IQTISODIY TARAQQIYOT VA TAHLIL ILMIY ELEKTRON JURNAL

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STRUCTURAL TRANSFORMATION AND EXPORT SOPHISTICATION IN CENTRAL ASIAN ECONOMIES: A COMPARATIVE ANALYSIS OF PRODUCT COMPLEXITY

Adashaliyeva Ibodatkhon
Institute of Macroeconomic and Regional Studies
ORCID: 0009-0007-6380-2325
i.adashaliyeva@imrs.uz
Jabbarova Nodira
Institute of Macroeconomic and Regional Studies
ORCID: 0009-0001-1070-9211
n.jaborova@imrs.uz

Abstract. *Central Asian economies have experienced notable economic restructuring and growing integration into global markets in recent years. This study analyzes the Product Complexity Index (PCI) of Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan from 2017 to 2024. Results show modest complexity gains in Uzbekistan, Kazakhstan, and Turkmenistan, linked to gradual industrial upgrading, while Kyrgyzstan and Tajikistan exhibit declining complexity due to reliance on low-value, resource-based exports. Strengthening product complexity is essential for export diversification, technological upgrading, and sustainable long-term growth in the region.*

Keywords: *Product Complexity Index (PCI), export diversification, Central Asia, value-added production, export structure.*

МАРКАЗИЙ ОСИЁ МАМЛАКАТЛАРИ ЭКСПОРТИ СТРУКТУРАСИДАГИ ЎЗГАРИШЛАР ВА ЭКСПОРТ МУРАККАБЛИГИ: МАҲСУЛОТ МУРАККАБЛИГИ БЎЙИЧА ТАҚҚОСЛАМА ТАҲЛИЛ

Адашалиева Ибодатхон
Макроиқтисодий ва ҳудудий тадқиқотлар институти
Жаббарова Нодира
Макроиқтисодий ва ҳудудий тадқиқотлар институти

Аннотация. *Сўнгги йилларда Марказий Осиё мамлакатлари иқтисодий тузилмасидаги ўзгаришларни ва жаҳон бозорларига интеграциясини кучайтирмоқда. Ушбу тадқиқот 2017-2024 йилларда Ўзбекистон, Қозоғистон, Қирғизистон, Тожикистон ва Туркманистоннинг маҳсулот мураккаблик индекси (PCI)ни таҳлил қилади. Натижалар Ўзбекистон, Қозоғистон ва Туркманистонда саноатни босқичма-босқич модернизация қилиш билан мураккаблик ошиб бораётганини, Қирғизистон ва Тожикистонда эса паст қийматли хомашё экспортга таяниш сабаб PCI кўрсаткичлари пасайганини кўрсатди. Маҳсулот мураккаблигини ошириш диверсификация ва барқарор ўсиш учун муҳимдир.*

Калит сўзлар: *маҳсулот мураккаблиги индекси (PCI), экспорт диверсификацияси, Марказий Осиё, қўшилган қийматга эга маҳсулотлар ишлаб чиқариш, экспорт таркиби.*

СТРУКТУРНАЯ ТРАНСФОРМАЦИЯ И ТЕХНОЛОГИЧЕСКАЯ СЛОЖНОСТЬ ЭКСПОРТА В СТРАНАХ ЦЕНТРАЛЬНОЙ АЗИИ: СРАВНИТЕЛЬНЫЙ АНАЛИЗ СЛОЖНОСТИ ЭКСПОРТНОЙ КОРЗИНЫ

Адашалиева Ибодатхон
Институт макроэкономических и региональных исследований
Жаббарова Нодира
Институт макроэкономических и региональных исследований

Аннотация. *В последние годы страны Центральной Азии усиливают экономическую перестройку и интеграцию в мировые рынки. Данное исследование анализирует Индекс сложности продукции (PCI) в Узбекистане, Казахстане, Кыргызстане, Таджикистане и Туркменистане за 2017-2024 годы. Результаты показывают умеренный рост сложности в Узбекистане, Казахстане и Туркменистане, связанный с постепенной индустриализацией, тогда как в Кыргызстане и Таджикистане наблюдается снижение из-за преобладания сырьевого и низкотехнологичного экспорта. Повышение сложности продукции является ключевым фактором диверсификации и устойчивого экономического роста.*

Ключевые слова: *индекс сложности продукции (PCI), диверсификация экспорта, Центральная Азия, производство с добавленной стоимостью, структура экспорта.*

Introduction.

In recent years, Central Asian countries have experienced faster economic growth, greater activity in international trade, and stronger ambitions to access global markets. These developments have brought notable changes to the region's economic performance. Countries are focusing on boosting their export potential, entering new markets, and producing higher value-added goods. In this context, the Product Complexity Index (PCI), which measures the sophistication of exported products, has become strategically important.

The analysis shows that export structures across the Central Asian region vary: some countries continue to rely on natural resource exports, while others are moving toward industrialization and the production of more technologically advanced goods. This allows for an assessment of each country's product complexity and its potential to diversify exports.

Literature review.

Economic development has long been linked to structural transformation – the shift of an economy's resources from low-productivity activities (e.g. traditional agriculture or primary commodities) to higher-productivity industrial and service activities. Classic development theorists emphasized this transition. For example, Lewis (1955) and Kuznets (1966) highlighted how labor moves from subsistence sectors to modern industries as a key driver of growth. Similarly, Rostow's (1959) stages of growth outline a progression from agrarian to industrial economies, and Kaldor (1967) stressed the role of manufacturing as an engine of growth. These early perspectives noted that different sectors have different productivity levels, demand elasticities, and market structures, implying that what an economy produces and exports matters for its development trajectory.

A central theme in this early literature is that developing countries must diversify and upgrade their production structure. Relying on a narrow base of primary commodities or simple products can lead to vulnerabilities and limited growth, whereas moving into more sophisticated, value-added products can set the stage for sustained income gains. This intuition laid the groundwork for later quantitative measures of product sophistication and complexity.

One of the most robust insights from the economic complexity literature is that richer economies systematically export more complex products, and that complexity metrics are strong predictors of future growth. Hausmann and Hidalgo demonstrated that a country's ECI correlates strongly with its subsequent GDP growth – more so than traditional measures like governance or human capital in some studies.

Empirical research has reinforced this point. For instance, Hausmann et al. (2014) (the Atlas of Economic Complexity) documented that countries rarely achieve high incomes without a corresponding high complexity of exports, and they estimated that complexity has a positive causal impact on subsequent income growth. Similarly, IMF economists Anand, Mishra, and Spatafora (2012) found that increases in export sophistication (measured by EXPY) over two decades were associated with higher growth, especially in low- and middle-income countries. They also noted regional differences: East Asian economies rapidly upgraded export sophistication and saw growth take off, whereas many resource-rich economies lagged on sophistication despite high GDP growth during commodity booms. The message is clear: diversification into complex products is not just correlation but potentially a driver of development.

Product complexity, capability accumulation and export sophistication are tightly interlinked. The Product Complexity Index can be viewed as a quantitative proxy for the breadth and depth of productive knowledge that an economy has amassed. A country exporting high-PCI products (say, specialized machinery or chemicals) has acquired a wide array of skills, technologies and institutional know-how, whereas one exporting mostly low-PCI goods (such as unprocessed commodities) has a much narrower capability base. This difference is reflected in income levels and growth potential: advanced economies not only produce more, but produce "smarter" – their exports embody far more know-how.

Research methodology.

This analysis employs the Product Complexity Index (PCI) methodology developed by the Growth Lab at Harvard Kennedy School. The methodology consists of the following key stages:

Export data: Detailed information on products exported from Uzbekistan during the period 2017–2024 was obtained from the database of the State Committee of the Republic of Uzbekistan on Statistics. Export data for Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan were drawn from the International Trade Center (ITC) database. The analysis considers both the volume and value of all products exported during this period.

PCI data: Product Complexity Index (PCI) values for each product were sourced from the online platform of the Growth Lab at Harvard University. Based on these data, the technological level and complexity of the product composition exported by Central Asian countries were assessed.

The overall PCI for each year t is calculated using the formula provided:

$$PCI_t^{overall} = \sum_{i=1}^{n} (PCI_{it} * \frac{E_{it}}{TE_t}) = \sum_{i=1}^{n} (PCI_{it} * \omega_{it})$$

Where,

$PCI_t^{overall}$ represents the overall PCI of the exports of goods in period t;

PCI_{it} is the PCI of the i-exported product in period t;

E_{it} denotes the export volume of product i in period t;

TE_t is the volume of the total exports of goods in period t;

ω_{it} represents the share or weight of the i-exported product in the period t, calculated as $\omega_{it} = \frac{E_{it}}{TE_t}$.

Stages of Analysis.

Share calculation: For each year, the share of exported products in total exports is determined. This is done by dividing the export volume of each product by the total export volume.

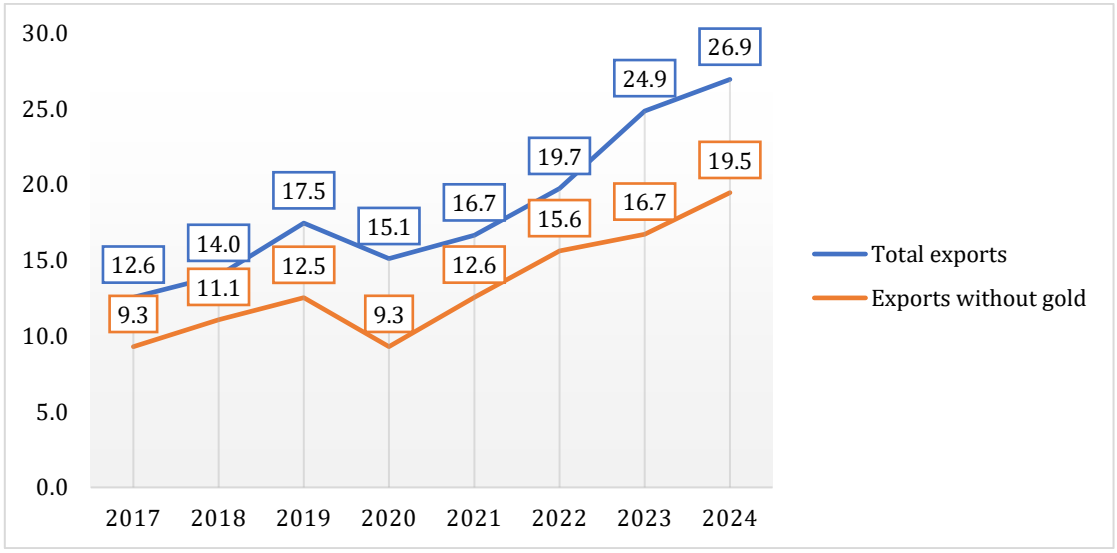
Product contribution calculation: The PCI value of each product is multiplied by its share in total exports. This shows the product's contribution to overall complexity.

PCI aggregation: The calculated PCI contributions of all products are summed up, providing the overall PCI value of the export portfolio for each year.

Analysis and discussion of results.

Between 2017 and 2024, Uzbekistan's total exports increased significantly. The export volume, which amounted to 12.6 billion USD in 2017, rose 2.1 times to reach 26.9 billion USD in 2024. However, gold exports continued to play a crucial role in the country's export structure, accounting for 27.8 percent of total exports in 2024. This indicates that many of the observed changes in export dynamics are closely linked to fluctuations in gold exports.

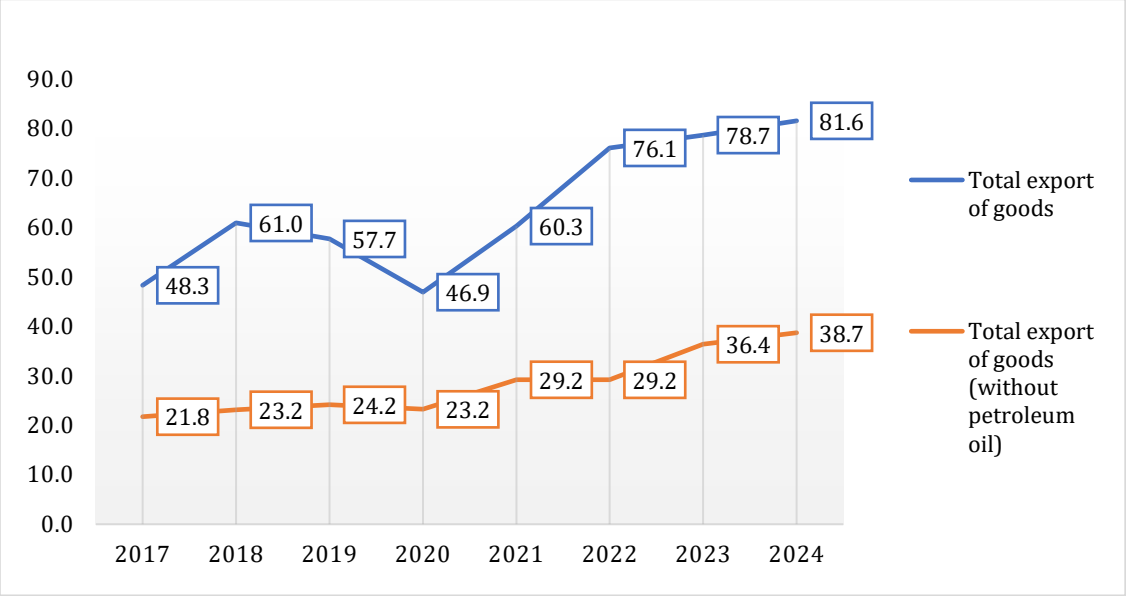
In particular, exports excluding gold stood at 9.3 billion USD in 2017 and increased to 19.5 billion USD in 2024, reflecting steady growth in the non-gold export segment. In recent years, the growth of non-gold exports indicates that efforts aimed at diversifying the country's export structure have intensified.



Picture 1. Uzbekistan's exports between 2017 and 2024

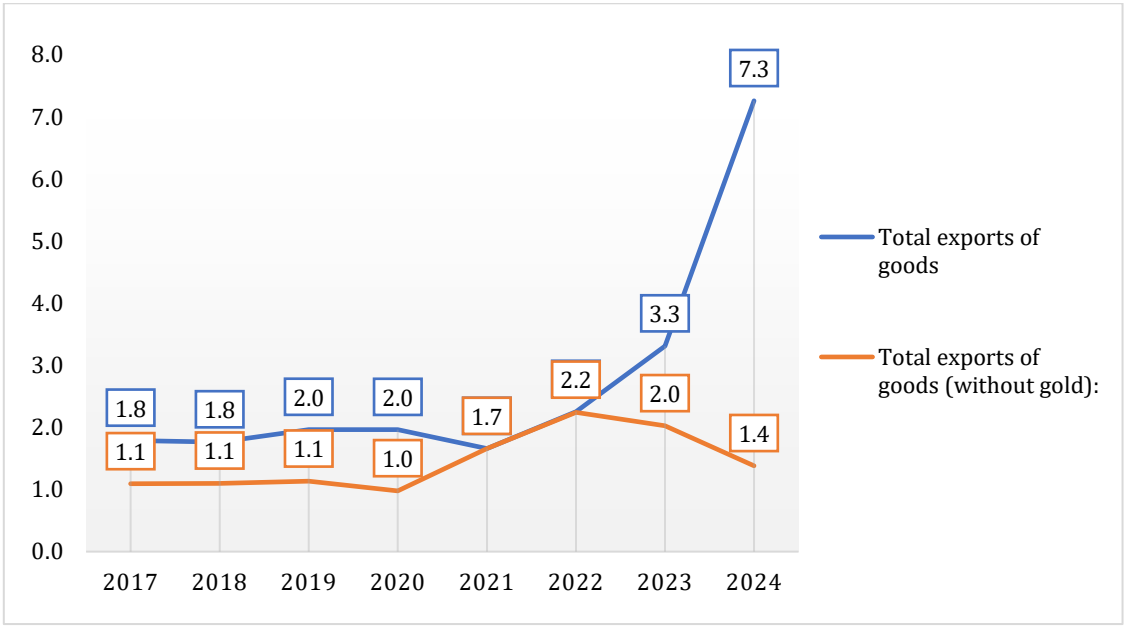
In 2017, Kazakhstan's goods exports totaled 48.3 billion USD, and by 2024 this figure had reached 81.6 billion USD, an increase of almost 1.7 times. In 2020, exports fell sharply due to the pandemic. In the following years, however, the situation stabilized. Exports recovered in 2021 and in 2022 exports reached a record high of USD 76.1 billion due to a sharp rise in the prices of oil, uranium, and copper. Although growth slowed in 2023–2024, the overall stable positive trend has been maintained.

Kazakhstan remains primarily a raw material–exporting country. Oil is its main export product, accounting for more than 50 percent of total goods export revenues for many years. In 2022, this share even reached 62 percent and decline to 53 percent in 2024. After oil, the main positions are held by mining products such as refined copper, copper ores, ferroalloys, uranium, and iron ores. Together these products are making up around 20–25 percent of exports. This indicates that Kazakhstan's trade balance is still heavily dependent on global prices for oil and metals.



Picture 2. Kazakhstan's exports between 2017 and 2024

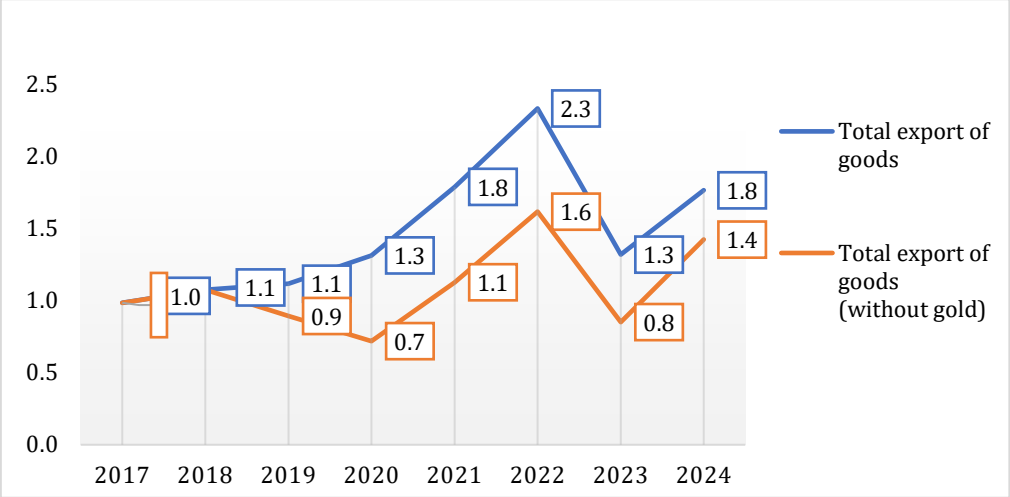
Kyrgyzstan's total goods exports also showed steady growth between 2017 and 2024. In 2017 and 2018, export volume amounted to 1.8 billion USD, while in 2021 the lowest level of the period was recorded, with exports falling to 1.7 billion USD. In the following years, exports began to increase, reaching 7.3 billion USD in 2024. This growth was mainly driven by precious metals, particularly gold, highlighting the important role gold continues to play in Kyrgyzstan's exports.



Picture 3. Kyrgyzstan's exports between 2017 and 2024

In 2024, Kyrgyzstan's exports excluding gold amounted to only USD 1.4 billion which accounts for 19.2 percent of total export of goods. This highlights the country's continued reliance on gold and the limited level of diversification in its economy.

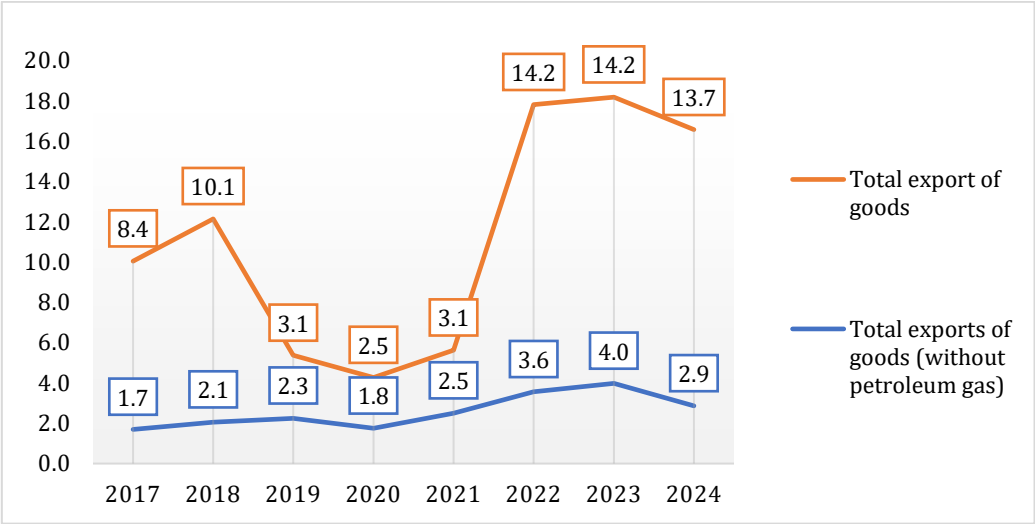
Between 2017 and 2024, Tajikistan's total goods exports grew from 1 billion USD in 2017 to 1.8 billion USD in 2024. The most notable expansion occurred between 2021 and 2022, when exports rose sharply from 1.8 billion USD to 2.3 billion USD, reflecting post-pandemic recovery and stronger external demand. However, a temporary decline was observed in 2023 (to 1.3 billion USD), before rebounding in 2024.



Picture 4. Tajikistan's exports between 2017 and 2024

The non-gold exports followed a similar volatile pattern. The exports excluding gold increased significantly from 0.7 billion USD in 2020 to 1.6 billion USD in 2022, but again decreased in 2023 before recovering to 1.4 billion USD in 2024.

Turkmenistan's total merchandise exports fluctuated over the period 2017–2024. In 2017 and 2018, export volumes stood at 8.4 billion USD and 10.1 billion USD, respectively. In 2019 and 2020, however, they fell sharply to 3.1 billion USD and 2.5 billion USD. Exports recovered in subsequent years, reaching a peak of 14.2 billion USD in 2022, the highest level of the period under review. By 2024, export volumes had slightly declined to 13.7 billion USD. These dynamics were largely driven by shifts in oil and gas exports, which constitute the dominant share of Turkmenistan's total exports.



Picture 5. Turkmenistan's exports between 2017 and 2024

Exports without petroleum oil remained at relatively low levels. In 2017, they amounted to 1.7 billion USD, before reaching their highest point of 4.0 billion USD in 2022. However, by 2024 the volume of non–oil and gas exports had fallen to 2.9 billion USD. These dynamics underscore Turkmenistan's strong dependence on hydrocarbons as its primary source of export revenues and indicate the limited degree of diversification within the national economy.

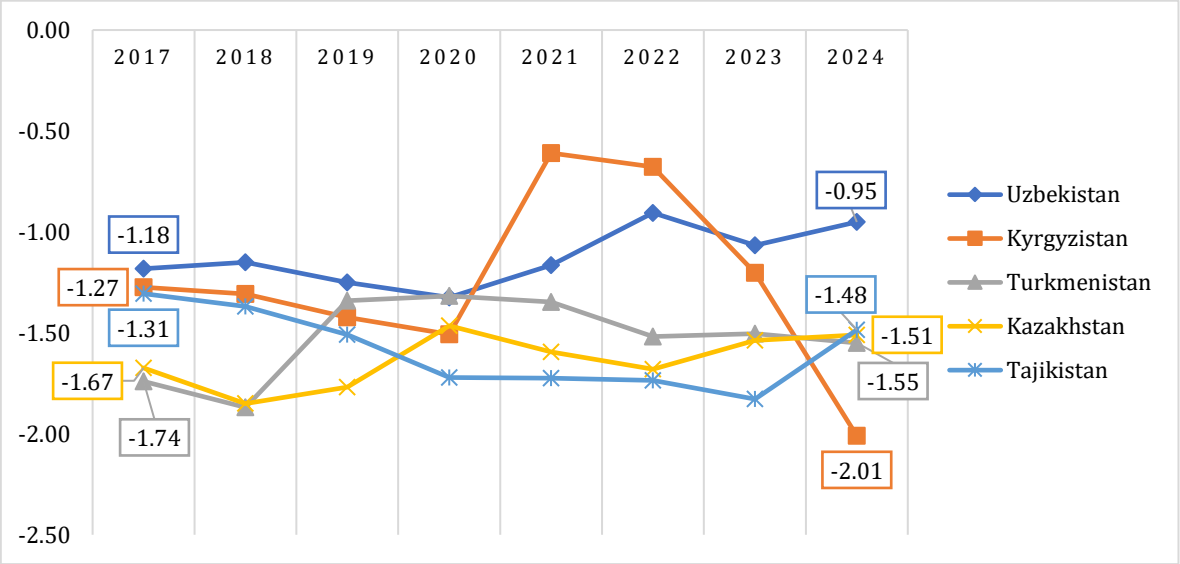
Dynamic analysis of PCI in Central Asia

From 2017 to 2024, Central Asian countries showed different patterns in the development of their export structures. Uzbekistan, Kazakhstan, and Turkmenistan maintained relatively stable Product Complexity Index (PCI) levels with an overall growth, while

Kyrgyzstan and Tajikistan recorded declines, pointing to continued dependence on raw material exports.

Uzbekistan's PCI improved from -1.18 in 2017 to -0.95 in 2024. The index dropped to -1.32 in 2020, mainly due to a sharp rise in gold exports to 5.8 billion USD. When gold exports fell to 4.1 billion USD in 2022, the PCI reached -0.90, the highest level during the period. This shows that, despite the dominant role of gold, Uzbekistan's export structure is gradually diversifying and including more complex products.

Kazakhstan also recorded an improvement, with the PCI rising from -1.67 in 2017 to -1.51 in 2024. The lowest level was in 2018 (-1.85). The gradual recovery reflects some growth of higher-technology sectors, but the overall index remains negative. The main reason is the large share of crude oil, which accounted for 52.5 percent of exports in 2024 and has a low PCI of -2.27. The heavy reliance on oil continues to hold back Kazakhstan's overall export complexity.



Picture 6. PCI Index of Central Asian Countries for 2017-2024

In Kyrgyzstan, the PCI stood at -1.27 in 2017 and, after sharp fluctuations, rose to -0.61 in 2021. However, in the following years the index declined again, reaching -2.01 in 2024. These shifts are closely linked to the country's gold exports, which dominate the export structure. In 2021, gold exports fell to zero, which significantly improved the PCI level. By contrast, in 2024 gold exports reached a record of 5.9 billion USD, contributing to a sharp deterioration in the overall index.

Tajikistan's PCI was -1.31 in 2017 but worsened to -1.48 in 2024, reflecting a negative trend over the seven-year period. The lowest value was recorded in 2023 at -1.83. This trajectory highlights the dominance of low-technology and unprocessed raw materials in the country's export basket. The strongest negative impact on Tajikistan's PCI comes from gold, metal ores and concentrates, and aluminum, which accounted for 19.4, 11.8, and 12.4 percent of total exports, respectively.

Turkmenistan showed a slight improvement in its PCI, rising from -1.73 in 2017 to -1.55 in 2024. The changes mainly come from fluctuations in natural gas exports, which remain the cornerstone of the country's trade. In 2018, gas exports increased to 8 billion USD, pushing the PCI down to -1.87. By 2020, the index reached its highest level of -1.32, mainly due to a steep decline in gas exports to 765 million USD. Despite the recent surge in gas exports to record levels, Turkmenistan's PCI has continued to improve, suggesting that alongside energy dependence, the share of more complex products in the export structure is gradually increasing.

Sectoral analysis. Uzbekistan

Between 2017 and 2024, Uzbekistan's export structure was dominated by precious and semi-precious stones (14) and textile products (11). In 2024, these sectors accounted for 29.7 percent and 11.3 percent of total exports, respectively. Other important contributors included vegetable products (2) with a share of 7.5 percent and base metals and articles of base metals (15) with 6.4 percent. Mineral products (5) held a relatively high share in earlier years with 13.5 percent in 2017 and 19.6 percent in 2018, but their contribution fell to 5.3 percent by 2024. This decline is primarily explained by the reduction in natural gas exports: from 2.5 billion USD in 2018 to only 628 million USD in 2024.

Table 1.

Share of sectors in Uzbekistan's exports

№	Sector	Share of sectors in exports							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.2%	0.2%	0.1%	0.2%	0.2%	0.3%	0.2%	0.5%
2	Vegetable products	6.3%	7.4%	8.4%	9.2%	9.2%	7.9%	6.8%	7.5%
3	Animal or vegetable oils	0.0%	0.0%	0.1%	0.2%	0.0%	0.2%	0.1%	0.2%
4	Prepared foodstuffs	0.6%	0.5%	0.7%	0.7%	0.9%	1.2%	1.1%	1.2%
5	Mineral products	13.5%	19.6%	15.1%	5.0%	6.3%	6.7%	4.0%	5.3%
6	Chemical products	2.0%	1.7%	1.3%	1.7%	2.9%	3.1%	2.3%	2.3%
7	Plastics, rubber and products made from them	3.6%	3.3%	2.4%	2.2%	2.6%	2.2%	1.5%	1.5%
8	Leather raw materials, natural fur and products made from them	0.8%	0.9%	0.3%	0.2%	0.3%	0.2%	0.2%	0.2%
9	Wood and articles of wood	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
10	Products made of wood or other fibrous cellulose materials	0.3%	0.3%	0.2%	0.3%	0.4%	0.6%	0.4%	0.3%
11	Textile products	13.2%	11.2%	11.3%	14.2%	19.3%	17.0%	13.0%	11.3%
12	Footware, hats, and other accessories	0.1%	0.1%	0.2%	0.3%	0.3%	0.3%	0.2%	0.1%
13	Artiles of stone, gypsum, cement, asbestos, mica	0.7%	0.2%	0.2%	0.5%	0.8%	0.9%	0.6%	0.7%
14	Precious or semi-precious stones	28.2%	21.9%	29.6%	40.1%	26.5%	22.2%	34.1%	29.7%
15	Base metals and articles of base metals	7.5%	8.5%	7.3%	8.4%	10.1%	8.6%	6.6%	6.4%
16	Machines, appliances and equipment	1.5%	0.9%	1.3%	1.5%	1.8%	3.1%	2.9%	2.5%
17	All types of vehicles	1.3%	0.6%	1.2%	1.5%	2.5%	1.9%	2.4%	2.1%
18	Optical, photographic and other types of instruments and equipment	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
19	Arms and Ammunition	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20	Miscellaneous industrial products	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.2%	0.1%
21	Works of art, collections and antiquities	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

By contrast, sectors such as wood and articles of wood (9), footwear, hats, and accessories (12), optical, photographic, and other instruments (18), and miscellaneous industrial products (20) played only a marginal role, together accounting for just 0.1 percent of total exports in 2024.

Kazakhstan. Between 2017 and 2024, Kazakhstan's external trade structure underwent notable shifts across product groups. From the perspective of the Product Complexity Index, these structural changes are highly relevant for assessing both the country's level of technological development and its competitiveness in international markets. Mineral products (5) have traditionally dominated Kazakhstan's export structure. In 2017, they accounted for 68.6 percent of total exports, and by 2024 their share had slightly declined to 63.5 percent. Despite this reduction, hydrocarbons and related commodities continue to form the backbone of the country's trade profile, underlining persistent dependence on raw materials.

By contrast, base metals and articles of base metals (15) and chemical products (6) demonstrated more dynamic trends. The share of base metals declined from 18.1 percent in 2017 to 13.4 percent in 2024, while chemicals increased from 4.9 percent to 7.9 percent over the same period. These changes suggest that, in line with ongoing industrial diversification policies, more complex products are slowly gaining ground in the export basket.

Table 2.

Share of sectors in Kazakhstan's exports

№	Sector	Share of sectors in exports							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	3.6%	3.7%	4.2%	5.1%	4.5%	4.6%	4.5%	3.4%
2	Vegetable products	**3.6%**	**3.7%**	**4.1%**	**5.1%**	**4.5%**	**4.6%**	**4.5%**	**3.4%**
3	Animal or vegetable oils	0.2%	0.2%	0.3%	0.4%	0.4%	0.6%	0.5%	0.7%
4	Prepared foodstuffs	0.8%	0.7%	0.7%	1.0%	0.8%	0.9%	1.3%	1.6%
5	Mineral products	**68.6%**	**74.6%**	**72.8%**	**65.9%**	**65.9%**	**67.8%**	**66.0%**	**63.5%**
6	Chemical products	4.9%	4.0%	4.5%	5.8%	4.9%	5.1%	6.6%	7.9%
7	Plastics, rubber and products made from them	**0.2%**	**0.2%**	**0.2%**	**0.3%**	**0.3%**	**0.4%**	**0.7%**	**0.8%**
8	Leather raw materials, natural fur and products made from them	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	Wood and articles of wood	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.2%	0.1%
10	Products made of wood or other fibrous cellulose materials	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
11	Textile products	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%	0.4%	0.4%
12	Footware, hats, and other accessories	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
13	Artiles of stone, gypsum, cement, asbestos, mica	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.2%**
14	Precious or semi-precious stones	1.2%	0.9%	0.7%	1.5%	1.4%	0.9%	1.4%	1.3%
15	Base metals and articles of base metals	18.1%	13.6%	13.5%	16.2%	17.4%	14.0%	12.2%	13.4%
16	Machines, appliances and equipment	0.9%	0.8%	0.9%	1.1%	2.1%	3.5%	3.8%	3.8%
17	All types of vehicles	0.4%	0.3%	1.0%	1.7%	1.1%	1.0%	1.2%	1.8%
18	Optical, photographic and other types of instruments and equipment	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.3%
19	Arms and Ammunition	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
20	Miscellaneous industrial products	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%
21	Works of art, collections and antiquities	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%

All remaining sectors together accounted for less than 4 percent of total exports in 2024, underscoring the highly concentrated nature of Kazakhstan's trade structure. Overall, while the gradual rise of chemical exports signals movement toward greater complexity, the overwhelming share of mineral products continues to constrain Kazakhstan's ability to substantially upgrade its export sophistication.

Kyrgyzstan

Between 2017 and 2024, Kyrgyzstan's export structure was largely dominated by precious and semi-precious stones (14). In several years, this category accounted for 40 to 50 percent of total exports, and by 2024 its share exceeded 80 percent. This reflects the central role of gold, which remains the country's primary export commodity.

In addition, mineral products (5) also represented a relatively significant share of exports. In 2024, these sector's share accounted for 9.5 percent of total exports, respectively.

Live animals and animal products (1), vegetable products (2) and base metals and articles of base metals (15) accounted for 1.8, 1.3 and 1.2 percent of total exports, respectively. All other sections each contributed less than 1 percent to the export structure.

Tajikistan

As of 2024, Tajikistan's export structure was heavily concentrated in mineral products (5) and base metals and articles of base metals (15), which accounted for 30.2 percent and 33.8 percent of total exports, respectively. Other major contributors included precious and semi-precious metals, with a 19.7 percent share in 2024, as well as textiles, which decreased from 18.5 percent in 2017 to 5.4 percent in 2024. These patterns illustrate the country's persistent dependence on raw materials and low-technology, minimally processed goods.

An analysis of sectoral changes in Tajikistan's export composition between 2017 and 2024 further reinforces this conclusion. From the perspective of the Product Complexity Index, the country's export basket remains dominated by unprocessed raw materials and

technologically simple products. As a result, Tajikistan's overall PCI declined from -1.31 in 2017 to -1.48 in 2024, underscoring the limited progress toward diversification and structural upgrading.

Table 3.

Share of sectors in Kyrgyzstan's exports

№	Sector	Share of sectors in exports							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	3.1%	2.6%	3.1%	4.0%	5.1%	6.8%	3.6%	1.8%
2	Vegetable products	7.3%	5.4%	6.7%	6.2%	10.2%	9.8%	5.0%	1.3%
3	Animal or vegetable oils	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4	Prepared foodstuffs	2.8%	3.1%	2.9%	2.5%	4.5%	3.0%	2.5%	0.9%
5	Mineral products	13.4%	16.6%	15.9%	13.7%	17.9%	16.2%	13.8%	9.5%
6	Chemical products	0.8%	0.7%	1.5%	1.1%	1.2%	1.2%	1.2%	0.7%
7	Plastics, rubber and products made from them	1.3%	1.1%	1.7%	2.2%	2.4%	2.5%	2.1%	0.6%
8	Leather raw materials, natural fur and products made from them	0.7%	0.6%	0.6%	0.4%	0.6%	1.6%	0.5%	0.2%
9	Wood and articles of wood	0.0%	0.0%	0.2%	0.3%	0.6%	0.6%	0.1%	0.2%
10	Products made of wood or other fibrous cellulose materials	0.3%	0.2%	0.3%	0.5%	0.3%	0.5%	0.1%	0.1%
11	Textile products	9.4%	10.6%	7.5%	4.6%	8.2%	21.8%	5.7%	0.3%
12	Footware, hats, and other accessories	2.9%	1.3%	0.8%	0.2%	0.5%	3.3%	1.4%	0.0%
13	Artiles of stone, gypsum, cement, asbestos, mica	2.3%	2.8%	2.6%	1.9%	7.2%	4.4%	2.0%	0.7%
14	Precious or semi-precious stones	39.6%	38.7%	43.4%	51.5%	0.0%	0.8%	38.9%	81.1%
15	Base metals and articles of base metals	3.2%	8.7%	6.2%	4.0%	10.3%	10.8%	5.9%	1.2%
16	Machines, appliances and equipment	4.0%	3.2%	2.1%	2.6%	6.1%	9.3%	10.7%	0.6%
17	All types of vehicles	7.8%	3.7%	3.3%	2.9%	3.3%	4.3%	5.1%	0.4%
18	Optical, photographic and other types of instruments and equipment	0.3%	0.2%	0.3%	0.2%	0.3%	0.3%	0.5%	0.1%
19	Arms and Ammunition	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
20	Miscellaneous industrial products	0.3%	0.2%	0.5%	0.4%	0.4%	2.4%	0.4%	0.1%
21	Works of art, collections and antiquities	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4.

Share of sectors in Tajikistan's exports

№	Sector	Share of sectors in exports							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.05%	0.06%	0.06%	0.03%	0.03%	0.13%	0.01%	0.32%
2	Vegetable products	2.63%	1.87%	2.41%	1.98%	2.23%	2.68%	4.66%	2.39%
3	Animal or vegetable oils	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
4	Prepared foodstuffs	0.51%	0.35%	0.45%	0.67%	0.40%	0.35%	0.79%	1.46%
5	Mineral products	49.31%	50.74%	35.92%	20.90%	27.28%	38.40%	31.88%	30.15%
6	Chemical products	0.28%	0.74%	0.72%	0.45%	0.68%	0.68%	0.20%	5.30%
7	Plastics, rubber and products made from them	0.08%	0.04%	0.08%	0.04%	0.10%	0.07%	0.02%	0.08%
8	Leather raw materials, natural fur and products made from them	0.25%	0.24%	0.24%	0.22%	0.23%	0.17%	0.55%	0.52%
9	Wood and articles of wood	0.04%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%
10	Products made of wood or other fibrous cellulose materials	0.01%	0.09%	0.10%	0.05%	0.05%	0.17%	0.35%	0.38%
11	Textile products	18.48%	21.09%	17.97%	14.96%	15.63%	11.93%	9.82%	5.39%
12	Footware, hats, and other accessories	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
13	Artiles of stone, gypsum, cement, asbestos, mica	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.01%	0.01%
14	Precious or semi-precious stones	0.15%	0.19%	20.23%	45.44%	37.27%	30.79%	35.76%	19.69%
15	Base metals and articles of base metals	23.32%	21.92%	19.53%	14.26%	14.89%	13.71%	15.70%	33.82%
16	Machines, appliances and equipment	1.45%	0.95%	0.62%	0.41%	0.55%	0.33%	0.10%	0.19%
17	All types of vehicles	2.63%	1.52%	1.43%	0.46%	0.50%	0.43%	0.04%	0.12%
18	Optical, photographic and other types of instruments and equipment	0.66%	0.06%	0.08%	0.01%	0.03%	0.02%	0.02%	0.04%
19	Arms and Ammunition	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
20	Miscellaneous industrial products	0.03%	0.03%	0.05%	0.09%	0.07%	0.06%	0.03%	0.10%
21	Works of art, collections and antiquities	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%

Turkmenistan

From 2017 to 2024, Turkmenistan's export structure was overwhelmingly concentrated in mineral products (5), which accounted for between 62.3 percent of total exports in 2020 and as much as 93.7 percent in 2024. This dominance reflects the country's strong dependence on oil and gas resources as the foundation of its economy.

Chemicals products (6) and textile products (11) also featured in the export basket, particularly in 2021 when their shares rose to 13.7 percent and 13.8 percent, respectively. By 2024, however, their contributions had declined to 3.9 percent and 1 percent. The remaining sectors each accounted for less than 1 percent of exports in 2024, highlighting their limited role in the overall trade profile.

Overall, these trends underscore Turkmenistan's continued reliance on hydrocarbons, with diversification into chemicals and textiles being temporary and constrained in scope.

Table 5.

Share of sectors in Turkmenistan's exports

№	Sector	Share of sectors in exports							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	Vegetable products	1.1%	0.7%	1.9%	2.5%	3.1%	0.6%	0.5%	0.5%
3	Animal or vegetable oils	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4	Prepared foodstuffs	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%	0.0%	0.1%
5	Mineral products	90.6%	92.9%	75.7%	62.3%	62.7%	90.1%	93.4%	93.7%
6	Chemical products	1.0%	1.0%	6.8%	11.9%	13.7%	5.8%	4.6%	3.9%
7	Plastics, rubber and products made from them	0.8%	0.7%	2.3%	2.7%	2.6%	0.3%	0.1%	0.3%
8	Leather raw materials, natural fur and products made from them	0.1%	0.1%	0.2%	0.2%	0.3%	0.1%	0.1%	0.1%
9	Wood and articles of wood	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10	Products made of wood or other fibrous cellulose materials	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11	Textile products	5.5%	3.5%	9.9%	9.8%	13.8%	2.3%	1.2%	1.0%
12	Footware, hats, and other accessories	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
13	Artiles of stone, gypsum, cement, asbestos, mica	0.0%	0.1%	0.4%	0.4%	0.5%	0.1%	0.0%	0.1%
14	Precious or semi-precious stones	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
15	Base metals and articles of base metals	0.2%	0.0%	0.4%	2.0%	2.8%	0.5%	0.1%	0.1%
16	Machines, appliances and equipment	0.0%	0.2%	0.6%	0.2%	0.2%	0.0%	0.1%	0.1%
17	All types of vehicles	0.1%	0.4%	0.4%	7.8%	0.1%	0.2%	0.0%	0.0%
18	Optical, photographic and other types of instruments and equipment	0.2%	0.3%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%
19	Arms and Ammunition	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20	Miscellaneous industrial products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
21	Works of art, collections and antiquities	0.5%	0.4%	2.1%	0.0%	0.3%	0.0%	0.0%	0.0%

Top sectors with positive PCI growths

Uzbekistan

Between 2017 and 2024, Uzbekistan recorded notable improvements in sectoral PCI values, with several industries showing particularly strong positive trends. The leading sectors included machines and equipment (16), base metals and articles of base metals (15), mineral products (5), and textile products (11). Growth in these areas reflects the adoption of new technologies, rising innovation capacity, and the increasing share of more complex products in both production and exports.

In particular, the textile sector illustrates this shift. The PCI for textiles improved from -0.23 in 2017 to -0.14 in 2024. This change highlights the gradual move away from the export of raw cotton toward more complex products such as cotton yarn, fabrics, and finished garments. Such structural upgrading signals an ongoing transformation of Uzbekistan's export base toward higher levels of technological sophistication.

However, some product groups, including precious or semi-precious stones (14), plastics, rubber, and articles thereof (7), and vegetable products (1) contributed to the overall PCI a negative growth. The largest negative change occurred in the precious and semi-precious stones category, primarily due to the increase in gold exports. As raw gold is a product with low technological complexity (PCI = -2.24), its growing share in exports negatively affects the overall product complexity of the sector.

Table 6.

PCI by sectors in Uzbekistan

№	Sector	Uzbekistan PCI (by sector)							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Vegetable products	-0.08	-0.10	-0.11	-0.12	-0.13	-0.10	-0.09	-0.10
3	Animal or vegetable oils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Prepared foodstuffs	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
5	Mineral products	-0.23	-0.34	-0.27	-0.07	-0.11	-0.09	-0.05	-0.06
6	Chemical products	-0.02	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
7	Plastics, rubber and products made from them	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00
8	Leather raw materials, natural fur and products made from them	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
9	Wood and articles of wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Products made of wood or other fibrous cellulose materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Textile products	-0.23	-0.18	-0.17	-0.21	-0.28	-0.21	-0.16	-0.14
12	Footware, hats, and other accessories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Artiles of stone, gypsum, cement, asbestos, mica	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
14	Precious or semi-precious stones	-0.59	-0.44	-0.64	-0.86	-0.58	-0.46	-0.73	-0.62
15	Base metals and articles of base metals	-0.05	-0.07	-0.06	-0.07	-0.07	-0.05	-0.04	-0.03
16	Machines, appliances and equipment	0.01	0.00	0.01	0.01	0.01	0.03	0.02	0.02
17	All types of vehicles	0.01	0.00	0.01	0.01	0.02	0.02	0.01	0.01
18	Optical, photographic and other types of instruments and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Arms and Ammunition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Miscellaneous industrial products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Works of art, collections and antiquities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Kazakhstan

In Kazakhstan's export structure positive changes in the PCI were observed in machines, appliances and equipment (16), mineral products (5), plastics, rubber, and articles thereof (7), all types of vehicles (17), and optical, photographic, and other instruments (18).

In particular, the machines, appliances and equipment sector (16) recorded the highest positive change, with the PCI increasing from 0.01 in 2017 to 0.04 in 2024. Although these sectors do not yet occupy a large share in the country's total exports, they reflect growing technological capabilities and indicate promising directions for future industrial development.

Although Kazakhstan's overall PCI exhibited an upward trend between 2017 and 2024, certain sectors demonstrated a marginal decline in their complexity levels. The most pronounced decreases were recorded in categories such as base metals and articles thereof (15), prepared foodstuffs (4), and textile products (11). While the cumulative negative contribution of these categories amounted to only -0.02 points, this modest figure primarily reflects their relatively limited share in total exports. Nevertheless, the observed decline remains analytically significant and should not be disregarded in assessing Kazakhstan's export structure dynamics.

Kyrgyzstan

In Kyrgyzstan, selected sectors also experienced positive PCI growth during 2017-2024. These included vegetable products (2), prepared foodstuffs (4), mineral products (5), textile products (11), and footwear, hats, and other accessories (12).

The textile sector showed particularly strong improvement. Its PCI rose from -0.14 in 2017 to -0.01 in 2024. A key factor behind this trend was the decline in raw cotton exports,

which fell from 24.7 thousand USD in 2017 to 12.7 thousand USD in 2024. Since raw cotton is a low-complexity product, its reduced share in exports contributed to the overall improvement in the sector's complexity.

Table 7.

PCI by sectors in Kazakhstan

№	Sector	Kazakhstan PCI (by sector)							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Vegetable products	-0.02	-0.03	-0.03	-0.04	-0.04	-0.03	-0.02	-0.02
3	Animal or vegetable oils	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
4	Prepared foodstuffs	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5	Mineral products	-1.51	-1.71	-1.63	-1.27	-1.41	-1.44	-1.42	-1.37
6	Chemical products	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
7	Plastics, rubber and products made from them	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
8	Leather raw materials, natural fur and products made from them	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Wood and articles of wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Products made of wood or other fibrous cellulose materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Textile products	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	-0.01
12	Footware, hats, and other accessories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Artiles of stone, gypsum, cement, asbestos, mica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Precious or semi-precious stones	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
15	Base metals and articles of base metals	-0.12	-0.09	-0.10	-0.14	-0.14	-0.12	-0.11	-0.12
16	Machines, appliances and equipment	0.01	0.01	0.01	0.01	0.02	0.04	0.04	0.04
17	All types of vehicles	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00
18	Optical, photographic and other types of instruments and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Arms and Ammunition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Miscellaneous industrial products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Works of art, collections and antiquities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8.

PCI by sectors in Kyrgyzstan

№	Sector	Kyrgyzstan PCI (by sector)							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	-0.01	-0.01	-0.02	-0.02	-0.03	-0.06	-0.03	-0.01
2	Vegetable products	-0.11	-0.09	-0.10	-0.10	-0.15	-0.15	-0.08	-0.02
3	Animal or vegetable oils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Prepared foodstuffs	-0.02	-0.03	-0.02	-0.01	-0.03	-0.02	-0.01	0.00
5	Mineral products	-0.19	-0.22	-0.20	-0.21	-0.27	-0.22	-0.21	-0.14
6	Chemical products	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
7	Plastics, rubber and products made from them	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
8	Leather raw materials, natural fur and products	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00
9	Wood and articles of wood	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
10	Products made of wood or other fibrous cellulose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Textile products	-0.14	-0.17	-0.12	-0.07	-0.11	-0.25	-0.08	-0.01
12	Footware, hats, and other accessories	-0.02	-0.01	0.00	0.00	0.00	-0.02	-0.01	0.00
13	Artiles of stone, gypsum, cement, asbestos, mica	0.00	0.00	0.00	0.00	-0.03	-0.02	-0.01	0.00
14	Precious or semi-precious stones	-0.86	-0.79	-0.95	-1.12	0.00	-0.01	-0.87	-1.81
15	Base metals and articles of base metals	-0.01	-0.04	-0.04	-0.02	-0.08	-0.05	-0.04	-0.01
16	Machines, appliances and equipment	0.03	0.03	0.02	0.02	0.06	0.09	0.09	0.00
17	All types of vehicles	0.05	0.02	0.03	0.02	0.03	0.03	0.04	0.00
18	Optical, photographic and other types of instruments and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
19	Arms and Ammunition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Miscellaneous industrial products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Works of art, collections and antiquities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

In Kyrgyzstan, negative PCI dynamics were also observed in several sectors, including precious or semi-precious stones (14), machines, appliances and equipment (16), and all types of vehicles (17). Among these, precious and semi-precious stones showed the sharpest decline from -0.84 in 2017 to -1.81 in 2024. This was mainly due to the continuous increase in gold exports, which play a dominant role in the country's total exports. Gold exports rose from 700 million USD in 2017 to 5.9 billion USD in 2024, significantly reducing the sector's overall product complexity.

Tajikistan

Between 2017 and 2024, Tajikistan recorded positive changes in the Product Complexity Index across several industrial sectors. The largest improvement was observed in the mineral products sector, where the PCI increased from -0.73 to 0.49. This growth reflects the emerging industrial capacity and the gradual development of technological capabilities in the country. In addition, the textile sector demonstrated a notable increase in PCI, from -0.40 to -0.11, indicating deeper processing stages and a gradual shift from low-value raw materials toward finished products.

Table 9.

PCI by sectors in Tajikistan

№	Sector	Tajikistan PCI (by sector)							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Vegetable products	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.06	-0.03
3	Animal or vegetable oils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Prepared foodstuffs	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
5	Mineral products	-0.73	-0.78	-0.52	-0.28	-0.37	-0.63	-0.55	-0.49
6	Chemical products	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
7	Plastics, rubber and products made from them	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Leather raw materials, natural fur and products made from them	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
9	Wood and articles of wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Products made of wood or other fibrous cellulose materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Textile products	-0.40	-0.47	-0.38	-0.32	-0.35	-0.26	-0.22	-0.11
12	Footware, hats, and other accessories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Artiles of stone, gypsum, cement, asbestos, mica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Precious or semi-precious stones	0.00	0.00	-0.48	-1.09	-0.93	-0.68	-0.80	-0.43
15	Base metals and articles of base metals	-0.20	-0.20	-0.17	-0.11	-0.15	-0.12	-0.19	-0.40
16	Machines, appliances and equipment	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
17	All types of vehicles	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
18	Optical, photographic and other types of instruments and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Arms and Ammunition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Miscellaneous industrial products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Works of art, collections and antiquities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

At the same time, several industries in Tajikistan experienced a decline in PCI. The sharpest drop was observed in base metals and articles thereof (15), where PCI fell from 0.20 in 2017 to 0.40 in 2024, indicating weak capacity for high-tech production. In the prepared food products (4) sector, PCI worsened from -0.00 to -0.01. All types of vehicles (17) sector also saw a decline, from 0.01 to 0.00. These trends reflect the low level of processing and continued dependence on raw material exports.

Turkmenistan

Between 2017 and 2024, Turkmenistan's PCI showed positive growth across several sectors. Increases in product complexity were observed in mineral products and textile products. One of the most notable improvements occurred in the textile industry, where the PCI level rose from -0.11 in 2017 to -0.02 in 2024. This progress can be attributed to a decline in the export of cotton yarn, which has a relatively low complexity level, and an increase in the export of nonwoven materials, which are more technologically sophisticated.

Table 10.

PCI by sectors in Turkmenistan

	Sector	Turkmenistan PCI (by sector)							
		2017	2018	2019	2020	2021	2022	2023	2024
1	Live animals and animal products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Vegetable products	-0.01	-0.01	-0.03	-0.03	-0.04	-0.01	-0.01	-0.01
3	Animal or vegetable oils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Prepared foodstuffs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Mineral products	-1.60	-1.61	-1.06	-0.94	-0.89	-1.41	-1.41	-1.47
6	Chemical products	-0.01	-0.01	-0.05	-0.08	-0.13	-0.05	-0.07	-0.05
7	Plastics, rubber and products made from them	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00
8	Leather raw materials, natural fur and products made from them	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Wood and articles of wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Products made of wood or other fibrous cellulose materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Textile products	-0.11	-0.07	-0.17	-0.15	-0.22	-0.04	-0.02	-0.02
12	Footware, hats, and other accessories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Artiles of stone, gypsum, cement, asbestos, mica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Precious or semi-precious stones	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	Base metals and articles of base metals	0.00	0.00	0.00	-0.02	-0.03	-0.01	0.00	0.00
16	Machines, appliances and equipment	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
17	All types of vehicles	0.00	0.00	0.00	-0.07	0.00	0.00	0.00	0.00
18	Optical, photographic and other types of instruments and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Arms and Ammunition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Miscellaneous industrial products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Works of art, collections and antiquities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

On the other hand, sectors such as chemical products (6) and plastics, rubber, and articles thereof (7) showed negative PCI dynamics. The decline in the chemical products sector is largely associated with the rising export of mineral or chemical nitrogen fertilizers, which are low-complexity goods (PCI = –1.58). Exports of nitrogen fertilizers increased from 65.9 million USD in 2017 to 318 million USD in 2024, resulting in a lower overall product complexity for the sector despite higher export volumes.

Conclusion and suggestions.

Economic Consequences and Implications. The Product Complexity Index is a key indicator for assessing the degree of technological sophistication and diversification within a country's exports. Between 2017 and 2024, Central Asian economies exhibited divergent trends: Uzbekistan, Kazakhstan and Turkmenistan demonstrated steady improvements in export complexity, while Kyrgyzstan and Tajikistan experienced sharp declines.

Uzbekistan's PCI improved from -1.18 in 2017 to -0.95 in 2024, reflecting a gradual shift toward more complex, higher-value industrial exports. Notable progress has been observed in textiles, mineral products and base metals, where the transition from raw materials, such as cotton, to semi-processed and finished goods has strengthened economic resilience and reduced external vulnerability.

Kazakhstan's PCI rose significantly from -1.67 to -1.51 over the same period, signaling a rebalancing of its export structure and an important turning point in industrial modernization. Despite continued reliance on raw materials, sustained momentum in this trajectory could enable Kazakhstan to emerge as a mid-technology exporter in the near future.

In contrast, Kyrgyzstan's PCI dropped sharply from -1.27 to -2.01, underscoring rising dependence on unprocessed raw materials and low-value products, particularly gold. This heightened reliance makes the economy highly sensitive to global price fluctuations,

undermining export efficiency. Similarly, Tajikistan's PCI also declined, driven by the dominance of raw materials such as gold, ores, and aluminum. The lack of emphasis on technological upgrading and industrial modernization remains a key structural constraint.

Turkmenistan also recorded significant improvement, its PCI increased from as low as -1.74 to -1.55 over the analyzed period. Although, heavy dependence on natural gas exports and limited diversification into technology-intensive sectors continue to constrain value addition within the country's export profile, the improvements highlight the country's effort to move towards more diversified and value-added products.

Policy recommendations. To enhance export complexity and foster structural diversification in Central Asia, differentiated strategies are required across countries. In the case of Uzbekistan, consolidating recent gains hinges on expanding domestic processing in textiles, copper, and machinery, while simultaneously promoting the emergence of high-technology industries. This can be achieved by strengthening institutional support for research and development (R&D), technology parks, and small enterprises, alongside more effective utilization of EU GSP+ preferences to stimulate exports of technologically sophisticated products. For Kazakhstan, sustaining growth in the Product Complexity Index necessitates a stronger emphasis on diversification into transport equipment, electronics, and green technologies. This process involves reducing the dominance of raw material exports through the establishment of industrial clusters and public–private partnerships, while also attracting foreign direct investment into high-complexity sectors and aligning vocational education systems with the evolving needs of export-oriented industries. For the smaller Central Asian economies, policy interventions should be directed toward halting structural decline and leveraging niche opportunities. In Kyrgyzstan, reversing the downward trend in complexity requires scaling up domestic processing of gold and agricultural products, complemented by improvements in infrastructure, financing, and quality standards to facilitate integration into global value chains. Tajikistan's policy priority lies in increasing value addition in aluminum and textiles, which should be supported by the development of joint ventures, vocational training, and targeted investments in energy and transport infrastructure to attract medium-technology industries. Turkmenistan, in turn, must address its acute dependence on hydrocarbons by channeling gas revenues into diversification funds, creating free industrial zones to pilot chemical, plastics, and fertilizer industries, and modernizing customs and logistics systems to reduce trade barriers and enhance export incentives. Collectively, these measures highlight the importance of tailoring industrial and trade policies to country-specific comparative advantages, while simultaneously advancing regional integration and resilience.

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