Method III (Estimating GDP gap with the transition from microdata to macrodata)

Description of the selected method and database used

In order to additionally verify the results obtained by the methods above, micro, i.e., enterprise- level data were used for Method III. Data from October-December 2022 as well as January 2023 on the turnover of 453 major enterprises have been used.

The actual loss of turnover of these 453 enterprises in December 2022 was assessed and converted into GDP loss, taking into account the ratio between the growth of the Economic Activity Index (EAI) and the growth of the turnover of the selected enterprises for October-November 2022. Drawing from the microdata of individual enterprises, a transition was first made according to the classification of types of economic activity (NACE), i.e., the turnovers of enterprises were consolidated according to the enterprise's NACE classification. Because the "public administration and defense" and "health care and social services of the population" sectors are missing, the data on these sectors was pulled from September-December 2021, taking into account the weight of these sectors in the GDP (28.5%). The data for October-December 2022 for these two sectors were computed by increasing the figure for the respective month in 2021 by their Q4 nominal growth of 18.2% .

As a result, in October 2022 , the turnover of the selected enterprises increased by about 23% year-on-year, and in November, the growth accelerated compared to the previous month, reaching 62%. However, in December, the growth rate of turnover slowed down dramatically, reaching only 18.4%. Thus, compared to October-November, the growth rate of turnover in December slowed by around 106 percentage points. Considering the correlation between the growth in economic activity and growth in turnover reported in the microdata of enterprises from October-November 2022, we estimated that the loss of EAI growth in December was around 34 percentage points. That is, ceteris paribus , if the "R oad of Life" was open in December, then the December EAI would have increased by about 9%, which is comparable to the growth registered in October-November 2022. (We would like to remind you that in October-November 2022, the EAI of Artsakh increased by about 20% on average year-on-year and decreased by 20.7% in December).

Estimation Results

As a result of the afore -mentioned estimations, the estimated GDP loss for December totaled AMD 9.5 million (USD 23.9 million). It should be noted that in December, the "R oad of L ife" was closed for 18 days, i.e., the average daily loss in December totaled AMD 526 million drams (USD 1.3 million). At the same time, taking into account the fact that December has a relatively large weight in a year, the loss for 2022 is estimated at an average of AMD 397 million (USD 1.0 million) per day. Besides, taking into account the multiplier effect of the loss and the possible GDP growth for 2023 (12.3%), the loss (including the multiplier effect) estimated using the Holt-Winters tool totals **AMD 446 million (USD 1.1 million) per day on average**.

2.4. Economic Loss Estimation Method IV (Estimating GDP gap using econometric models)

Description of the selected method and database used

To assess the possible 2023 GDP loss as a result of the blockade of Artsakh , the expert group also applied an econometric toolset, which, based on historical data and the dynamic interactions of selected indicators, allows us to estimate the expected loss of GDP at the macro level under conditions of blockade (autarky or economy without foreign trade). In particular, to estimate the possible loss of GDP (including the multiplier effect), we used a structural vector autoregressive (SVAR) [18] model , along with the annual data from 2002-2021 of both nominal GDP growth, monetary increase of export and import of Artsakh . It is obvious that in the case of a blockade, imports to and exports from Artsakh come to a complete stop, i.e., the economy turns into autarky.

The model uses the following equation :

$$BY_t = C + AY_{t-1} + e_t$$

where Y_t=[〖IM〗 t 〖,EX〗 _t, 〖GDP〗 _t] – is the vector of nominal growth of imports, exports, and GDP. A is the matrix of lag effect parameters, C is the vector of "free" parameters, B is the matrix of structural parameters specified by the Cholesky structure, and e_t is the structural errors of the model.

The comprehensive (direct and indirect) effects of exports and imports on GDP were estimated using the model (see Appendix 1).

The results of the analysis of the impulse-response functions of the model show that a 1% change in export growth leads to an 0.11% change in nominal GDP growth, and a 1% change in import growth causes a 0.34% change in nominal GDP growth. [19] So, considering that for the years 2012-2021 , the weight of exports in GDP was around 22% and the weight of imports was around 58%, using the elasticity coefficients estimated by the above model, we can obtain the multipliers of exports and imports on GDP, i.e., the projected change in GDP in AMD in the case of an AMD 1 change in export and import.

The transition from elasticity to multipliers can be done using the following formula:

[18] For a more detailed description of SVAR models, see Walter Enders, "Applied econometric time series", University of Alabama, Fourth edition, 2015, Chapter 5, pp. 313-335.

[19] It is important to note here that the effect of imports implicitly includes the effects of consumption and investment related to imports, since consumption and investment indicators are not included in the model. c onsumption and investment growth indicators were not included in the model in order to be able to estimate the indirect effects of imports that occur through imported consumption and investment. In addition, the positive multiplier of imports is also a result of the fact that imported goods of intermediate consumption and a capital nature are used in the production process and help create added value (GDP).

$$M_i = \frac{\rho_i}{w_i}, \qquad i = export, import$$

w here M_i is the multiplier of exports and imports for the GDP, ρ_i is the GDP elasticity from exports or imports, and w_i is the weight of exports or imports in the GDP.
Thus, applying this formula, the export multiplier is 0.48 and the import multiplier is 0.58.
With these estimates of the export and import multipliers, we need to get an understanding of 2023 export and import volumes to estimate the GDP loss. The historical data for average nominal increase from 2012-2019 (exports 24.7%, imports 5.9%) were used to derive the export and import volumes.

Estimation Results

Thus, ceteris paribus , if the current blockade was not in place, Artsakh's exports in 2023 would be around AMD 175.8 billion (USD 444.3 million) and imports around AMD 207.6 billion (USD 524.6 million). Assuming it will not be possible to export and import during the blockade, then applying the multipliers to **2023, the GDP loss will be AMD 561 million (USD 1.41 million) per day on average.**

2.5. Loss of GDP of Artsakh (Summary of 4 methods)

The four methods delineated above reveal quite similar and therefore reliable results regarding the economic losses of Artsakh. **Based on these results , it can be concluded that the GDP loss totals USD 1.35 million per day**.

Table 3: Loss of GDP of Artsakh (summary of 4 methods)

Method	GDP loss in 2023, mln AMD	Calculated for one calendar day, mln AMD
1. Estimating the monthly GDP gap	183.143	502
2. Estimating the GDP gap by sectoral structure	207,086	567
3. Estimating the GDP gap with the transition from microdata to macrodata	162,686	446
4. Estimating the GDP gap with econometric models	204,846	561
Average, mln AMD[20]	**195,949**	**534**
Average, mln USD	**492.4**	**1.35**

[20] Since Methods 1 and 2 are essentially based on the December loss estimate, the average of these two methods was used to calculate the total mean indicator.

3. Primary social costs arising from GDP loss (unemployment, decline in social welfare)

The economic losses described above inevitably entail social tension and social costs that Artsakh has to bear. In other words, if the life and well-being of an individual was once ensured by his employment and participation in the economic activities of Artsakh, then, after the blockade, the consequence of an individual's loss of employment and income are costs, which have to be covered by the government of Artsakh. Therefore, in order to estimate these social costs, it is first necessary to estimate how many people will become unemployed as a result of a halt in economic life and a loss of GDP.

Additional unemployment resulting from the closure of the "Road of Life" was estimated based on employment distribution and losses by individual industries/economic sectors. In particular, we sought to determine how much unemployment would arise in the case of such a loss of GDP under conditions of equal productivity. The main results were obtained based on the 2nd method's estimates of losses in individual sectors. As a result, we found out that around 17.2 thousand people will become unemployed if the "Road of Life" remains closed. Then, taking into account the amount of GDP loss computed by the other methods, the number of potentially unemployed individuals was also proportionally adjusted. **As a result, an additional 16.2 thousand unemployed people may appear, on average.**

Therefore, another burden arises for the government to provide benefits to these newly unemployed in order to meet their minimum social needs. **Thus, if AMD 68 thousand of benefit is paid per unemployed person, then around AMD 36.3 million (USD 92 thousand) of additional expenditures will burden the state budget per day.**

It should also be noted that as long as these recently unemployed individuals enjoyed greater welfare before the blockade, when they were employed, because their salaries were clearly higher than the AMD 68,000 thousand government benefit. Therefore, the blockade has also caused a loss of welfare, as the individual and his/her family are deprived of the income they previously received. Therefore, taking this reality into account, we performed additional calculations using the average salary in Artsakh for the first 9 months of 2022, which was AMD 255.8 thousand per month. We concluded that if the government of Artsakh were to fully account for and compensate the loss of welfare for unemployed persons, the daily costs would total around **AMD 136 million (USD 345 thousand).**

4. Increase in budgetary burden due to loss of GDP

During the post-war period, about 73% of the budgetary income of Artsakh is the budget loan from Armenia. The remaining 27% are tax revenues, of which 7 percentage points are taxes paid by the mining industry.

Table 4: State budget indicators of Artsakh

Indicator	Unit of Measure	2021 (actual)	2022 (forecasted)	2023 (forecasted)
State budget revenues, including:	AMD mln	175,548.3	189,554.1	185,850.0
Tax revenues (including other revenues)	AMD mln	35,182.0	45,554.1	49,850.0
Budget loan from RoA	AMD mln	140,366.3	144,000.0	136,000.0

State budget expenditures	AMD mln	224,158.5	221,035.2	215,171.4
State budget deficit	AMD mln	-48,610.2	-31,481.1	-29,321.4

As for the structure of expenditures of Artsakh's budget, it is mainly social. This is also due to objective reasons, as around 30,000 citizens of Artsakh have been left homeless in the post-war period. Therefore, the share of social expenditures in the budget expenditures has obviously increased. As a result of the loss of economic territories, the budget tension has increased even more in light of the significant decrease in budget revenues and the increase in demand for social expenses.
The structure of expenditures of the state budget of Artsakh is as follows:

Table 5: 2021-2023 state budget expenditures of Artsakh by sector

Indicator	2021 (actual, AMD mln)	2022 (forecasted, AMD mln)	2023 (forecasted, AMD mln)
State budget expenditures	224,158.5	221,035.2	215,171.4
including			
General public services (public and municipal administration, interest payments)	19,297.4	32,412.7	32,310.8
Public order, security, and judicial activity	10,370.6	20,840.5	24,645.2
Economic relations, infrastructure, agriculture	34,018.3	31,644.9	23,544.4
Environmental protection	194.1	266.7	205.3
Healthcare	8,856.6	15,500.0	13,401.2
Culture	2,598.7	3,120.3	2,983.6
Education	13,850.7	17,331.2	15,497.0
Social protection	100,583.8	57,564.2	72,939.9
Capital investments	23,948.4	34,500.0	22,000.0
Centralized funds (government's reserve fund, etc.)	10,439.9	7,854.8	7,644.0

The blockade of the Republic of Artsakh by Azerbaijan has a double effect on the state budget of Artsakh in terms of increasing the additional burden: on the one hand, due to the further decline of budget revenues in conditions of economic contraction, and on the other hand, due to the increase in demand for mandatory fulfillment of unplanned and urgent expenditures.

Enterprises in almost all the sectors of material production and the service sector of the economy of Artsakh use imported raw materials to one degree or another (at least fuel materials, since following the cut- off of gas supply, the gas-powered transport fleet also stopped). In addition, since the overhead power transmission line

from the RoA was also disrupted by Azerbaijan and domestic power generation only satisfies about half the total demand, electricity is not supplied to the production facilities. Under these conditions, only some enterprises (for example, in the financial or IT sector) or organizations in the public sector are able to continue their activities. Other organizations mainly do not conduct business and do not pay taxes.

Consequently, the limitation of the financial assistance provided by Armenia together with the reduction of budgetary inflows have forced Artsakh to revise its budget, reducing expenditures and setting new priorities, which means additional costs and loss in Artsakh's socio-economic life.

Applying the tax to GDP ratio to the GDP loss estimates derived using the four methods described above allows us to estimate the cost of taxes, which is estimated at AMD 81 million or about USD 205 thousand per day and about AMD 6.5 billion (USD 16.4 million) during the entire period of the blockade (calculated for 80 days). Using this information, it is possible to revise budget expenditures by delaying, suspending, or reducing the implementation of certain expenditures.

On the other hand, the need to solve the problems the state faces in a crisis situation forces the government of Artsakh to make many unforeseen expenditures from the state budget, such as:

- transportation and other expenditures incurred in order to provide the population with food and other basic commodities ,
- due to the lack of imported electricity and gas, costs of maintenance and restoration of the energy system, of water supply in individual settlements,
- costs of ensuring accommodation of Republic of Artsakh citizens in the RoA and of RoA citizens staying in Artsakh,
- implementation of support programs for natural and legal persons aimed at mitigating the socio-economic consequences and other costs of the blockade .

A **s mentioned in the previous section, the financial burden of providing the minimum social welfare for those unemployed as a result of the blockade alone is estimated at around AMD 36.3 million (USD 92 thousand) per day, or AMD 2.9 billion (USD 7.3 million) for the entire period of the blockade (estimated to be 80 days) . The rest of the costs are subject to further evaluation based on decision-making on the relevant measures.**

Thus, the total direct burden on the state budget of Artsakh is at least AMD 117.6 million (USD 296 thousand) per day, or 20% of the total daily budget expenditure . In this regard, the government of Artsakh has to cut down budgetary, first of all capital and current expenditures of economic nature, thereby deepening the contraction of the economy of Artsakh.

SUMMARY

The estimates of GDP loss , additional social expenditures, and loss of budgetary taxes allow for a comprehensive understanding of the socio-economic consequences of the blockade and financial losses due to the crisis. In particular, depending on the kind of social policy target that is selected (providing minimum living conditions or normal living conditions), **Artsakh's losses are estimated to be at least AMD 652-753 million (USD 1.65-1.9 million) per day. Moreover, the longer the blockade lasts, the more the mentioned indicators become optimistic estimates, because every additional day of the blockade harms the economic potential of Artsakh. T herefore, the costs of restoring the GDP potential are added to the estimated costs and their multiplier effects.**[21]

Table 2: Financial-economic losses of Artsakh

Method	Based on calculation for calendar day, AMD mln (with per capita assistance of AMD 68 thousand)	Based on calculation for calendar day, AMD mln (with per capita assistance of AMD 256 thousand)
1. Estimating the monthly GDP gap	612	706
2. Estimating the GDP gap by sectoral structure	692	798
3. Estimating the GDP gap with the transition from microdata to macrodata	544	627
4. Estimating the GDP gap with econometric models	685	790
Average, AMD mln[22]	**651**	**752**
Average, USD mln	**1.65**	**1.9**

[21] For example, if the government does not spend the necessary money on road maintenance today, tomorrow it will be forced to rehabilitate the road, that is, to restore the functioning of the damaged road.

[22] Since Methods 1 and 2 are essentially based on the December loss estimate, the average of these two methods was used to calculate the total mean indicator.

Annex. Description and results from SVAR model

Structural vector autoregressive (SVAR) model description and steps.

A structural vector autoregressive (SVAR) model was built to estimate the possible loss of GDP as a result of the blockade of Artsakh.

The SVAR model allows us to estimate the dynamic interactions between different indicators in one system simultaneously, as well as with the structural parameters, in order to estimate the effects between variables in the same period. The model also makes it possible to take into account the reasonable assumptions of theoretical provisions of economics or other necessary/reasonable assumptions.

The constructed SVAR model looks like this:

$$BY_t = C + AY_{t-1} + e_t$$

where Y_t =[〖IM〗_t 〖,EX〗_t, 〖GDP〗_t] – is the vector of nominal growth of imports, exports, and GDP at time t; A is the matrix of lag effect parameters; C is the vector of free term parameters; B is the matrix of structural parameters specified by the Cholesky structure; e_t is the structural errors/shocks of the model at time t.

The model was evaluated for 2002-2021, based on time series at annual intervals. The optimal lag length was chosen as one.

After evaluating the model, the significance of the endogenous interactions between the variables was evaluated and the non-significant interactions were neutralized. Because the model was evaluated based on 2002-2021 annual data, i.e., the time series consists of only 20 observations, zeroing out non-significant interactions reduces the number of parameters that need to be estimated and avoids the problem of small "degrees of freedom."

Following the evaluation of and quality/sustainability checks on the model, simulations were performed using impulse-response functions.

Estimated results of the model

The estimated[23] SVAR model has the following matrix:

$$\begin{pmatrix} 1 & 0 & 0 \\ -1.13^{*} & 1 & 0 \\ -0.25^{**} & -0.07^{**} & 0 \end{pmatrix} \begin{pmatrix} IM_t \\ EX_t \\ GDP_t \end{pmatrix} = \begin{pmatrix} 24.9 \\ 46.4 \\ 31.0 \end{pmatrix} + \begin{pmatrix} -0.07 & 0.82^{***} & - \\ 0.58^{***} & - & - \\ - & 0.67^{***} & \end{pmatrix} \begin{pmatrix} IM_{t-1} \\ EX_{t-1} \\ GDP_{t-1} \end{pmatrix}$$

As we can see, only 4 out of 9 possible parameters were estimated in the estimated A-matrix. The estimation of the remaining parameters was limited to increasing the degree of freedom. The results of the SVAR model in the matrix above can be presented by the following system of equations:

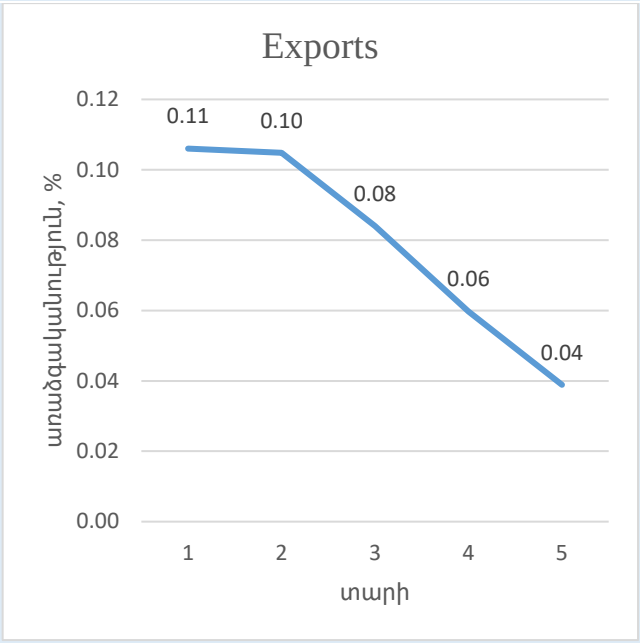
$$\begin{cases} IM_t = 24.9 + 0.07 * EX_{t-1} + 0.82 * GDP_{t-1} & (1) \\ EX_t = 46.4 + 1.13 * IM_t + 0.58 * EX_{t-1} & (2) \\ GDP_t = 31.0 + 0.25 * IM_t + 0.07 * EX_t + 0.67 * GDP_{t-1} & (3) \end{cases}$$

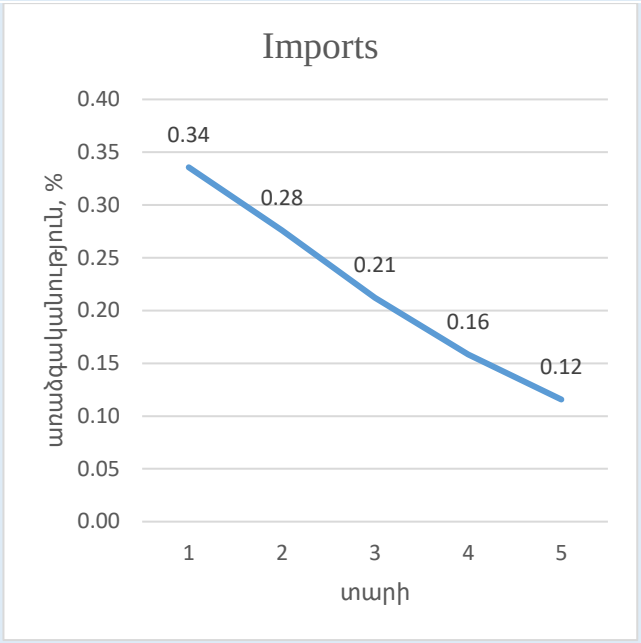
Equation 3 of the system shows that at time t " the elasticity of GDP from exports is 0.07 and from imports 0.25. However, as we can see from equations 1 and 2, the growth of exports and imports are endogenously interdependent. Therefore, in order to understand the full impact of the latter on nominal GDP growth, it is necessary to construct the impulse-response functions of the model.

Impulse-response functions of the model

[23] Note: *** - significance level (p-value) < 1%, ** - significance level (p-value) < 7%, * - significance level (p-value) < 12%.

Response of 1% shock of export and import growth on GDP growth (elasticity coefficients)





As we can see from the impulse-response functions of the model, GDP elasticity from exports is estimated at 0.11% and from imports at 0.34%.