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КАРТИРОВАНИЕ ПРОДУКТОВ: НА ПРИМЕРЕ АРМЕНИИ

Аннотация: С точки зрения стратегии продвижения экспорта, крайне важно выбрать отрасли, в которых данная страна обладает сравнительными преимуществами и развитие которых может привести к экономическому росту, ориентированному на экспорт. В этой статье индексы выявленных симметричных сравнительных преимуществ (RSCA), нормализованных выявленных сравнительных преимуществ (NRCA) и торгового баланса (TBI) были рассчитаны на основе данных об экспорте около 100 товарных групп (разделы на двузначном уровне) Гармонизированной системы (HS) для картирования продуктов на период 2018-2022 годов. Также были рассчитаны индекс рыночной концентрации экспорта и индекс товарной концентрации экспорта. Результаты показывают, что Армения обладает сравнительными преимуществами в производстве некоторых групп товаров, а для повышения конкурентоспособности некоторых из них требуется государственная поддержка. Мы приходим к выводу, что большинство товаров, в производстве которых Армения имеет сравнительные преимущества, в основном экспортируются в Россию. Мы считаем, что необходимо диверсифицировать экспорт товаров, поскольку индекс концентрации экспортных рынков в 2022 году составил 0.427 (нормализованный индекс Херфиндаля-Хиршмана), и экспорт товаров должен быть в большей степени направлен в страны со средним и выше среднего уровнем дохода. Это, в свою очередь, способствовало бы преобразованию структуры экономики Армении.

Ключевые слова: Экспорт, Гипотеза роста за счёт экспорта, Индекс торгового баланса, Выявленный индекс сравнительных преимуществ, Выявленный симметричный индекс сравнительных преимуществ, Нормализованный выявленный индекс сравнительных преимуществ, Картирование продуктов.

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PRODUCTS MAPPING: THE CASE OF ARMENIA

Abstract: From the point of view of the export promotion strategy, it is crucial to choose industries in which a given country has comparative advantages and the development of which can lead to export-led economic growth. In this article, the indices of Revealed Symmetrical Comparative Advantage (RSCA), Normalized Revealed Symmetric Comparative Advantage (NRCA), and the Trade Balance (TBI) were calculated based on the export data of about 100 commodity groups (chapters at 2-digit level) of Harmonized System (HS) to carry out the Products Mapping for the period 2018-2022. The market concentration index of exports and the product concentration index of exports were also calculated as well. The results show that Armenia had comparative advantages in producing some product groups, and in some, government support is required to increase the competitiveness thereof. We conclude that the majority of products that Armenia has a comparative advantage in producing thereof were mostly exported to Russia. We believe that it is necessary to diversify merchandise exports since the concentration index of export markets in 2022 was 0.427 (normalized Herfindahl-Hirschman index), and exports of products should be channeled more to middle- and upper-middle-income countries. This, in turn, would contribute to the transformation of the structure of the Armenian economy.

Keywords: *Exports, Export-Led Growth Hypothesis, Trade Balance Index, Revealed Comparative Advantage Index, Revealed Symmetric Comparative Advantage Index, Normalized Revealed Comparative Advantage Index, Products Mapping.*

Introduction

The availability of product groups with comparative advantages and their exports is crucial in attracting foreign exchange earnings into the country and decreasing the current account deficit. It also helps to increase the country's competitiveness and productivity and create new jobs, which leads to economic growth. Therefore, in the context of export promotion, implementation of foreign trade policy, and export diversification, it is essential to choose product groups with comparative advantages and, most importantly, be competitive in the global market concerning price-to-quality ratio.

In foreign trade studies, comparative advantage can be measured using the Revealed Comparative Advantage Index (RCA), proposed by Balassa [2], which is based on the comparative advantage of the observed trade patterns [32, p. 267]. Another tool is the Products Mapping. The analysis of the comparative advantages of product groups and the construction of the Products Mapping were carried out in the cases of Indonesia, Malaysia, the Philippines, Singapore, Thailand, Vietnam [6], Bangladesh [26], China, Japan, and other Asian countries [29], as well as Armenia (2012-2016; [11] and 2013-2017; [13]). In this context, this article analyzes various indices to identify the product groups of the merchandise exports of Armenia that the country has a comparative advantage in producing thereof, as well as the composition of merchandise exports and export destinations.

Brief Literature Review

The evidence of the Export-led growth hypothesis was found in the case of the United States, Japan, the United Kingdom and Germany [14], Chile [19], Bangladesh, India, Pakistan and Sri Lanka [9, p. 10], Nepal [18, p. 482], Korea [5, p. 260], Jordan [1, p. 395], Myanmar [8, p. 56], Cote D'Ivoire [33, p. 10], Singapore [24], as well as Turkey [16, p. 12].

The evidence of the given hypothesis has been found in the case of various income group countries and development, in particular in the case of 45 developing countries [4, p. 57], in some countries of Sub-Saharan Africa [15, p. 88], in the case of 5 countries of the Persian Gulf, such as Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates [7, p. 204], and in 3 BRICS member states such as Brazil, India, South Africa [17], etc.

Methodology and Data Description

Products mapping is one of the analytical tools used to identify comparative advantages of the product groups and the competitiveness thereof, constructed by Widodo [29] by combining two indices: the Revealed Symmetric Comparative Advantage Index designed by Dallum and others [3] and the Trade Balance Index proposed by Laffay [10]. On the other hand, a tool proposed by Ulla and Kazuo [26] is also used to construct products mapping that includes two indices: the same Trade Balance Index as well as the Normalized Revealed Comparative Advantage index constructed by Yu et al., [32, p. 270].

The following indices were calculated:

$$BRCA_j^i = (E_j^i/E_j)/(E^i/E) \quad (1),$$

Where:

E_j^i is the export of product j from country i .

E_j is the export of j products by all countries worldwide.

E^i is the exports of all products by country i

E is the world exports.

$BRCA_j^i$ is an index of revealed comparative advantage for the product j of country i in the market of goods of category j [32, p. 268]. The index values vary from 0 to infinity and respective classification is presented in Table 1.

Table 1

The Classification of the Balassa Index (BRCA) Values

Group A	$0 < \text{Balassa Index} \leq 1$	Revealed Comparative Disadvantage
Group B	$1 < \text{Balassa Index} \leq 2$	Weak Comparative Advantage
Group C	$2 < \text{Balassa Index} \leq 4$	Medium Comparative Advantage
Group D	$4 < \text{Balassa Index}$	Strong Comparative Advantage

Source: [25, p. 335]

$$NRCA_j^i = (E_j^i - (E^i * E_j)/E)/E \quad (2),$$

Where:

E_j^i is the export of product j from country i .

E^i is the export of all products of country i .

E_j is the export of product j by all countries worldwide.

E is the world exports.

$NRCA_j^i$ is the value of the normalized revealed comparative advantage index for product j from country i [32, p. 270]. The index value ranges from $-1/4$ to $+1/4$, in which case 0 is considered a neutral point in terms of comparative advantage [32, p. 273].

$$RSCA_{ij} = (RCA_{ij} - 1)/(RCA_{ij} + 1) \quad (3),$$

Where:

RCA_{ij} is the Revealed Comparative Advantage Index or Balassa Index,

$RSCA_{ij}$ is the Revealed Symmetric Comparative Advantage Index for product j from country i [30, p. 68].

The $RSCA_{ij}$ index varies from -1 to $+1$ (or $-1 \leq RSCA_{ij} \leq +1$). If the value of $RSCA_{ij}$ is greater than zero, it means that country i has a comparative advantage in a group of products j , and if it is less than 0, it does not have it [30, p. 68].

The trade balance index (TBI) shows whether a country specializes in exporting (as a net exporter) or importing (as a net importer) a particular group of products [30, p. 68].

$$TBI_{ij} = (x_{ij} - m_{ij})/(x_{ij} + m_{ij}) \quad (4),$$

Where:

TBI_{ij} is the trade balance index of country i for a group of products j [30, p. 68].

x_{ij} and m_{ij} exports and imports of a group of products j by country i , accordingly

The index values range from -1 to $+1$; if the TBI is -1 , then the country only imports, and if the TBI is $+1$, then the country only exports [30, p. 68]. A country is considered a net importer of a particular group of products when the TBI value is negative and is regarded as a net exporter when the TBI value is positive [30, p. 68].

Widodo suggests constructing products mapping based on the RSCA and TBI, and Ullah and Kazuo based on a combination of the NRCA and TBI [30, p. 67]; [26, p. 477] (see Table 2). The difference between the RSCA and NRCA is that in the case of RSCA, when products are mapped for a country, the exports of product group j of country i is subtracted from the world exports of the j product group, while in the case of NRCA, it is not subtracted. The products were mapped for Armenia using two methods. However, since the sum of exports of all Armenian product groups in world exports amounted to 0.022% in 2022 [31], nearly the same results were obtained for Armenia while using 2 methods (see Table 2).

The products can be divided into four groups: A, B, C, and D [30, p.68]:

1. Group A consists of products that have a comparative advantage and are of export specialization,
2. Group B consists of products that have a comparative advantage but with no export specialization,
3. Group C consists of products that are of export specialization with no comparative advantage,

4. Group D consists of products with neither comparative advantage nor export specialization. The indices describing the degree of export concentration were calculated based on the following formulas:

Table 2

Products Mapping

Revealed Symmetric Comparative Advantage (RSCA)	RSCA > 0 NRCA > 0	Group B Comparative Advantage Net-importer 1. (RSCA > 0 and TBI < 0) 2. (NRCA > 0 and TBI < 0)	Group A Comparative Advantage Net-exporter 1. (RSCA > 0 and TBI > 0) 2. (NRCA > 0 and TBI > 0)
Normalized Revealed Comparative Advantage (NRCA)	RSCA < 0 NRCA < 0	Group D Comparative disadvantage Net-importer 1. (RSCA < 0 and TBI < 0) 2. (NRCA < 0 and TBI < 0)	Group C Comparative disadvantage Net-exporter 1. (RSCA < 0 and TBI > 0) 2. (NRCA < 0 and TBI > 0)
		TBI < 0	TBI > 0
Trade Balance Index (TBI)			

Sources: [30, p. 67]; [26, p. 477]

1. The market concentration index of exports (MCI) [27]:

The market concentration index of exports of a product group j (at a 4-digit level) is calculated as a normalized Herfindahl-Hirschmann index using the following formula:

$$MCI_{exports,j} = \frac{\sqrt{\sum_{i=1}^m \left(\frac{x_{i,j}}{x_j}\right)^2} - \sqrt{\frac{1}{m}}}{1 - \sqrt{\frac{1}{m}}}, \quad x_j = \sum_{i=1}^m x_{i,j} \quad (5),$$

Where:

$x_{i,j}$ is the value of exports of product j from economy i .

m is the number of export destinations.

2. Product concentration index of exports (PCI) [27].

The product concentration index of country i is also calculated using the normalized Herfindahl-Hirschman index as follows:

$$PCI_{exports,i} = \frac{\sqrt{\sum_{j=1}^n \left(\frac{x_{i,j}}{x_i}\right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}}, \quad x_i = \sum_{j=1}^n x_{i,j} \quad (6),$$

Where:

$x_{i,j}$ is the value of exports of product j from country i .

n is the number of product lines (at 4-digit level).

The normalized value of the Herfindahl-Hirschman ($MCI_{exports,j}$, $PCI_{exports,i}$) Index ranges from 0 to 1, where values close to 1 indicate a higher degree of export concentration for several product lines, while values close to 0 reflect a lower level of concentration of exported products [20, p.251]. The same applies to the export market concentration index.

For calculating the indices the data were retrieved from the UN Comtrade database [28] according to HS codes at a 2-digit level, as well as the databases of foreign trade of the Statistical Committee of Armenia on the 4-digit level classification of commodity nomenclature and the database of foreign trade by country (to calculate concentration indices) [21]; [23].

Results and Discussion

Groups of products with comparative advantages were calculated for six different periods (the average of the values of indices for the period 2018-2022 and every single year) according to the HS codes at a 2-digit level (see Table 3). The results identify the following:

1. Based on the indices for the entire period, as well as according to the average values of the indices for the period 2018-2022, the following groups were identified as groups that Armenia had a strong revealed comparative advantage in producing thereof, namely: Beverages, spirits and vinegar;

Tobacco and manufactured tobacco substitutes; products, whether or not containing nicotine, intended for inhalation without combustion; other nicotine-containing products intended for the intake of nicotine into the human body; Ores, slag and ash; as well as Apparel and clothing accessories; not knitted or crocheted (except 2020 and 2022, in the case of this product groups, medium revealed comparative advantage was identified) (see Table 3). Traditionally, alcoholic beverages, especially brandy, were one of the main exported items in the export composition of Armenia and were mainly exported to Russia. On the contrary, tobacco was exported mainly to Iraq (see Table 5). The products of companies representing the mining industry were mainly exported to European countries (see Table 5). In the case of companies representing the manufacture of wearing apparel industry, Europe was also the primary market due to nearshoring practices (see Table 5).

2. The pattern of the single-year and average values of the indices of product groups with strong, medium, and weak comparative advantages identified for the period 2018-2022 nearly remained unchanged compared to previous years from 2012 to 2017 [11]; [12]; [13]. In general, the medium and weak comparative advantage was reported with respect to agriculture, food products, the manufacture of wearing apparel industry, and watches and clocks (see Table 3).

3. 10 product groups with weak comparative advantages in any year of the selected period were also identified but did not continue to have weak and/or medium comparative advantages (see Table 3).

Using a combination of the RSCA, NRCA, and the TBI, Products Mapping was carried out based on the indices for the period 2018-2022, and the average values thereof, for groups of products exported from Armenia, thus dividing them into four groups (A, B, C, D), (see Table 4). The product groups (at 2-digit level) included in Group D are not considered since in the case of this group the country is a net importer [26, p.476]. These exported products are not competitive globally and exacerbate the current account disbalance. Based on the average values, only two product groups were included in Group C. These groups were considered net exporters, however, Armenia had no comparative advantage in producing thereof, and are not addressed in this article as well (see Table 4). The exported groups with revealed comparative advantages included in Group A and considered net exporters were mainly product groups that were of at least medium revealed comparative advantage according to the Balassa index for the period 2018-2022, and the average values thereof (see Table 4). Group B includes products that Armenia had a weaker (medium) revealed comparative advantage in producing thereof and are considered net importers (see Table 4).

Thus, after mapping products based on average index values for the period 2018-2022, and for single-year values, it can be concluded that the net exported groups with revealed comparative advantages (in the case of Armenia) mainly represented agriculture, manufacture of tobacco products, wearing apparel, mining and quarrying industries and the manufacture of basis metals.

Table 3

Product groups with comparative advantage based on the Balassa Index (BRCA)

Code	Product Group	2018	2019	2020	2021	2022	2018-2021 Average	2018-2022 Average
1	Animals; live		++	+++	+++	++	++	++
3	Fish and crustaceans, molluscs, and other aquatic invertebrates	+	+	++	++	++	++	++
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included				+	+		+
6	Trees and other plants, live; bulbs, roots, and the like; cut flowers and ornamental foliage	++	++	++	++	++	++	++
7	Vegetables and certain roots and tubers; edible	++	++	++	+++	++	++	++
8	Fruit and nuts, edible; peel of citrus fruit or melons	+	+	++	++	++	++	++
9	Coffee, tea, mate, and spices					+		
16	Meat, fish, crustaceans, molluscs or other aquatic invertebrates, or insects; preparations thereof	+	+	+	+		+	+

Code	Product Group	2018	2019	2020	2021	2022	2018-2021 Average	2018-2022 Average
18	Cocoa and cocoa preparations	++	++	+	++	+	++	++
20	Preparations of vegetables, fruit, nuts, or other parts of plants	++	++	++	+++	+++	++	++
22	Beverages, spirits, and vinegar	+++	+++	+++	+++	+++	+++	+++
23	Food industries, residues and wastes thereof; prepared animal fodder					+		
24	Tobacco and manufactured tobacco substitutes; products, whether or not containing nicotine, intended for inhalation without combustion; other nicotine-containing products intended for the intake of nicotine into the human body	+++	+++	+++	+++	+++	+++	+++
25	Salt; sulphur; earths, stone; plastering materials, lime and cement	+	+	+	+		+	+
26	Ores, slag, and ash	+++	+++	+++	+++	+++	+++	+++
42	Articles of leather; saddlery and harness; travel goods, handbags, and similar containers; articles of animal gut (other than silk-worm gut)	+						
45	Cork and articles of cork					+		
57	Carpets and other textile floor coverings					+		
60	Fabrics: knitted or crocheted	+						
61	Apparel and clothing accessories: knitted or crocheted	++	+	+	+		+	+
62	Apparel and clothing accessories; not knitted or crocheted	+++	+++	++	+++	++	+++	+++
66	Umbrellas, sun umbrellas, walking-sticks, seat sticks, whips, riding crops, and parts thereof			+				
68	Stone, plaster, cement, asbestos, mica, or similar materials; articles thereof	+						
70	Glass and glassware	+		+	+		+	+
71	Natural, cultured pearls; precious, semi-precious stones; precious metals, metals clad with precious metal, and articles thereof; imitation jewelry; coin	++	+++	++	++	+++	++	+++
72	Iron and steel	++	++	++	++	++	++	++
74	Copper and articles thereof	++					+	+
76	Aluminium and articles thereof	++	++	+++	+++	++	+++	++
78	Lead and articles thereof				+			
91	Clocks and watches and parts thereof	+++	+++	+++	+		+++	++
96	Miscellaneous manufactured articles	+						

Source: [28]. Author's own calculations. The codes correspond to the HS codes at the 2-digit level. Note: (+) indicates a weak revealed comparative advantage, (++) indicates medium revealed comparative advantage, (+ + +) indicates strong revealed comparative advantage:

Table 5 shows the export groups included in Group A, with respect to which Armenia had a comparative advantage and were net exporters (see Table 5). Three groups included in Group A (1, 3, and 7) represented agriculture, which, except Chapter 1 (exported to Kuwait, Qatar, Iraq, Georgia, etc.), were mainly exported to Russia. It turns out that Armenia had a revealed comparative advantage in producing several commodities, and mainly exported to Russia (see Tables 5 and 6). The main products exported were tomatoes, mushrooms, truffles, zucchini, eggplant, spinach, cucumbers, and fish, fresh and frozen (see Table 5).

The results of Products Mapping by groups

Revealed Symmetric Comparative Advantage (RSCA)	RSCA > 0	Group B 2018 8, 16, 18, 25, 42, 60, 61, 68, 70, 96 2019 6, 8, 16, 18, 25, 61, 76 2020 8, 16, 18, 25, 61, 66, 70, 72, 76 2021 4, 6, 8, 16, 18, 25, 61, 70 2022 4, 6, 8, 9, 18, 23, 45, 57, 76 2018-2022 (average) 4, 6, 8, 16, 18, 25, 61, 70, 76	Group A 2018 3, 6, 7, 20, 22, 24, 26, 62, 71, 72, 74, 76, 91 2019 1, 3, 7, 20, 22, 24, 26, 62, 71, 72, 91 2020 1, 3, 6, 7, 20, 22, 24, 26, 62, 71, 91 2021 1, 3, 7, 20, 22, 24, 26, 62, 71, 72, 76, 78, 91 2022 1, 3, 7, 20, 22, 24, 26, 62, 71, 72 2018-2022 (average) 1, 3, 7, 20, 22, 24, 26, 62, 71, 72, 91
	Normalized Revealed Comparative Advantage (NRCA)	Group D 2018 1, 2, 4, 5, 9, 10, 11, 12, 15, 17, 19, 21, 23, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 63, 64, 65, 66, 67, 69, 73, 75, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 92, 94, 95, 97, 99 2019 2, 4, 5, 9, 10, 11, 12, 15, 17, 19, 21, 23, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 63, 64, 65, 66, 67, 68, 69, 70, 73, 78, 79, 81, 82, 83, 84, 85, 86, 87, 90, 92, 94, 95, 96, 97, 99 2020 2, 4, 5, 9, 10, 11, 12, 13, 14, 15, 17, 19, 21, 23, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 63, 64, 65, 66, 67, 68, 69, 73, 82, 83, 84, 85, 86, 87, 88, 89, 90, 92, 94, 95, 96, 97, 99 2022 2, 5, 10, 11, 12, 13, 14, 15, 16, 17, 19, 21, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61, 63, 64, 65, 66, 67, 68, 69, 70, 73, 75, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 97, 99 2018-2022 (average) 2, 5, 9, 10, 11, 12, 13, 14, 15, 17, 19, 21, 23, 25*, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 63, 64, 65, 66, 67, 68, 69, 73, 75, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 92, 94, 95, 96, 97, 99	Group C 2018 - 2019 47, 74, 88 2020 74, 97 2021 47, 74 2022 47, 74, 78 2018-2022 (average) 47, 74
	RSCA < 0 NRCA < 0	TBI < 0	TBI > 0
	Trade Balance Index (TBI)		

Source: [28]. Author's own calculations. *Note: This is only by RSCA.

Product group 22 represented mainly the manufacture of beverages and was mainly exported to Russia (brandy, wine, etc), followed by the manufacture of tobacco products, the products thereof were mainly exported to the following countries of the Middle East: Iraq, Syria, the United Arab Emirates (UAE), etc. (see Table 5). The exported products of companies representing the mining of metal ores industry were included in 2 product groups: namely, Groups 26 and 72 (copper and molybdenum concentrates, ferromolybdenum (iron alloy), and precious metal concentrates containing gold as well), and were mainly exported to Switzerland, China, the Netherlands, and Bulgaria. The main trade partners of Group 62 representing the exported items of the manufacture of wearing apparel industry were mainly

exported to the EU member-states, particularly Italy, Germany, and France. Gold, representing precious metals production, was exported to Switzerland (43.2%), the UAE (25.4%), India (24.8%), etc., and diamonds, whether or not worked, but not mounted or set, were exported to Russia, the UAE, and Belgium. Switzerland was the major export destination in the case of Group 91, and Armenia was exporting mainly clocks and watches, and parts thereof (see Table 5). Group B included exported products that had a comparative advantage and were considered net importers (see Table 6). Of the product groups included in Group B, 3 groups represented the manufacture of food products (Group 4 (excluding honey), 16, 18), and 1 represented the manufacture of wearing apparel industry (Group 61), and trees, flowers, fruits, clay, glass, and aluminum products were also included that Group as well. The leading export destination of seven out of nine commodity groups included in Group B was Russia (Group 4, 6, 8, 16, 18, 25, 61). The product lines included in Group 70 were exported to Georgia, Iran, etc, meanwhile, in the case of products of Group 76 (Aluminium and articles thereof), the main export destinations were Germany, the USA, Poland, the Netherlands, and Italy (see Table 6). Although there were nine product groups included in Group B, and Armenia was considered a net importer with respect to these items, however, Armenia had a comparative advantage in producing thereof. Interesting to note, that some major exported items included in those Groups and presented in Table 6 were considered net exporters (especially at the 10-digit level of commodity nomenclature) [22]. Thus, in the case of product groups with strong revealed comparative advantages and ensuring foreign exchange earnings for Armenia in the merchandise export composition, the dependence on a single export destination was rather high in terms of exports to Russia, since this high dependence on a single export market made the Armenian economy vulnerable to the developments taking place in Russia. In the case of net importer groups with a comparative advantage, they were mainly exported to Russia and represented the manufacture of food products and wearing apparel industries. However, the share of these products in total merchandise exports, in particular, in the period 2021-2022 was below the share of exports of products representing the mining and quarrying industry and the manufacture of basic metals in merchandise exports, with European countries being major export destinations [23]. Therefore, we believe that export diversification (by products and markets) should be implemented, and products exported to Russia need to be exported to the middle- and upper-middle-income countries, by taking into account the dependence on Europe in terms of products of mining and quarrying industry and the manufacture of basic metals. This, in turn, will contribute to the transformation of the structure of the Armenian economy.

During 2018-2022, the number of exported product lines (at a 4-digit level) increased from 812 to 924 (12% increase); so did the number of export destinations reaching 112 in 2022 compared to 107 markets in 2018 (see Table 7). The market concentration index in 2022 was 0.427, reflecting a higher dependence on the Russian market, the share of which in the merchandise exports increased by 17.57 percentage points in 2022 compared to 2021, amounting to 45.45%, explained by the fact that Armenia started exporting to Russia a higher number of product lines (in 2018: 667, and in 2022: 843), thus resulting in lower product concentration index value of 0.184 in 2022 compared to 0.276 in 2021(see Table 7). During 2018-2021, the product concentration index in Armenia ranged from 0.259 to 0.276; and only in 2022, this indicator amounted to 0.184 (see Table 7), due to exports of a broader range of products to Russia.

Table 5

Group A-exported product groups (net exporters) that have a comparative advantage

Group	The main exported product lines		Exports in 2018-2022 (million US Dollars)	Exports by five main partners									
	Code	Name of the product line		Country	%	Country	%	Country	%	Country	%	Country	%
1	104	Sheep and goats; live	33.33	Kuwait	41.0%	Qatar	32.9%	Lebanon	12.8%	Jordan	7.1%	Georgia	2.6%
	102	Bovine animals; live	32.51	Iraq	97.9%	Kuwait	1.2%	Georgia	0.6%	-	-	-	-
	106	Animals; live, n.e.c. in chapter 01	0.09	Georgia	50.5%	Russia	18.6%	UAE	13.8%	Kuwait	8.9%	Iran	5.6%

Group	The main exported product lines		Exports in 2018-2022 (million US Dollars)	Exports by five main partners									
	Code	Name of the product line		Country	%	Country	%	Country	%	Country	%	Country	%
3	302	Fish; fresh or chilled, excluding fish fillets and other fish meat of heading 0304	228.37	Russia	98.7%	Belarus	0.8%	USA	0.5%	-	-	-	-
	303	Fish; frozen, excluding fish fillets and other fish meat of heading 0304	33.44	Russia	99.2%	Belarus	0.4%	USA	0.3%	Georgia	0.2%	-	-
	304	Fish fillets and other fish meat (whether or not minced); fresh, chilled, or frozen	10.06	Russia	99.6%	Georgia	0.4%	-	-	-	-	-	-
7	702	Tomatoes; fresh or chilled	167.52	Russia	99.5%	UAE	0.3%	Latvia	0.1%	-	-	-	-
	709	Vegetables; n.e.c. in chapter 07, fresh or chilled	40.98	Russia	93.2%	UAE	5.5%	Georgia	1.2%	Ukraine	0.1%	-	-
	707	Cucumbers and gherkins; fresh or chilled	17.99	Russia	93.7%	Latvia	4.3%	Lithuania	1.5%	Poland	0.5%	-	-
20	2008	Fruit, nuts and other edible parts of plants; prepared or preserved in ways n.e.c., whether or not containing added sugar or other sweetening matter or spirit, not elsewhere specified or included	88.17	Georgia	41.0%	Russia	40.7%	USA	9.8%	Israel	1.4%	France	1.1%
	2005	Vegetables preparations n.e.c.; prepared or preserved otherwise than by vinegar or acetic acid, not frozen, other than products of heading no. 2006	66.95	Russia	82.2%	USA	7.0%	Georgia	2.7%	France	1.6%	Belarus	1.1%
	2009	Fruit or nut juices (including grape must and coconut water) and vegetable juices, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter	18.68	Russia	77.2%	Kazakhstan	5.2%	USA	3.6%	Ukraine	2.0%	France	2.0%
22	2208	Ethyl alcohol, undenatured; of an alcoholic strength by volume of less than 80% volume; spirits, liqueurs, and other spirituous beverages	1,196.04	Russia	79.6%	Ukraine	4.8%	Belarus	4.6%	USA	2.0%	Unknown country	1.5%
	2206	Fermented beverages, n.e.c. in chapter 22; (e.g. cider, perry, mead, sake)	67.01	Russia	77.0%	Lithuania	4.7%	Unknown country	3.4%	Latvia	2.7%	USA	2.2%
	2204	Wine of fresh grapes, including fortified wines; grape must other than that of heading no. 2009	60.44	Russia	62.7%	USA	11.7%	Unknown country	5.3%	Switzerland	2.4%	Ukraine	2.3%
24	2402	Cigars, cheroots, cigarillos, and cigarettes; of tobacco or of tobacco substitutes	1,340.16	Iraq	62.5%	Syria	11.6%	UAE	10.5%	Georgia	4.9%	Russia	3.8%
	2403	Manufactured tobacco and manufactured tobacco substitutes n.e.c.; homogenised or reconstituted tobacco; tobacco extracts and essences	46.48	Iraq	62.9%	Georgia	11.3%	UAE	8.0%	Syria	4.6%	Iran	4.6%
	2404	Products containing tobacco, reconstituted tobacco, nicotine, or tobacco or nicotine substitutes, intended for inhalation without combustion; other nicotine containing products intended for the intake of nicotine into the human body	18.97	Iraq	84.5%	Iran	8.3%	China	4.1%	Russia	0.7%	USA	0.6%
26	2603	Copper ores and concentrates	3,188.71	Switzerland	32.2%	China	32.1%	Bulgaria	30.6%	Canada	2.4%	Romania	1.7%

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Картирование продуктов: на примере Армении

Group	The main exported product lines		Exports in 2018-2022 (million US Dollars)	Exports by five main partners									
	Code	Name of the product line		Country	%	Country	%	Country	%	Country	%	Country	%
	2613	Molybdenum ores and concentrates	406.64	China	66.2%	Belgium	11.1%	Russia	9.1%	Switzerland	6.0%	Korea	3.9%
	2616	Precious metal ores and concentrates	119.61	Switzerland	97.4%	Malaysia	2.6%	-	-	-	-	-	-
62	6202	Coats; women's or girls' overcoats, carcoats, capes, cloaks, anoraks (including ski-jackets), wind-cheaters, wind-jackets, and similar articles, other than those of heading no. 6204 (not knitted or crocheted)	187.13	Italy	64.3%	Russia	35.5%	France	0.1%	Germany	0.1%	-	-
	6203	Suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches, and shorts (other than swimwear); men's or boys' (not knitted or crocheted)	186.14	Germany	64.7%	Russia	29.8%	Italy	3.5%	Czech	0.9%	Poland	0.5%
	6201	Overcoats, car-coats, capes, cloaks, anoraks (including ski-jackets), wind-cheaters, wind-jackets, and similar articles, men's or boys', other than those of heading no. 6203 (not knitted or crocheted)	119.60	Italy	57.9%	Russia	37.2%	Germany	4.4%	France	0.4%	-	-
71	7108	Gold (including gold plated with platinum) unwrought or in semi-manufactured forms, or in powder form	1,204.64	Switzerland	43.2%	UAE	25.4%	India	24.8%	Turkey	4.8%	Italy	1.5%
	7102	Diamonds, whether or not worked, but not mounted or set	726.07	Russia	42.0%	UAE	29.6%	Belgium	16.9%	Israel	3.9%	Canada	2.8%
	7113	Jewellery articles and parts thereof, of precious metal or of metal clad with precious metal	295.82	UAE	41.5%	USA	26.1%	Russia	11.3%	Turkmenistan	8.8%	Belarus	3.0%
72	7202	Ferro-alloys	808.33	Netherlands	89.6%	Russia	9.7%	Poland	0.3%	Switzerland	0.2%	Belarus	0.1%
	7207	Iron or non-alloy steel; semi-finished products thereof	19.92	Georgia	100.0%	-	-	-	-	-	-	-	-
	7204	Ferrous waste and scrap; remelting scrap ingots of iron or steel	12.06	Iran	32.6%	India	25.6%	Russia	21.0%	Netherlands	6.0%	Belize	5.2%
91	9111	Watch cases and parts thereof	75.27	Switzerland	99.94%	USA	0.04%	Thailand	0.01%	Russia	0.01%	-	-
	9114	Clock or watch parts; n.e.c. in chapter 91	30.16	Switzerland	99.9%	Russia	0.1%	-	-	-	-	-	-
	9102	Wrist-watches, pocket-watches, stop-watches, and other watches, other than those of heading no. 9101	14.35	Switzerland	47.4%	Latvia	20.9%	Russia	10.0%	Great Britain	6.5%	Singapore	6.5%

Sources: [23]; [28]. Author's own calculations.

Group B - exported product groups (net importers) that have a comparative advantage

Group	The main exported product lines		Exports in 2018-2022 (million US Dollars)	Exports by five main partners									
	Code	Name of the product line		Country	%	Country	%	Country	%	Country	%	Country	%
4	406	Cheese and curd	54.84	Russia	89.1%	USA	7.7%	Georgia	2.5%	Unknown country	0.3%	Vietnam	0.2%
	405	Butter and other fats and oils derived from milk; dairy spreads	19.47	Russia	98.7%	Uzbekistan	0.6%	Kazakhstan	0.6%	Georgia	0.1%	-	-
	409	Honey; natura	4.25	Suriname	69.3%	USA	25.9%	Unknown country	1.4%	France	0.8%	Russia	0.5%
6	603	Flowers; cut flowers and flower buds of a kind suitable for bouquets or for ornamental purposes, fresh, dried, dyed, bleached, impregnated, or otherwise prepared	43.31	Russia	92.4%	Georgia	6.8%	Belarus	0.8%	Sweden	0.1%	-	-
	602	Plants, live; n.e.c. in heading no. 0601, (including their roots) cuttings and slips; mushroom spawn	3.77	Russia	93.7%	Georgia	2.9%	UAE	1.8%	Iran	1.1%	Uzbekistan	0.5%
8	809	Apricots, cherries, peaches (including nectarines), plums and sloes, fresh	167.56	Russia	98.6%	Ukraine	0.4%	UAE	0.4%	Hong Kong, China	0.1%	Georgia	0.1%
	810	Fruit, fresh; n.e.c. in chapter 08	64.7	Russia	98.9%	UAE	0.7%	Qatar	0.2%	Bahrain	0.1%	-	-
	806	Grapes; fresh or dried	55.89	Russia	99.7%	Romania	0.1%	Belarus	0.1%	Moldova	0.1%	-	-
16	1604	Prepared or preserved fish; caviar and caviar substitutes prepared from fish eggs	23.22	Russia	82.0%	USA	10.8%	Israel	2.2%	Unknown country	2.1%	Belarus	0.8%
	1601	Sausages and similar products, of meat, meat offal, blood, or insects; food preparations based on these products	14.28	Georgia	62.3%	Russia	27.3%	Kyrgyzstan	5.5%	Unknown country	2.6%	Kazakhstan	1.6%
	1602	Prepared or preserved meat, meat offal, blood, or insects	5.72	Russia	64.3%	Georgia	29.8%	Syria	3.2%	Kyrgyzstan	1.2%	Kazakhstan	0.3%
18	1806	Chocolate and other food preparations containing cocoa	87.72	Russia	67.6%	Georgia	7.4%	Iran	6.0%	Ukraine	3.9%	Unknown country	3.1%
	1805	Cocoa; powder, not containing added sugar or other sweetening matter	0.07	Russia	85.5%	Belarus	9.1%	USA	5.0%	France	0.2%	Georgia	0.1%
	1804	Cocoa; butter, fat, and oil	0.05	Russia	80.5%	USA	19.2%	Kazakhstan	0.2%	Georgia	0.1%	-	-
25	2508	Clays; (not including expanded clays of heading no. 6806), andalusite kyanite and sillimanite, whether or not calcined; mulite; chamotte or dinas earth	14.38	Russia	94.6%	Belarus	3.9%	Poland	1.0%	Kyrgyzstan	0.3%	China	0.1%
	2530	Mineral substances not elsewhere specified or included	12.54	Russia	95.1%	UAE	4.2%	Belgium	0.3%	USA	0.1%	Egypt	0.1%
	2512	Siliceous fossil meals (e.g., kieselguhr, tripolite, and diatomite) and similar siliceous earths; whether or not calcined, of an apparent specific gravity of 1 or less	7.20	Germany	31.2%	Russia	23.7%	Iran	16.3%	Ukraine	12.9%	Slovakia	7.8%
61	6110	Jerseys, pullovers, cardigans, waistcoats, and similar articles; knitted or crocheted	57.86	Russia	93.3%	Germany	3.2%	Italy	0.9%	Bulgaria	0.8%	France	0.7%
	6116	Gloves, mittens and mitts; knitted or crocheted	50.92	Russia	98.9%	Ukraine	0.8%	Georgia	0.2%	Belarus	0.1%	-	-

Group	The main exported product lines		Exports in 2018-2022 (million US Dollars)	Exports by five main partners									
	Code	Name of the product line		Country	%	Country	%	Country	%	Country	%	Country	%
	6111	Garments and clothing accessories, babies'; knitted or crocheted	43	Russia	99.2%	Kazakhstan	0.7%	-	-	-	-	-	-
70	7010	Carboys, bottles, flasks, jars, pots, phials, ampoules, containers of glass of a kind used for the conveyance or packing of goods; preserving jars of glass; stoppers, lids and other closures of glass	63.36	Georgia	94.7%	Iran	2.2%	Iraq	1.3%	Moldova	0.7%	Belarus	0.4%
	7020	Glass; articles n.e.c. in chapter 70	1.3	Belarus	61.9%	Russia	24.7%	Czech	12.4%	Canada	0.5%	Hungary	0.4%
	7017	Laboratory, hygienic, or pharmaceutical glassware, whether or not graduated or calibrated	1.18	Russia	67.2%	Kazakhstan	30.2%	UAE	0.9%	Ethiopia	0.6%	Sudan	0.6%
76	7607	Aluminium foil (whether or not printed or backed with paper, paperboard, plastics, or similar backing materials) of a thickness (excluding any backing) not exceeding 0.2mm	528.46	Germany	37.2%	USA	17.9%	Poland	11.5%	Netherlands	9.7%	Italy	7.0%
	7601	Aluminium; unwrought	41.3	Switzerland	17.3%	USA	16.2%	Cyprus	13.1%	Japan	12.0%	Iran	11.7%
	7610	Aluminium; structures (excluding prefabricated buildings of heading no. 9406) and parts (e.g., bridges and sections, towers, lattice masts, etc.) plates, rods, profiles, and tubes for structures	4.74	Saudi Arabia	58.8%	Russia	21.1%	USA	7.7%	Georgia	5.1%	Bermuda.	2.7%

Sources: [23]; [28]. Author's own calculations.

Table 7

Normalized Herfindall-Hisherman indices of concentration of markets and goods

	2018	2019	2020	2021	2022
Market concentration Index	0.279	0.294	0.295	0.287	0.427
Product concentration index	0.259	0.276	0.275	0.276	0.184
Product lines (at the 4-digit level of classification)	812	778	796	783	924
Number of exported destinations	107	101	105	109	112
Exports to Russia (% ,merchandise trade of Armenia)	27.61%	28.01%	26.82%	27.87%	45.45%

Sources: [23]; [21] Author's own calculations.

Conclusion

Hence, according to the average values of the indices for the period 2018-2022, and single-year values of the same indices, the export groups with comparative advantages were identified according to HS codes at a 2-digit level. Upon carrying out product mapping based on the average index values for the period 2018-2022, and single-year values of those indices, we conclude that in the case of Armenia, the exported groups that had revealed comparative advantages and were considered net exporters mainly represented the agriculture, the manufacture of beverages, tobacco products, as well as wearing apparel industries, and mining and quarrying industry and the manufacture of basic metals. Of the products included in Group A, three groups represented agriculture products, which, except Group 1, were exported to Russia. The leading export destination of seven out of nine product groups included in Group B was Russia.

In the case of product groups with revealed strong comparative advantage in the composition of Armenia's merchandise exports, dependence on a single market, namely Russia, needs to be addressed since that makes the Armenian economy vulnerable to developments taking place in Russia. Therefore, export diversification should be prioritized, and more products exported to Russia should be channeled to middle- and upper-middle-income countries. This, in turn, will contribute to the transformation of Armenia's economy.

The market concentration index in 2022 was 0.427, reflecting a greater dependence on the Russian market, since the share in the merchandise exports increased by 17.57 percentage points in 2022 compared to 2021 and amounted to 45.45%, because Armenia started exporting more product lines to Russia in 2022 than in 2021, thus resulting in lower product concentration index in 2022 (0.184) than in 2021 (0.276).

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