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THE IMPACT OF GLOBAL AND REGIONAL CRISES ON THE ECONOMY OF THE REPUBLIC OF ARMENIA:QUANTITATIVE EVALUATION

This article is devoted to assessing the impact of external shocks on the economy of the Republic of Armenia (RA) in 2008-2009 (the global financial crisis), 2020 (the Covid-19 pandemic and the 44-day Artsakh war), and in 2022 (the Russian-Ukrainian

conflict) and the measurement and analysis of the consequences. The work on assessing the impact of crises and external shocks on the country's economy is of a different nature. An attempt is made to assess not only the actual consequences of shocks, but also the amount of losses/damage that manifested itself in the RA economy throughout the entire post-shock period: uncreated result, lost income.

Methods of statistical analysis, such as dynamic series indicators, averages, structural analysis, smoothing trends in series, modeling with dummy variables were used. To understand the mechanisms of the impact of external shocks, we have applied internationally recognized indicators of the distribution of GDP: the formation of GDP by sectors and the use of GDP.

As a result of the study, it has turned out that if at the beginning of the period under consideration the RA economy was more sensitive to external factors causing fluctuations in the industry sector, then recently it has already been sensitive in the service sector. It has also turned out that the wave of the crisis of 2007-2009 had serious and long-term consequences, shook the RA economy, and broke the growth potential for almost a decade. On the contrary, the geopolitical events of 2022 have already created favorable conditions for unprecedented economic growth in the RA.

Keywords: *GDP, crisis, economic shocks, early warning systems, time series approach models*

JEL: G01, Q02

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INTRODUCTION. The 21st century is characterized as a period of economic, social, geopolitical and technological changes, and, in particular, conducting research on major global and regional events with quantitative assessments has acquired particularly important significance.

Attempts to change the architecture of the current world order, recent wars, economic shocks caused by the COVID-19 pandemic, financial and economic crises and quantitative assessments of the latter are crucial for understanding the impact of major events on the RA economy.

The main goal of this article is to assess the impact of the 2008-2009 financial crisis, Covid-19 and the 44-day war in 2020, as well as the Russian-Ukrainian conflict in 2022 on the RA GDP for the subsequent period.

The research addresses two primary issues:

1. quantification the above-mentioned effects of given crises on the RA GDP,
2. characterization of the prerequisites of economic shocks in order to mitigate their consequences for the economy.

LITERATURE REVIEW. Currently, there are three widely recognized concepts of crises: the Austrian, Marxist and Keynesian perspectives (Ivanyuk, 2021):

1. ***The Austrian business cycle theory*** considers business crises (cycles) as a consequence of excessive growth of bank credit due to artificially low interest rates set by the Central Bank. The founders of the Austrian

business cycle theory are Ludwig von Mises and Friedrich Hayek (Hayek, 2014).

2. ***Marxist theory*** considers two main factors: the amount of taxes levied by the government on profits and returned to the public in order to provide social security, healthcare and education, family benefits, and, secondly, the ratio of the number of employed workers to the number of investors/business owners in society (Ivanyuk, 2021).
3. ***John Maynard Keynes*** (Keynes, 1978) developed a theory applicable to the closed economy, which was later refined by Hyman Minsky (Minsky, 2008). Notably, in 1999, Paul Krugman (Krugman, 1999) proposed a crisis model from the point of view of Keynesian theory, which is currently considered the most developed and widely accepted perspective.

At present many contemporary scientists attach great importance to studying the economic consequences of the 2008-2009 financial crisis, the Covid-19 pandemic, and the Russian-Ukrainian conflict. All shocks have an impact on the rate of economic growth and the government's debt burden, reflecting vulnerabilities in the public sector (Galoyan & Hovsepyan, 2023). Ayvazyan and Dabán (Ayvazyan & Dabán, 2008) in thier findings reveal that global demand shocks and fluctuations in oil prices strongly influence the RA economic activity, while financial volatility has a relatively limited effect. The transmission of these shocks occurs through the economies of Russia and the European Union, as well as through remittances and external borrowing (Ayvazyan & Dabán, 2008). Stepanyan et al. (Stepanyan et al., 2015) examined the mechanisms through which Russia's domestic crises or shocks are transmitted to neighboring countries, with particular consideration given to Armenia (IMF, 2015).

In recent years, the global economy has witnessed many trade shocks, whether caused by trade disputes between major economies, military disputes, or just crises in the supply of crude oil (Fahad & Abdurrazaq, 2022)**.** Thus, Andrey Korobeynikov (Korobeinikov, 2009) describes the crisis model as a epidemic of catastrophic bankruptcies. Hennessy and others (Hennessey, Holtz-Eakin, & Thomas, 2011) consider one of the main causes of the global financial and economic crisis that began in 2008 to be the impact of the globalization process.

In the context of studying the causes of the global financial and economic crisis, Rakauskiene and Krinikiene (Krinickienė & Rakauskienė, 2009) note the growing role of capital markets, growing uncertainty in financial markets, the intensity of globalization processes, social inequality, the absence of moral values, insufficient control and irresponsible activities of financial institutions. Ron Martin (Martin, 2011) reveals the growing mismatch of productive capacity between consumer and purchasing power, extremely weak legal regulation, control over the stock market and the prevailing uncertainty about a

sustainable economic future. Additionally, the Reinharts (Reinhart & Reinhart, 2010) underscore the global nature of the crisis and its impact on emerging economies.

Early warning systems based on a macroprudential approach emphasize the role of systemic risk factors in forecasting and preventing economic crises (Borio, 2014), including indicators such as credit growth, rising asset prices, financial leverage ratios and vulnerability of the financial and banking sector (Claessens, Kose, & Terrones, 2012). GDP growth, inflation and fiscal imbalances are also taken into account in early warning systems for economic crises, and high inflation rates and high budget deficits can signal economic instability (Frankel & Saravelos, 2012). Early warning systems often provide valuable information in terms of improving the forecasting of economic crises (Kaminsky, Lizondo, & Reinhart, 1998).

However, the accuracy and reliability of these systems vary depending on the quality of the data, the characteristics of the selected model and economic dynamics (Claessens, Kose, & Terrones, 2012).

Impact of the COVID-19 pandemic. The impact of the COVID-19 pandemic has been analyzed by economists worldwide who have utilized global and regional economic forecasting models to assess the macroeconomic effects of the crisis.

Bartik and other reseachers studied the economic impact of the COVID-19 pandemic using new publicly available databases based on private sector data (Bartik, et al., 2020). As a result of the conducted surveys, they conclude that despite employing nearly half of the U.S. workforce, many small businesses, particularly in retail, are displaying significant financial fragility amid the COVID-19 crisis, with 43% temporarily closed, a 40% drop in employment, and limited cash reserves, thus facing the stark choices of cutting expenses, accumulating further debt, or bankruptcy, highlighting the critical role of immediate funding for medium-term stability (Bartik, et al., 2020). Baldwin and Tomiura (2020) considered the supply chain flexibility and changing macroeconomic indicators in light of the effects of the COVID-19 pandemic (Baldwin & Tomiura, 2020).

The impact of wars or conflicts. Wars or armed conflicts have a significant impact on the economies of countries both in the short and long term. In the short term, the war may lead to a decrease in economic activity, especially in the affected areas, as well as contribute to inflation. Over the long term, this can lead to a reduction in human capital, as people will be displaced, injured or even lose their lives. The result may be a reduction of the number of qualified, educated professionals or highly qualified employees (Miguel, Satyanath, & Sergenti, 2004).

The war can also lead to a reduction in foreign investment (Collier & Hoeffler, 2004), substantial job losses (Blattman & Miguel, 2010), deepening poverty and economic inequality (Azam & Hoeffler, 2002), as well as income

inequality (Collier & Hoeffler, 2004). The poor bear the bulk of the economic consequences, which further increases the difference in income distribution. The economic consequences predominantly burden the impoverished, thereby intensifying the disparity in income distribution (Ravallion, 2018). Additionally, war reduces both imports and exports, which hinders economic integration, (Busse & Gröning, 2013). Furthermore, different industries are affected in varying ways: some areas are experiencing significant decline, while others are developing (Berman, Shapiro, & Felter, 2011).

RESEARCH METHODOLOGY. In order to analyze and quantify the impact of shocks on the RA economy, the following indicators have been selected: the nominal and real values of GDP, the structure of GDP production by the type of economic activity, and the use of GDP. All these indicators were measured in millions of drams. The time series is annual and covers the period from 2000 to 2022. The annual time series are taken in accordance with the purpose of the study, taking into account the fact that the state budget and other policies are planned annually, and the impact of shocks will be seen cumulatively from comparing annual indicators.

Firstly, an analysis of the dynamics of the studied time series was carried out, and the dynamics indicators were calculated. Subsequently, models were derived based on the analysis of the time series structure.

The modeling of shock impact was conducted using two approaches:

1. Using technical analysis methods, the time range of the indicator was modeled to the point of shock, then a forecast for the shock year was made, and the forecast was compared with the actual value of the shock year. This approach allowed to measure the impact of shock. The approach was based on the following position: if it weren't for the shock (which is the same if the series would develop according to its model with the pattern that existed before the shock), the level of the series would be equal to the predicted value, but in fact it was significantly deviated, and this deviation was caused by the shock, and the magnitude of the deviation was the effect caused by the shock.
2. The series was modeled entirely by one model at a time using time series components and dummy variables (Hamilton, 1989), (Levin, Lin, & James Chu, 2002). Here, dummy variables are indicators of the moment of the shock occurrence (i.e., the degree of deviation of the series from the basic pattern indicates a fictitious variable).

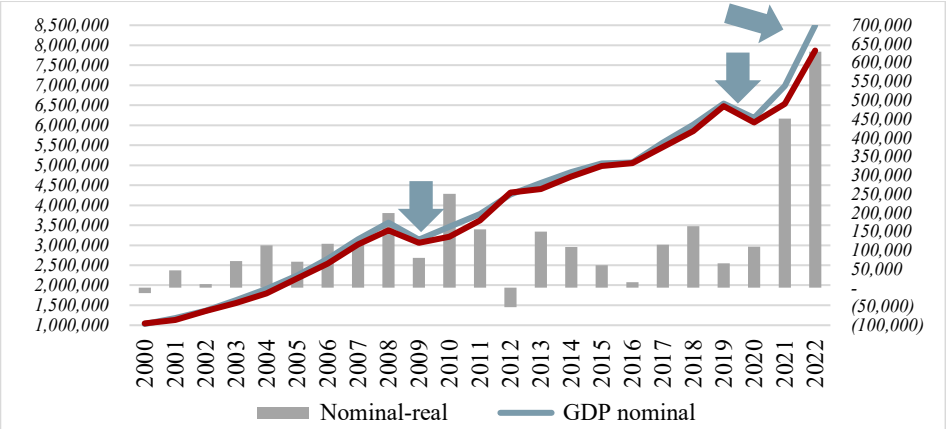
The analysis of the index series was conducted through the following sequential steps:

1. first, the visualization of the series was performed in order to see the dynamics of the series more clearly,
2. then the indicators of the dynamics of the series were calculated,

3. based on the above-mentioned two steps, trend and other models characterizing the corresponding time range were selected,
4. a component analysis of models for different time periods of the same series was carried out,
5. the results were interpreted and analyzed.

The statistics have been sourced from the databases maintained by the Statistical Committee of the RA.

ANALYSIS. Let us start from examining the nominal and real GDP indicators. Chart 1 shows the dynamics of nominal and real GDP and their difference in 2000-2022. It can be seen from the chart that during the observed period, both indicators showed a growth trend and were exposed to the shocks of 2009, 2020, 2022.



Source: Prepared by the authors based on the databases of the Statistical Committee of the RA, https://armstat.am/am/?nid=12&id=01001

Chart 1. ***Dynamics of Nominal and Real GDPs of the RA***

The fact that the shock of 2009 had a long-term effect on the RA economy is clearly emphasized, only in 2011 it was possible to record an index close to the pre-crisis index, and the recovery corresponding to the 2009 trend (even stronger growth) was achieved only in 2022.

Table 1 shows the chain absolute growth of nominal and real GDP and the rate of growth, where it can be seen that in the case of chain (present – past moment) estimates of nominal GDP, the effect in 2009 is manifested as a 12% decline, in 2020 -6% and 22% growth in 2022, and for real GDP -9%, -6%, +20%, respectively. From Table 1, judgements can be made regarding the impact of prices on the RA GDP: in 2010, 2021, 2022 a large price effect was observed.

The study of the GDP structure was highly important to understand through what channels the economic shocks penetrated and affected the economy. For this purpose, the GDP data by production method was used. The data is aggregated as follows (Table 2).

Table 1

Dynamic indicators of Nominal, Real GDP and Deflator of the RA

Year	Gross domestic product, at market prices, mln. AMD	Absolute growth	Growth rate	GDP Deflator	Real GDP	Absolute growth	Growth rate
2000	1,031,338			99	1,045,982		
2001	1,175,877	144,539	14%	104	1,129,565	83,583	8%
2002	1,362,472	186,595	16%	101	1,353,001	223,436	20%
2003	1,624,643	262,171	19%	**105**	1,553,196	200,195	15%
2004	1,907,945	283,303	17%	**106**	1,794,869	241,673	16%
2005	2,242,881	334,936	18%	103	2,173,334	378,466	21%
2006	2,656,190	413,309	18%	**105**	2,539,378	366,044	17%
2007	3,149,283	493,094	19%	104	3,022,345	482,967	19%
2008	3,568,228	418,944	13%	**106**	3,369,431	347,086	11%
2009	**3,141,651**	**(426,577)**	**-12%**	103	**3,062,038**	**(307,393)**	**-9%**
2010	3,460,203	318,552	10%	**108**	3,209,836	147,798	5%
2011	3,777,946	317,743	9%	104	3,622,191	412,356	13%
2012	4,266,461	488,515	13%	99	4,318,280	696,088	19%
2013	4,555,638	289,178	7%	103	4,405,840	87,560	2%
2014	4,828,626	272,988	6%	102	4,720,065	314,225	7%
2015	5,043,633	215,007	4%	101	4,983,827	263,762	6%
2016	5,067,294	23,660	0%	100	5,052,137	68,310	1%
2017	5,564,493	497,200	10%	102	5,450,042	397,905	8%
2018	6,017,035	452,542	8%	103	5,853,147	403,105	7%
2019	6,543,322	526,287	9%	101	6,478,536	625,389	11%
2020	**6,181,903**	**(361,419)**	**-6%**	102	**6,072,596**	**(405,941)**	**-6%**
2021	6,982,963	801,060	13%	**107**	6,532,238	459,642	8%
2022	**8,496,778**	**1,513,815**	**22%**	**108**	**7,867,387**	**1,335,149**	**20%**

Source: The calculations were carried out by the authors based on the databases of the Statistical Committee of the RA, https://armstat.am/am/?nid=12&id=01001

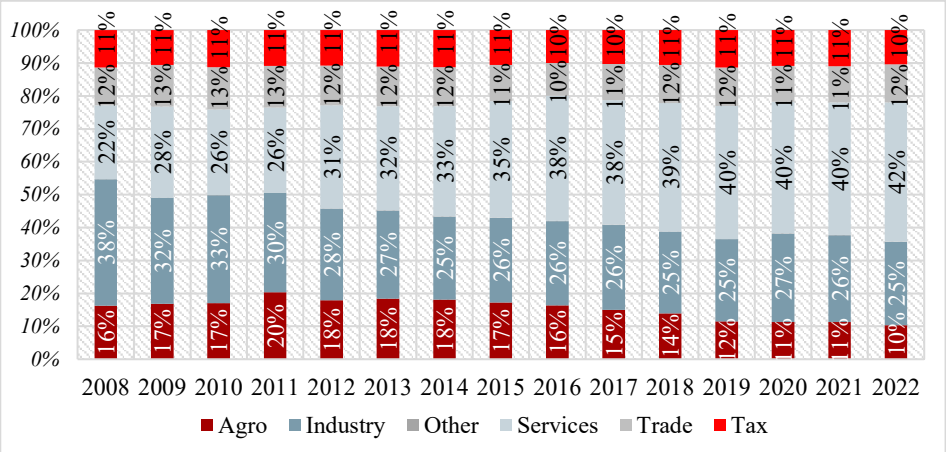
Table 2

Aggregation of the Structure of the RA Economy

Index:	Aggregation type
Domestic product (gross, at market prices)	GDP
Taxes on products (minus subsidies)	Tax
Value added (gross, at basic prices)	Value added
Finance. Indirectly Measured Intermediation Services (IMSS)	Services
A. Agriculture, forestry and fishing	Agro
B. Mining and open pit mining	Industry
C. Manufacturing industry	Industry
D. Supply of electricity, gas, steam and good quality air	Industry
E. Water supply, sewage, waste management and recycling	Industry
F. Construction	Industry
G. Wholesale and retail trade. car and motorcycle repair	Trade
H. Transportation and warehousing	Services
I. Accommodation and catering	Services
J. Information and communication	Services
K. Financial and insurance activities	Services
L. Real Estate Activities	Services
M. Professional, scientific and technical activities	Services
N. Administrative and support activities	Services
O. Public administration and defense: compulsory social insurance	Services
P. Education	Services
Q. Health and social services of the population	Services
R. Culture, entertainment and leisure	Services
S. Other maintenance services	Services
T. Activity of households as employers: household production of undifferentiated goods and services for own consumption	Other

Source: The table was compiled by the authors based on the data of the RA Statistical Committee, https://statbank.armstat.am/pxweb/hy/ArmStatBank/?rxid=9ba7b0d1-2ff8-40fa-a309-fae01ea885bb

The structure of the RA GDP with aggregated groups is presented below (Chart 2).



Source: The Chart was made by the authors based on the databases of the Statistical Committee of the RA.

Figure 2. ***The structure of the RA's GDP from 2008 to 2022***

It is obvious that the share of services in the GDP structure is increasing. In 2008 compared to 2022, it increased by 20 percentage points or 89%. In contrast, the shares of industry and agriculture decreased by 13 and 6 percentage points, respectively. Trade and taxes were stable over the period under review. To understand what actually happened, consider Table 3.

Table 3

GAP of the RA GDP Shocks

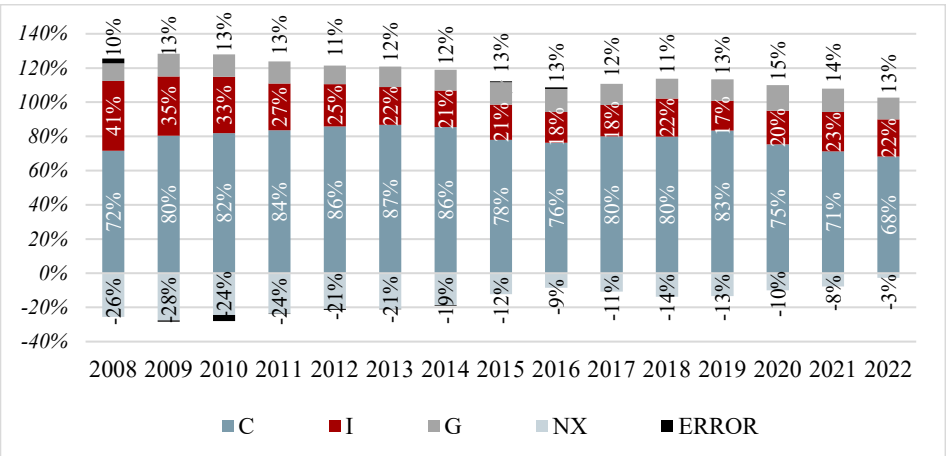
Branch	*2009/2008*	*Weight*	*2020/2019*	*Weight*	*2022/2021*	*Weight*
GDP	(426,577.00)	100%	(361,419.20)	100%	1,509,657.70	100%
Agriculture	(50,736.00)	12%	(52,523.90)	15%	88,749.80	6%
Industry	(359,428.00)	84%	23,846.40	-7%	305,968.00	20%
Other	130.00	0%	(239.00)	0%	241.70	0%
Services	71,464.00	-17%	(168,222.50)	47%	784,141.10	52%
Trade	(15,279.00)	4%	(92,922.80)	26%	214,951.80	14%
Tax	(72,728.00)	17%	(71,357.40)	20%	115,605.30	8%

Source: The calculations were performed by the authors.

It can be seen from the table that the impact tube of the 2009 shock is the industry, namely construction (down by 35%) and manufacturing industry (down by 11%), and therefore taxes (the tax base shrinks). The service sector moderated the impact of the shock. And the shock tube of 2020 is already, first of all, services, trade and therefore taxes. From services, in particular, activities related to real estate: 82,602 million AMD, transportation and reserve economy: 60,330 million AMD, culture, entertainment and recreation: 58,369 million AMD, organization of accommodation and public catering: 54,194 million AMD. The shock was softened by the growth of the following services: public administration and defense, social security: 52,114 million drams, financial and insurance activities: 35,318 million drams.

The pipes of unprecedented growth in 2022 were primarily the services sector, in particular, financial and insurance activities - 264,759 million AMD, activities related to real estate - 146,977 million AMD, information and communication - 126,793 million AMD, transportation and reserve economy - 103,553 million AMD, etc., industry, especially the processing industry - 189,807 million AMD, construction - 123,380 million AMD and the trade sector - 214,952 million AMD. It is noteworthy that the sector of mining industry and operation of open mines experienced a decline by -65,508 million AMD (-21% compared to industrial growth). It should be noted that the taxes on the products produced by the institutional units of the GDP-producing economic sectors (minus subsidies) have increased disproportionately. In other words, it turns out that the budget revenue plan is overachieved only at the expense of higher-than-expected economic growth, but it could have been more.

In the same way, it is possible to clarify the features of GDP use in the period of shocks (Chart 3).



Source: The Chart was made by the authors based on the databases of the Statistical Committee of the RA.

Chart 3. ***The Structure of the RA's GDP use from 2008 to 2022***

It is obvious that the lion's share of the RA GDP use, on average 79%, were household consumption expenses. The share of investments decreased by 19 percentage points compared to the beginning of the researched period, state expenditures were stable with an average share of 13%. The negative balance with the outside world in 2022/2008 also decreased by 23 percentage points.

The crisis of 2009 was accompanied by a reduction in investment amounting to 87% of the total GDP reduction (Table 4). The next large item is the error item, which can be attributed to the balance of the external world, and it can be assumed that the balance with the external world has not increased, but decreased the use of GDP. Government spending, which increased in order to alleviate the consequences of the crisis, had a positive effect.

In 2020, household expenses experienced an unprecedented decline, the state tried to alleviate the situation by increasing its expenses, and a positive balance with the outside world, which was due to covid restrictions.

55% of the unprecedented growth in 2022 was spent by households, 21% was a positive balance with the outside world, and 16% was used for investment spending.

Table 4

Gap of the RA GDP Usage Shocks

Request	*2009/2008*	*Weight*	*2020/2019*	*Weight*	*2022/2021*	*Weight*
GDP	**(426,577.00)**	**100%**	**(361,419.20)**	**100%**	**1,509,657.70**	**100%**
C	(28,795)	7%	(803,109)	222%	824,438	55%
I	(369,174)	87%	76,503	-21%	240,234	16%
G	53,989	-13%	103,206	-29%	129,193	9%
NX	48,881	-11%	261,981	-72%	315,793	21%
ERROR	(131,478)	31%	-	0%	-	0%

Source: The calculations were performed by the authors.

An attempt was then made to measure the shock effect using Methodology **Approach 1** in this section of the study.

Modeling the 2008-2009 shocks. For the period preceding 2009 at first polynomial order-2 trend (parabolic) was chosen for nominal GDP modeling. The simulation results are shown in Table 5.

Table 5

Results of Estimation of the RA GDP Model with Polynomial trend until 2009

Regression Statistics				
Multiple R	**0.9997**			
R Square	**0.9994**			
Adjusted R Square	**0.9993**			
Standard Error	24,416			
F	***Significance F***			
5352.82	**0.0000**			
	Coefficients	***Standard Error***	***tStat***	***P-value***
Intercept	930,257	31,067.36	29.94	0.0000
t	72,221	14,264.92	5.06	0.0023
t^2	24,900	1,391.23	17.90	0.0000

Source: The calculations were carried out by the authors.

As a result of the assessment based on the model, the forecast in 2009 was 4,142,499 million drams, and the actual amount - 3,141,651 million AMD, that is, the impact of the financial crisis amounted to AMD 1,000,848 million only in 2009 AMD However, economic processes do not have such a long-term development, over time, as the growth rate matures and reaches large volumes, it weakens. In other words, it would be naive to believe that the RA GDP would grow with a quadratic acceleration. In addition, the graph shows that the GDP has the potential of a linear growth rate, but not a quadratic one. Therefore, it is important to present the modeled, predicted and actual values with the linear trend until 2009 (Tables 6, 7).

Table 6

Estimating the Results of the Linear Trend Model of Armenian GDP until 2009

Regression Statistics				
Multiple R	**0.98**			
R Square	**0.97**			
Adjusted R Square	**0.97**			
Standard Error	166,709			
F	***Significance F***			
222.77	**0.0000**			
	Coefficients	***Standard Error***	***tStat***	***P-value***
Intercept	473,752	121,112	3.91	0.0058
t	321,224	21,522	14.93	0.0000

Source: The calculations were carried out by the authors.

Table 7

Actual-Forecast Comparison of Armenian GDP

Year	*GDP*	*Until 2009*	*Actual/Prevention*	*Actual/Forecast*
2000	1,031,338	794,976		
2001	1,175,877	1,116,200		
2002	1,362,472	1,437,425		
2003	1,624,643	1,758,649		
2004	1,907,945	2,079,873		
2005	2,242,881	2,401,097		
2006	2,656,190	2,722,321		
2007	3,149,283	3,043,546		
2008	3,568,228	3,364,770		
2009	3,141,651	3,685,994	(544,343)	-17%
2010	3,460,203	4,007,218	(547,015)	-16%
2011	3,777,946	4,328,442	(550,497)	-15%
2012	4,266,461	4,649,666	(383,206)	-9%
2013	4,555,638	4,970,891	(415,252)	-9%
2014	4,828,626	5,292,115	(463,489)	-10%
2015	5,043,633	5,613,339	(569,706)	-11%
2016	5,067,294	5,934,563	(867,270)	-17%
2017	5,564,493	6,255,787	(691,294)	-12%
2018	6,017,035	6,577,012	(559,976)	-9%
2019	6,543,322	6,898,236	(354,914)	-5%
2020	6,181,903	7,219,460	(1,037,557)	-17%
2021	6,982,963	7,540,684	(557,722)	-8%
2022	8,496,778	7,861,908	634,870	7%

Source: The calculations were carried out by the authors.

Table 7 documents the judgments made on the basis of Chart 3 regarding the long-term and high stress impact of the financial crisis. It turns out that in fact the impact of this shock led to a decrease of 17% or 544,343 million drams, not 12%.

The extent of long-term impact can also be estimated based on the data presented in Table 7. In every subsequent year, on average, the GDP lagged behind its precrisis level by 580,172 million drams, in 2009-2021, the RA did not create a result of 7,542,241 million drams.

Modeling the 2020 shocks. Two approaches can be used here, in one case, one can model the series of 2000-2019, prediction based on that series and

compare with the actual one, in the other case, cut the series up to 2009 and model up to 2020 starting from 2009. The trend coefficient obtained on the basis of the 2009-2019 series is 315,318 million drams, which is slightly different from the trend coefficient of 2000-2009, which was 321,224 million drams, so the beginning of the series cannot be cut off. The simulation results are shown in Table 8, and the actual-prediction comparison is shown in Table 9.

Table 8

Estimation Results of the Linear Trend Model of the Armenian GDP up to 2020

Regression Statistics				
Multiple R	**0.99**			
R Square	**0.99**			
Adjusted R Square	**0.99**			
Standard Error	200,442			
F	***Significance F***			
1297.70	**0.0000**			
	Coefficients	***Standard Error***	***tStat***	***P-value***
Intercept	609,209	93,111.78	6.54	0.0000
t	280,005	7,772.82	36.02	0.0000

Source: The calculations were carried out by the authors.

Table 9

Actual-Forecast Comparison of RA GDP

Year	*GDP*	*Until 2020*	*Actual/Interruption*	*Actual/Forecast*
2000	1,031,338	889,214		
2001	1,175,877	1,169,218		
2002	1,362,472	1,449,223		
2003	1,624,643	1,729,228		
2004	1,907,945	2,009,232		
2005:	2,242,881	2,289,237		
2006	2,656,190	2,569,242		
2007	3,149,283	2,849,246		
2008	3,568,228	3,129,251		
2009	3,141,651	3,409,256		
2010	3,460,203	3,689,260		
2011	3,777,946	3,969,265		
2012	4,266,461	4,249,269		
2013	4,555,638	4,529,274		
2014	4,828,626	4,809,279		
2015	5,043,633	5,089,283		
2016	5,067,294	5,369,288		
2017	5,564,493	5,649,293		
2018	6,017,035	5,929,297		
2019	6,543,322	6,209,302		
2020	6,181,903	6,489,307	(307,404)	-5%
2021	6,982,963	6,769,311	213,651	3%
2022	8,496,778	7,049,316	1,447,462	17%

Source: The calculations were carried out by the authors.

Table 9 shows that the impact of the 2020 shock is short-term, limited to 2020 and amounts to 5% or 307,404 million AMD.

Modeling the 2022 shock. The 2022 shock simulation results and impact calculation are shown in Tables 10,11.

Table 10

Estimation Results of the Linear Trend Model for the Armenian GDP until 2022

Regression Statistics				
Multiple R	**0.99**			
R Square	**0.99**			
Adjusted R Square	**0.99**			
Standard Error	207,655			
F	***Significance F***			
1601.24	**0.0000**			
	Coefficients	***Standard Error***	***tStat***	***P-value***
Intercept	613,739.9	91,652.34	6.70	0.0000
t	279,240.1	6,978.29	40.02	0.0000

Source: The calculations were carried out by the authors.

Table 11

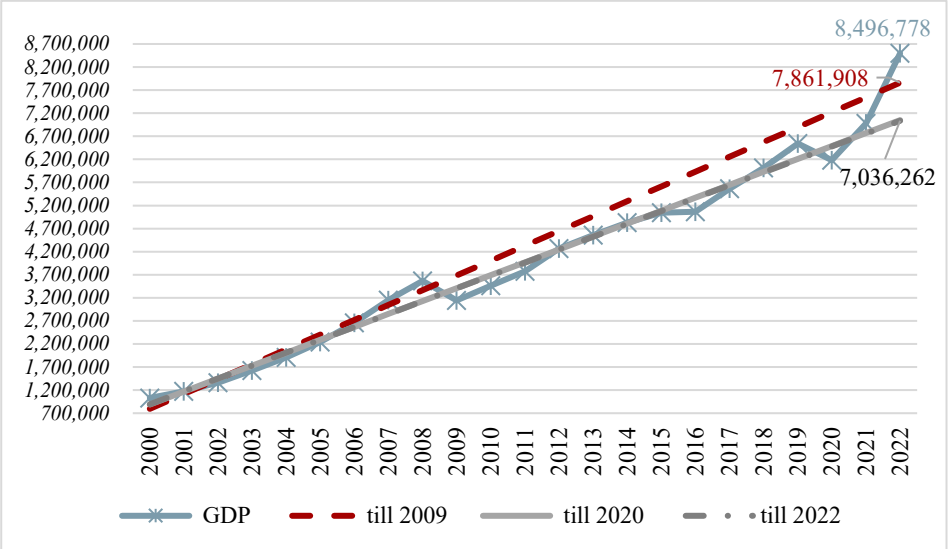
Actual-Forecast Comparison of the Armenian GDP

Year	*GDP*	*Until 2022*	*Actual/Interruption*	*Actual/Forecast*
2000	1,031,338	892,980		
2001	1,175,877	1,172,220		
2002	1,362,472	1,451,460		
2003:	1,624,643	1,730,700		
2004	1,907,945	2,009,940		
2005:	2,242,881	2,289,181		
2006	2,656,190	2,568,421		
2007	3,149,283	2,847,661		
2008	3,568,228	3,126,901		
2009	3,141,651	3,406,141		
2010	3,460,203	3,685,381		
2011	3,777,946	3,964,621		
2012	4,266,461	4,243,861		
2013	4,555,638	4,523,101		
2014	4,828,626	4,802,341		
2015	5,043,633	5,081,581		
2016	5,067,294	5,360,822		
2017	5,564,493	5,640,062		
2018	6,017,035	5,919,302		
2019	6,543,322	6,198,542		
2020	6,181,903	6,477,782		
2021	6,982,963	6,757,022		
2022	8,496,778	7,036,262	1,460,516	17%

Source: The calculations were carried out by the authors.

Table 11 shows that the positive effect of 2022 is actually 17% compared to the chain growth rate. It means that based on the GDP trend, it would grow by 5% in 2022, and the events of 2022 accelerated that growth by another 17%.

The above-mentioned simulation results are summarized in Chart 4.



Source: The calculations were carried out by the authors.

Chart 4. ***Modeling Results of Shocks on Armenian GDP***

Approach 2: The results of modeling using dummy variables are shown in Table 12, and the actual-model comparison is shown in Chart 5.

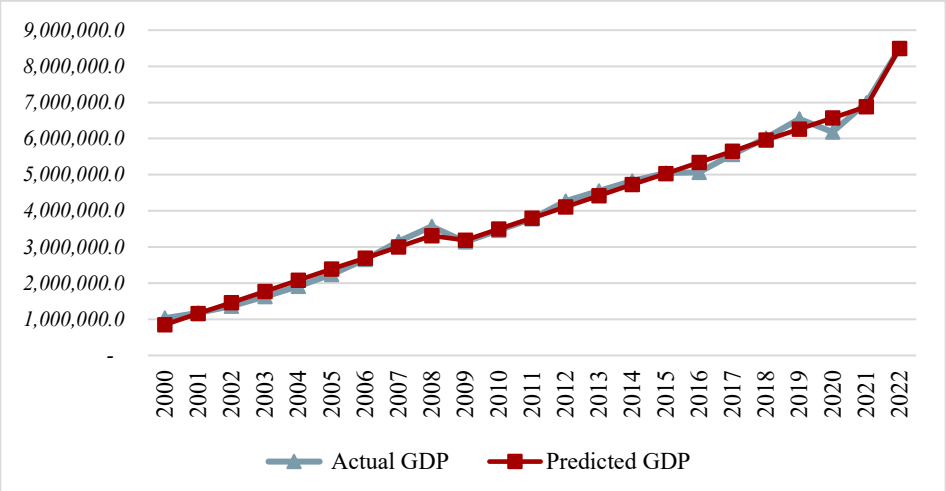
Table 12

Estimation Results of the Model for the Armenian GDP with Trend and Dummy Variables

Regression Statistics				
Multiple R	**0.99**			
R Square	**0.99**			
Adjusted R Square	**0.99**			
Standard Error	176,197			
F	***Significance F***			
968.43	**0.0000**			
	Coefficients	***Standard Error***	***tStat***	***P-value***
Intercept	540,629	81,588.22	6.63	0.0000
t	307,849	11,326.36	27.18	0.0000
F2009+2020	(433,044)	146,151.39	(2.96)	0.0080
F2022	875,625	275,788.99	3:17	0.0050

Source: The calculations were carried out by the authors.

It follows from Table 12 that in 2009 and every subsequent year plus 2020, GDP decreased by 433,044 million drams on average per year, the shock of 2022 led to an increase in GDP by 875,625 million drams. In other words, if there were no shocks in 2009 and 2020, the RA GDP would grow by an additional 433,044 million drams every year on average, and if there was no positive shock in 2022, the GDP would not increase by 875,625 million drams.



Source: The calculations were carried out by the authors.

Chart 5. ***Comparison of Actual and Model-Predicted Series of the Armenian GDP***

Chart 5 also clearly shows that the built model approximation quality is high.

CONCLUSIONS. The above-mentioned analyses allow to come to the following conclusions:

1. the RA GDP during the research period:
   - showed an increasing trend,
   - was exposed to the shocks in 2009, 2020, 2022.
2. In the case of nominal GDP, the shock of 2009 is 3 percentage points higher than that of real GDP, the shocks of 2020 are equal, and the positive shock of 2022 contributed to the growth of real GDP by 2 percentage points more than nominal GDP to the growth. In 2022, the level of the GDP deflator is high, meaning there is a large price effect.
3. The structure of GDP has changed during the researched period: the share of services has increased sharply. This means that the RA becomes more vulnerable to shocks affecting the service sector. The impact of the 2009 shock was on industry, on services and trade in 2020, and on services, industry and trade in 2022.
4. GDP usage was greatly affected by the 2009 shock with a sharp decrease in investment, in 2020 by an unprecedented drop in consumption, and in 2022 by an increase in all components.
5. To measure the impact of shocks, the time series of GDP was modeled. The models have trend and trend plus dummy structure. Attempts were made to use other approaches, but the predictive potential of the models was lower than that of trend-type models, that is why they were not included in the article.

6. Calculations made on the basis of models prove that as a result of the 2009 crisis, the RA did not realize its potential by 12% on average every year in 2009-2021. In other words, as a result of the mentioned shock, the economy lagged behind the potential level of development for 13 years.
7. The shocks of 2020 were short-term, manifested for 1 year, which means that the economy quickly recovered.
8. 5% of the unprecedented growth in 2022 was legitimate, the rest was the result of an external effect.

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