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Time Series Research of Foreign Trade Operations of Post-Soviet Countries

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***Abstract* – The paper presents the structure and the dynamics of external trade performance of post-Soviet countries. Historical time series of external trade performance during the period from 1960 to 2016 are used as the empirical basis. The structure of exports and imports of post-Soviet countries has some characteristics, established back in the USSR. Post-Soviet countries were unable to reconstruct the economy radically and to adjust the release of industrial products competitive in the global market. USA, Germany, France and Japan has always been and still are trading partners of post-Soviet countries, among new partners Gulf countries and APAC countries (primarily China) can be named. An important aspect of the global trade between described countries is a significant level of mutual trade, which exceeds 50% of all trade in some republics. The use of the Chow test confirmed that crises have a significant impact in foreign economic activity of post-Soviet countries.**

Keywords – time series, foreign economic activity, export, import, post-Soviet countries

I. INTRODUCTION

Foreign trade operations by means of which required goods (works and services) are received and domestic products are sold at the global market, are an integral part of the economy of the country. For Russia and a number of post-Soviet countries foreign economic activity is also a source of replenishment of the consolidated budget in the form of taxes and customs payments from hydrocarbon sales. Analyzing goods traffic one can identify the direction of industrial production of the country (global division of labors) and undeveloped spheres of the country's economy. The direction of analysis under consideration is particularly relevant in post-Soviet countries, as collapse of the USSR had destroyed all foreign economic ties, which resulted in newly formed republics being forced to build economic relationships with the outside world from scratch. There is also a particular specifics that should be noted relating to investigated countries, which allows developing such directions as mutual trade with special conditions between members of international unions (such as CIS, EEU and SCO).

This issue was addressed in works of such authors as Gladkov I. [1] and Chernov N. [2]. Gladkov I. in his research appeals to post-Soviet countries, by which he means the CIS republics and Baltic countries. In our opinion, this approach is not quite correct, as the "post-Soviet space" includes a greater number of countries: only 10 of 15 republics of the USSR are currently members of the CIS, and there are only three republics of the former Soviet Union among Baltic countries. Moreover, countries-members of the Council for Mutual Economic Assistance can be added to the list of countries under consideration.

The main advantage of the research is significant attention paid by the author to the problem of foreign economic relations of the CIS and Baltic countries with their former partners on the "socialist bloc", i.e. mutual trade.

Turning to the research conducted by Chernov N., it is worth noting that in the title of the paper the author refers to "post-Soviet countries", but in fact there are only two countries considered in the paper - Ukraine and Kazakhstan. Developing

a gravity model between those two countries, the author concludes that structural inequalities in imports are not significant, while inequalities in exports are significant. The authors believe that one can achieve such results without resorting to calculation of complex econometric models, but merely calculating the Riabtsev index of structural changes and inequalities [3]. Nevertheless, there is a positive result of using regression models by Chernov N.: he made a conclusion that such factor as the access to the sea is of high importance for the foreign economic activity of a particular country. This result can not be achieved by applying structural dynamic analysis to trade characteristics.

It should be noted that researches mentioned earlier have approached this problem in general, for multiple post-Soviet countries, in turn export-import operations of certain countries and (or) politico-economic unions were reflected in works of such authors as Berjoza A. et al. [4], Dekhtyar N. et al. [5], Faltsman V. et al. [6], Gorokhov S. [7], Morachevskaya K. et al. [8], Saboniene A. [9], Zhanakova, N. [10].

Summarizing the domestic experience in the analysis of the foreign economic activities of post-Soviet countries, it can be concluded that there is an objective need for in-depth consideration of identified direction with application of statistical tools to export-import operations in order to identify patterns typical of these countries.

II. Research Methods

The indicators used in this research describe the foreign economic activity of countries and represent values. This imposes limits on a number of approaches to analysis. In particular it is impossible to organize time series of exports-imports over a long period of time, as goods traffic is measured in incomparable currency. In this regard the authors consider separately two time periods: before and after 1990. Soviet and post-Soviet periods will be compared on the basis of relative numbers [11].

As a source of information data from the Official Statistical Yearbook "Foreign Economic Relations of the USSR" was used to describe trends over the Soviet period. To describe the current situation in foreign trade of post-Soviet countries, the authors used data provided by the World Bank and information from the "International Trade Statistics Yearbook", published by the United Nations Statistics Division. This Yearbook has been published since 1990s in two volumes. Volume I contains information on exports-imports of all the countries in the world, in dynamics and in structure. Volume II contains data on international trading of a variety of goods.

In order to validate the assumptions of structural instability of dynamics of indicators considered, the authors use the Chow test [12, 13].

III. Results

The starting point for analysis of changes in economic relations of post-Soviet countries will be 1960, the dynamics of foreign trade turnover from 1960 to 1990 is presented in Fig. 1.

As appears from Figure 1, goods turnover has increased dramatically in the mid-1970s, but export has slowed down its growth, when import, on the contrary, has increased.

In the beginning of the period under consideration the main goods traffic was between the USSR and the Comecon countries. In 1970 the proportion of turnover was 55.6%, in 1980 - 53.2%, and in 1990 it fell to 43.8%, when trade with industrialized capitalist countries only increased, and at the end of the reporting period reached 38.0%. From this a change in the direction of trade can be stated, which fits into a logical explanation, as the developed countries have willingly bought primary commodities from the USSR; in its turn, the USSR has imported high-technology goods, which the Comecon countries could not provide.

Against this background of the structure of foreign economic activities partners of the USSR is illustrative. If in 1960 all major partners were the Comecon countries (German Democratic Republic - 18% of all turnover, Czechoslovakia - 11%, China - 15%, Poland - 8%, Bulgaria - 6%, Hungary - 5%), to the end of 1990 the European countries have joined the Comecon countries (Germany - 15%, Czechoslovakia - 9%, Poland - 8%, Bulgaria - 6%, Hungary - 5%, Finland - 3%, Italy - 3%). The information presented in Fig. 1 was obtained from the Statistical Yearbook "Foreign Economic Relations of the USSR".

It addition it is necessary to note that the proportion of exports and imports between the USSR and mentioned countries was approximately the same, but the structure of the goods imported and exported was different, according to the Table I, made by the authors on the basis of the Statistical Yearbook "Foreign Economic Relations of the USSR".

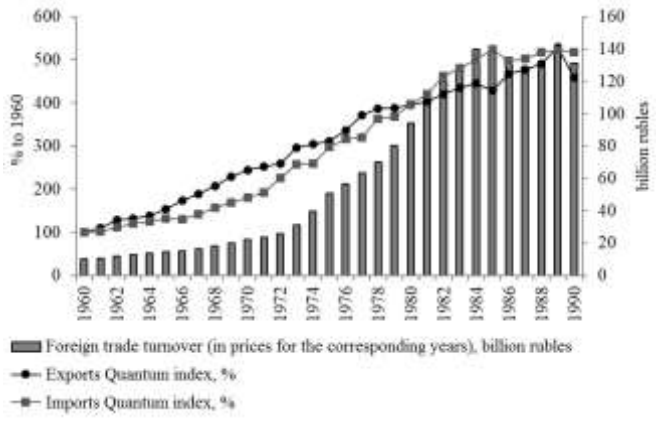

Fig. 1. Dynamics of exports-imports in the USSR according to the Statistical Yearbook "Foreign Economic Relations of the USSR".

As it can be seen from the Table I, in the reporting year the largest proportion of exports was "fuel and electrical energy" (40,5%), but in 1970 this proportion declined to only 18%, i.e. since the 1980s the structure has been changing towards an increase in amounts of hydrocarbons sold. In its turn, "machinery, equipment and vehicles" seem to be the largest share in imports, which validates the earlier assumption about high-technology commodity shortages in the USSR.

TABLE I. Main commodity groups in the exports-imports structure of the USSR, %

Commodity Groups	Exports, %			Imports, %		
	1970	*1980*	*1990*	*1970*	*1980*	*1990*
Machinery, equipment and vehicles	21.8	15.8	18.3	35.5	33.9	44.8
Fuel and electrical energy	18.0	46.9	40.5	2.0	3.0	2.6
Ore and concentrates, metals and products made of them	18.7	8.8	11.3	9.6	10.8	5.1
Chemical products, fertilizers and rubber	3.4	3.3	4.6	5.7	5.3	4.1
Timber and pulp-and paper products	6.3	4.1	3.7	2.1	2.0	1.0
Fibrous materials and semiproducts	3.3	1.9	1.2	4.8	2.2	1.1
Food and flavour products and materials for their manufacturing	9.2	1.9	2.0	15.8	24.2	15.8
Manufactured goods for national consumption	2.9	2.5	3.6	18.3	12.1	17.7

In order to evaluate the contribution of the USSR and post-Soviet country to the global trade, it is proposed to look at the data presented in Table II created by the authors on the basis of the Statistical Yearbook "Foreign Economic Relations of the USSR" and the data provided by the World Bank.

According to the data presented in Table II, USA holds leading positions in exports-imports until 2010s but China strengthening their position has led to changes in the structure of the global trade, as in 2016 People's Republic of China accounted for 13% of all exports and 9.8% of all imports.

Over the entire investigated period the USSR accounts for an insignificant share in the global exports and imports. A similar pattern can be observed after the collapse of the Soviet Union. In total exports and imports of post-Soviet countries in reporting period do not exceed those 3%. It seems that market changes in post-Soviet countries, which were to provide global markets entry, did not lead to the desired outcome.

Moving forward, it is proposed to consider the period from 1990 to 2016 and observe how dynamics and structure of indicators describing foreign trade of post-Soviet countries have changed under the influence of transition to a market economy.

TABLE II. Dynamics of specific weight of exports-imports of the countries on the global scale, %

Direction	Countries	1960	1970	1980	1990	2000	2010	2016
Export	Great Britain	8.5	6.4	5.5	5.3	4.4	2.7	2.5
	USA	16.6	14.1	11.4	11.3	12.0	8.3	9.0
	Germany	9.2	11.2	9.7	12.0	8.5	8.2	8.3
	France	5.5	5.9	5.8	6.2	5.0	3.4	3.1
	China	2.1	0.8	0.9	1.8	3.8	10.2	13.0
	The USSR/Post-Soviet countries	1.0	4.2	3.8	2.9	2.4	4.1	2.9
Import	Great Britain	10.0	6.9	5.7	6.3	5.2	3.8	3.9
	USA	12.5	13.4	12.7	14.5	18.8	12.7	13.8
	Germany	7.8	9.5	9.3	10.0	7.4	6.8	6.5
	France	4.8	6.0	6.7	6.6	5.1	3.9	3.5
	China	2.0	0.7	1.0	1.5	3.4	9.0	9.8
	The USSR/Post-Soviet countries	1.0	3.7	3.4	3.3	1.4	3.0	2.4

[a] Data obtained from http://www.un.org/ru/databases/index.html and https://data.worldbank.org/.

Data presented in Table III shows that low values of exports and imports in 1990 and a sharp increase in 2000 are typical for all post-Soviet countries; further the value of the indicator stabilizes. This data was obtained from the United Nations Statistical Division and the World Bank.

The highest indicators of exports-imports (relative to the GPD) appear to be in Estonia - 79.0% and 75.1% respectively.

Turning to specific weights of post-Soviet countries in gross volume of trade, it is possible to observe that Russia is on the first place: in 1990 its share in exports was 63% and in import - 56%, in 2016 - 56% and 49% respectively.

In order to compare the development of these phenomena before and after 1991, it is proposed to calculate the Export (Import) Quantum index by 1990 for every post-Soviet country and to find the geometric mean. The results are shown in Fig. 2.

It is possible to observe growth in exports and imports of the same volume as it was in the Soviet period of development, but it is necessary to take a closer look at the period from 1991 to 2003: the reduction in 1990 and then a sharp increase is observed.

This pattern can be explained by a general transitional decline typical for all post-Soviet countries. The failures in 2009 and 2015, caused by the impact of crises can be observed. This pattern is presented in Fig. 3.

TABLE III. Changes in exports and imports in post-Soviet countries, GPD

Countries	Exports, GPD				Imports, GPD			
	1990	*2000*	*2010*	*2016*	*1990*	*2000*	*2010*	*2016*
RUS	18.2	44.1	29.2	25.7	17.9	24.0	21.1	20.5
UKR	27.6	62.4	47.1	49.3	27.7	57.4	51.1	55.5
BLR	46.0	69.2	51.4	62.5	43.7	72.4	64.6	62.7
UZB	28.8	24.6	31.7	18.9	47.8	21.5	28.5	20.7
KAZ	7.8	56.6	44.2	31.8	30.5	49.1	29.9	28.5
GEO	40.0	23.0	35.0	43.6	45.3	39.7	52.8	59.3
AZE	43.9	39.0	54.3	46.4	39.2	38.4	20.7	43.7
LTU	38.7	38.5	65.3	74.5	47.4	44.7	67.2	73.2
MDA	48.7	49.8	39.2	43.3	51.0	75.4	78.6	71.3
LVA	39.4	36.9	53.7	60.0	43.5	44.9	55.1	59.2
KGZ	29.2	41.8	51.6	35.8	49.6	47.6	81.7	70.0
TJK	27.8	98.8	14.9	13.3	35.1	100.9	58.6	42.8
ARM	35.0	23.4	20.8	33.1	46.3	50.5	45.3	42.8
TKM	111.2	97.2	76.3	74.4	107.5	82.4	44.5	44.1
EST	42.0	61.6	75.1	79.0	49.9	64.9	68.7	75.1

[b.] Data obtained from http://www.un.org/ru/databases/index.html and https://data.worldbank.org/.

Fig. 2. Dynamics of exports-imports in post-Soviet countries. Information obtained from http://www.un.org/ru/databases/index.html.

To formalize the suggestion about the influence of crises situation on dynamics of exports-imports of post-Soviet countries the authors propose to use the Chow test [14, 15].

First the following time marks: 1993, 1998, 2009, and 2015 are marked.

For exports the actual value of the F-test is 3.85, given the p-level 0.01 (F table value is 2.59 given df1=8 и df2= 59), for imports - 4.90 (given the p-level 0.03), therefore, the test demonstrates points standing out from the general time series motion pattern, i.e. crises have a significant influence on the foreign economic activity of post-Soviet countries.

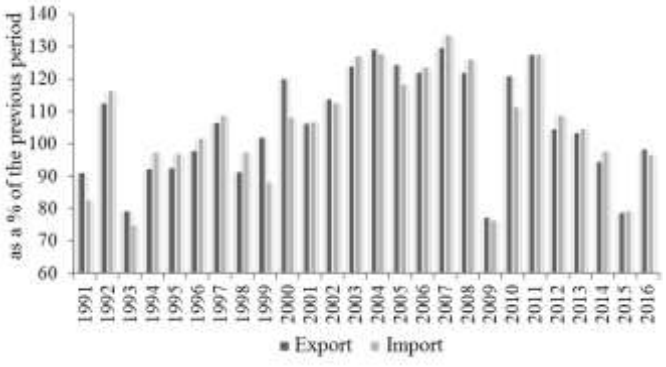

Fig. 3. Dynamics of exports-imports of goods and service compared to the prevoius period. Information obtained from http://www.un.org/ru/databases/index.html.

Since Russia contributes significantly to exports and imports, the authors propose to consider its partners on the foreign economic activity. In 1990 export with the CIS countries accounted for 2.5% of all turnover (import - 2.2%), therefore, specific weight of export with countries of the far abroad was 97.5% (import - 98.8%).

In 2016 the situation has changed: export with countries of the first category reached 13.2% (import - 10.7%), export with the second category accounted for 86.8% (import - 89.3%).

Regarding the geographical focus of the foreign economic activity, in 2016 the main export partners for Russia were the Netherlands (10.2%), China (9.8%), Germany (7.4%), Belarus (5.0%) and Turkey (4.8%), the main import partners - China (20.9%), Germany (10.7%), USA (5.9%), Belarus (5.3%), France (4.7%) and Japan (3.7%).

It can be concluded that Germany still remains one of the main foreign trade turnover partners for Russia, Belarus also provides a substantial contribution, but the most important partner is China, as it supplies high-technology commodities to the Russian domestic market.

As the authors focus on the analysis of information obtained from the "International Trade Statistics Yearbook", it is possible to notice notice that it contains data on 12 post-Soviet republics. Data on Uzbekistan, Turkmenistan and Tajikistan was provided by official national statistical services.

The structure of exports and imports of the countries under consideration is divided according to the Standard International Trade Classification (SITC) developed by the United Nations Statistical Commission (Table IV).

According to Table IV, hydrocarbons and their products account for the largest share of exports of Russia, Belarus, Kazakhstan, Azerbaijan, this means that the structure established in the USSR in 1980s was inherited by these countries.

Armenia, Georgia and Moldova do not have enough mineral resources, which is why main products for export are agricultural goods.

The European Union countries (Latvia, Lithuania and Estonia) export (import) machinery and transport equipment, which can be explained by transit flows through these countries from Central Europe to East Europe and Asia.

TABLE IV. Largest share of export (import) in the SITC structure of post-Soviet countries in 2016

Country	Direction	SITC codes	Share
RUS	Export	3	47.2
	Import	7	41.2
UKR	Export	6	28.4
	Import	3	29.0
BLR	Export	3	20.8
	Import	3	26.8
KAZ	Export	3	50.7
	Import	7	34.8
GEO	Export	0+1	32.0
	Import	7	28.8
AZE	Export	3	87.2
	Import	7	34.6
LTU	Export	7	18.5
	Import	7	26.0
MDA	Export	0+1	32.8
	Import	7	21.6
LVA	Export	7	22.3
	Import	7	27.9
KGZ	Export	9	54.1
	Import	6	20.7
ARM	Export	0+1	28.7
	Import	6	19.8
EST	Export	7	32.3
	Import	7	32.9

[a.] Codes according to the SITC: 0 Food and live animals; +1 Beverages and tobacco; 3 Mineral fuels, lubricants and related materials; 6 Manufactured goods; 7 Machinery and transport equipment; 9 Commodities and transactions, n.e.s. Available at https://comtrade.un.org/pb/.

The Soviet inheritance can be seen in imports of post-Soviet countries. According to Table I, machinery and equipment accounted for the largest share of import, and, according to Table IV, the same picture can be seen in most of the countries presented. The conclusion can be made that over the past 25 years republics did not succeed in domestic production of high-technology machinery, equipment and vehicles.

Next the authors propose to consider the foreign economic activity of countries that were not included in the "International Trade Statistics Yearbook". Thus, in Uzbekistan in 2016 the specific weight of export in foreign trade of the CIS countries was 34.8% (import - 33.4%), export in foreign trade of other countries of the world - 65.2% (import - 66.6%). The main partners of Uzbekistan are Afghanistan, Iran, Kazakhstan, China, the Republic of Korea, the Russian Federation and Turkey.

Such categories as "Energy suppliers and petroleum products", and "Services", accounted for the largest specific weight in exports in 2016 - 14.2% and 25.8% respectively. Consequently, "Chemical products" and "Machinery and equipment" were dominating in imports: 17.5% and 41.3% respectively. As it can be seen, the existing structure of foreign trade turnover of Uzbekistan is consistent with the pattern of post-Soviet countries.

The foreign trade turnover of Tajikistan in 2016 amounted to 50.1% of deals with the CIS countries and to 49.9% of deals with other countries. The main partners of Tajikistan are Germany, Kazakhstan, the Russian Federation, Turkmenistan, Turkey and Switzerland, given that 32.5% of all imports is from Russia.

In the commodity structure of exports two large categories can be identified: "cotton fiber" - 13.6% and "ore and concentrates" - 26.6%. In its turn the largest share in import also belongs to such categories as "wheat" - 7.6% and "petroleum products" - 8.6%. In general, the commodity structure of exports-imports is consistent with the pattern of ex-USSR countries.

Before considering values of indicators for Turkmenistan, it is necessary to note that there is insufficient information on this republic. The official website of the Turkmenistan State Committee of Statistics provides only a few macroeconomic indicators, other information is not available.

The limited choice of empirical data suggests that main commodities of Turkmenistan for export are hydrocarbons: «petroleum gas" (more than 70%) and "petroleum products" (about 10%), therefore, import is represented by such categories as "raw materials" (about 35%), "technological equipment and mechanical devices" (more than 30%), "vehicles" (less than 10%) and "consumer products" (about 20%). The main trade partners of this republic are Germany, Italy, China, Russia, Turkey and Ukraine.

Summarizing the outcomes of analysis of the commodity structure of exports-imports of Uzbekistan, Tajikistan and Turkmenistan, it can be stated that the structure of foreign trade operations established in the USSR remains relevant for described countries.

IV. CONCLUSIONS

To sum up the analysis conducted on dynamics and structure of foreign trade operations of 15 post-Soviet countries, the following conclusions can be made:

- The analysis on dynamics of exports-imports over two time periods of development shows that during the Soviet period there has been a steady growth in 1960. During the post-Soviet period it is possible to observe a significant failure in 1990, which continued until the mid-2000s. This pattern can be explained by a general transformational recession and breakdown of all international relationships, i.e. new republics needed time to form relations with partners on the foreign economic activity and a range of commodities to be delivered to the external market.

- The commodity structure of export and import operations of the USSR can be described with a large proportion of exported mineral resources (mostly hydrocarbons) and imported machinery, equipment and vehicles. Over the past 25 years the structure has not changed significantly for post-Soviet countries, because mineral-rich countries export their resources and countries without any sell food commodities; yet almost all considered republics import high-technology commodities.
- The geography of turnover since the collapse of the USSR has not changed dramatically: new directions such as China, Gulf countries and euro-zone countries have added to the long-established relationships, and the volume of export-import operations between post-Soviet countries exceeded 50% in some republics. The high level of mutual trade can be explained by close socio-economic relationships and a big amount of politico-economic unions (CIS, Customs Union, EEU, SCO, etc.)

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