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Tilep Aiaru
Grade 10 student
Bilim-Innovation Lyceum for Gifted Girls
(Astana, Kazakhstan)

WHEN DID IT EXPORTS TAKE OFF? ICT SERVICE EXPORTS OF KAZAKHSTAN, ARMENIA, GEORGIA AND THREE NEIGHBOURS, 2015-2024

Abstract: In 2024 Kazakhstan exported 999.6 million US dollars of information and communication technology (ICT) services, while Armenia, whose population is about one seventh of Kazakhstan's, exported 1,811.6 million. I used the World Bank's balance of payments series on ICT service exports to find out when the exports of Kazakhstan and five neighbours (Armenia, Georgia, Uzbekistan, Kyrgyzstan and Azerbaijan) began to grow fast, how much Kazakhstan's exports grew, and how Kazakhstan compares with Armenia. Before seeing the yearly data, I predicted that Kazakhstan's ICT exports had grown strongly between 2019 and 2024. They grew 7.6 times over these years, while Kazakhstan's other service exports grew 1.43 times. Their average growth was 0.3% a year in 2015-2020 and 62.1% a year in 2020-2024. Defining the take-off as the first of two years in a row with growth of at least 25%, Kazakhstan, Georgia and Azerbaijan took off in 2021 and Armenia, Uzbekistan and Kyrgyzstan in 2022, but this result depends on the threshold, and in some countries the rise was partly a recovery to earlier levels. The largest single rise in Kazakhstan, Armenia and Georgia came in 2022. Per resident, Armenia exported 12.3 times more than Kazakhstan in 2024 and 8.8 times more in 2025; the gap was already 12.9 times in 2019. Countries that received more software developers from Russia and Belarus in 2021-2022 had a larger rise in ICT exports per resident from 2021 to 2024 (Spearman $\rho = 0.77$, two-sided $p = 0.10$, $n = 6$), but not a larger rise relative to their own earlier exports ($\rho = 0.20$), and the same countries already exported more per resident before 2022. The data therefore cannot show whether the relocation of specialists caused the growth.

Keywords: ICT services; IT exports; services trade; Kazakhstan; Armenia; Georgia; Central Asia; World Bank

Introduction

Kazakhstan has made the export of IT services a policy goal. In January 2025 the Government reported that the Head of State had set the task of raising IT exports to one billion US dollars by 2026, and the Prime Minister said that the volume of exported Kazakhstani IT services had grown "more than 20 times" over the previous five years [1]. Armenia, a much smaller country, exports more. A World Bank report describes the ICT services sector as a driver of the recent growth of Armenia's service exports [2, p. 9] and links the sector's growth to "a highly skilled labor force with good English proficiency", competitive costs, tax incentives and "a strong educational foundation in mathematics, physics, and engineering" [2, p. 52]. More generally, studies of developing countries find that service exports depend on human capital, the quality of telecommunication networks and the quality of institutions [3].

Something unusual also happened in the region in 2022. After Russia's invasion of Ukraine, the European Bank for Reconstruction and Development reported that Armenia and Georgia were "benefiting from an inflow of Russian businesses and information and communication technology (ICT) professionals" [4]. In an online survey of a convenience sample of Russians who had left their country, carried out in spring 2022, 45% of those who had been employed worked in the IT industry, and the most common places where respondents had settled were Turkey, Georgia and Armenia [5]. Using the locations of highly active software developers on GitHub, Wachs estimated that arrivals from Russia and Belarus between early 2021 and November 2022 increased the number of such developers by 94% in Georgia, 42% in Armenia, 13% in Kazakhstan, 8% in Uzbekistan and 7% in Kyrgyzstan [6]. A recent paper in this journal found that developer accounts on GitHub in Kazakhstan and Kyrgyzstan grew faster in the fourth quarter of 2022 than in any other quarter of 2021-2023, while noting that fourth quarters are often strong in both countries [7].

Developer counts show where people moved, but not whether the countries started to sell more IT services abroad. This study looks at the export side with one public series that covers all six countries in the same way: the World Bank's ICT service exports from the balance of payments [8]. My mentor first told me only the 2024 totals for Kazakhstan and Armenia and asked me two questions: why Armenia exports more, and how Kazakhstan's exports changed from 2019 to 2024. Before seeing the yearly data, I answered that Kazakhstan's exports had grown strongly, and that Armenia exports more because its IT sector is well developed and many of its specialists work for foreign companies. The study asks three questions:

• When did ICT service exports of Kazakhstan and five neighbours (Armenia, Georgia, Uzbekistan, Kyrgyzstan and Azerbaijan) start to grow fast, and did they start in the same year?

• How much did Kazakhstan's exports grow, and how does Kazakhstan compare with Armenia in total and per resident?

• Did the countries that received more software developers from Russia and Belarus see a larger rise in ICT exports afterwards?

Materials and Methods

Data. The main series is "ICT service exports (BoP, current US$)" (code BX.GSR.CCIS.CD) from the World Development Indicators, which the World Bank takes from the balance of payments statistics of the International Monetary Fund [8]. Its definition lists "computer and communications services (telecommunications and postal and courier services) and information services (computer data and news-related service transactions)" [8]. Under the current international classification of services, postal and courier services belong to transport [9]. In this paper "IT exports" means the whole ICT category, which is wider than software alone. Four more indicators from the same database were used: ICT service exports as a percentage of all service exports, total service exports, total population and the official exchange rate [10]. All series were downloaded through the World Bank data interface on 24 October 2026 (database last updated 8 October 2026). The main period is 2015-2024; the 2025 values, which were available for five of the six countries on the download date, are shown separately, and the 2010-2014 values were used to check earlier levels.

Countries. Kazakhstan was compared with Armenia and Georgia, the two countries named in the EBRD report on the 2022 inflow of IT specialists [4], and with Uzbekistan, Kyrgyzstan and Azerbaijan, three other former Soviet countries of Central Asia and the

Caucasus. My mentor proposed these six countries before I downloaded the data. Turkmenistan has no values in this series. Tajikistan, which was not in the set, is used only as a check in the relocation comparison. I downloaded the series as a CSV file from the World Bank website, built a table of the six countries for 2015-2024 in Google Sheets and drew a line chart. This table was later checked cell by cell against the data downloaded through the World Bank interface: all 60 values were identical.

Calculations. For each country the study calculated the year-on-year change, the average annual (compound) growth rate over 2015-2020 and over 2020-2024, the year with the largest percentage rise in 2016-2024, exports per resident (exports divided by the population of the same year) and the ratio of 2024 to 2019 exports. The take-off year was defined as the first year in 2016-2024 that began two years in a row of growth of at least 25%; to see how much this choice matters, the rule was repeated with thresholds from 15% to 32%. To see whether the growth was specific to ICT, the change in all other service exports (total service exports minus ICT) from 2019 to 2024 was also calculated. 2019 was used as the base here because other services fell sharply in 2020 and 2021 during the pandemic.

Relocation. For the third question, each country's estimated increase in highly active GitHub developers from Russia and Belarus was taken from Table 3 of Wachs, which compares developer locations in early 2021 with November 2022 [6]. That table lists every receiving country where the increase exceeded 5%; Azerbaijan is not listed, so its increase was below 5% and it was given the lowest rank. The increase was compared with two measures of export growth from 2021, the last full year before the invasion, to 2024: the change in ICT exports per resident in US dollars, and the ratio of 2024 to 2021 exports, which does not depend on the size of exports. Agreement was measured with Spearman's rank correlation, with exact two-sided p-values calculated from all possible orderings of the countries (720 for six countries, 120 for five, 5,040 for seven). The comparison was repeated with 2022 and 2023 as end years, without Kyrgyzstan, without Azerbaijan, with Tajikistan added, and with the level of exports per resident before 2022 in place of the change. This comparison was designed after the data had been seen, and with six countries it is a description, not a test of cause. All numbers were calculated in Python from the downloaded files.

Results

When the growth started

Table 1 shows the yearly values. From 2015 to 2020 Kazakhstan's ICT exports stayed between 116.1 and 145.0 million US dollars, and their average growth was 0.3% a year (Table 2). Growth then accelerated: +32.4% in 2021, +148.7% in 2022, +58.5% in 2023 and +32.1% in 2024, an average of 62.1% a year over 2020-2024. By the 25% rule, Kazakhstan's take-off year was 2021. This was new growth, not a recovery: before 2021 Kazakhstan's highest value since 2010 was 146.6 million dollars, in 2014.

Table 1. ICT service exports, million current US dollars, 2015-2025

Year	Kazakhstan	Armenia	Georgia	Uzbekistan	Kyrgyzstan	Azerbaijan
2015	142.8	130.5	45.0	206.6	42.4	86.8
2016	124.4	173.1	56.2	147.5	65.6	72.8
2017	116.1	211.6	89.9	150.7	39.4	66.3
2018	122.5	235.8	84.6	156.5	21.7	79.0
2019	131.6	261.7	113.8	165.4	14.7	58.4
2020	145.0	328.5	113.8	166.5	13.8	65.2
2021	191.9	382.4	215.9	176.3	13.5	96.3
2022	477.2	1,051.2	597.2	270.3	37.9	134.8
2023	756.7	1,590.0	892.0	441.0	84.9	138.8
2024	999.6	1,811.6	842.3	619.7	383.4	111.3
2025	1,355.2	1,774.8	1,292.3	921.5	n/a	130.3

Source: World Bank, World Development Indicators, BX.GSR.CCIS.CD, downloaded 24.10.2026 [8]. n/a: no value for Kyrgyzstan in 2025 on the download date.

By the 25% rule all six countries took off in 2021 or 2022 (Table 2). Georgia's exports grew by 89.6% in 2021 and 176.7% in 2022, so its take-off year was 2021, and Armenia's was 2022 (+174.9%). In both, the largest single rise came in 2022, as in Kazakhstan, and growth slowed in 2024: Armenia's exports rose by 13.9% and Georgia's fell by 5.6% before rising again in 2025. Uzbekistan's exports rose every year from 2022, by 53.3%, 63.2% and 40.5%, but in 2012-2014 they had been between 204.3 and 238.7 million dollars, higher than in 2021 (176.3), so the first part of this rise was a return to an earlier level. Kyrgyzstan's exports fell from 65.6 million dollars in 2016 to 13.5 million in 2021, rose by 180.1% in 2022 and 124.1% in 2023, and made 80.7% of their increase from 2021 to 2024 in 2024 alone (+351.5%). Azerbaijan passed the 25% rule with +47.8% in 2021 and +40.0% in 2022, but its other service exports also grew by 44.7% in 2021, its 2022 value was close to its 2014 level (127.1 million), and its exports were lower in 2024 than in 2022. So Azerbaijan's "take-off" looks more like a recovery after the pandemic than a new trend.

The take-off years depend on the threshold. Georgia grew by 24.9% in 2016 and 59.9% in 2017, so with any threshold of 24% or lower its take-off year moves to 2016, and with 22% or lower Armenia's does too. With thresholds from 25% to 32% the years in Table 2 do not change. Armenia and Georgia, unlike Kazakhstan, had also grown fast in some earlier years. Figure 1 shows the paths in total and per resident.

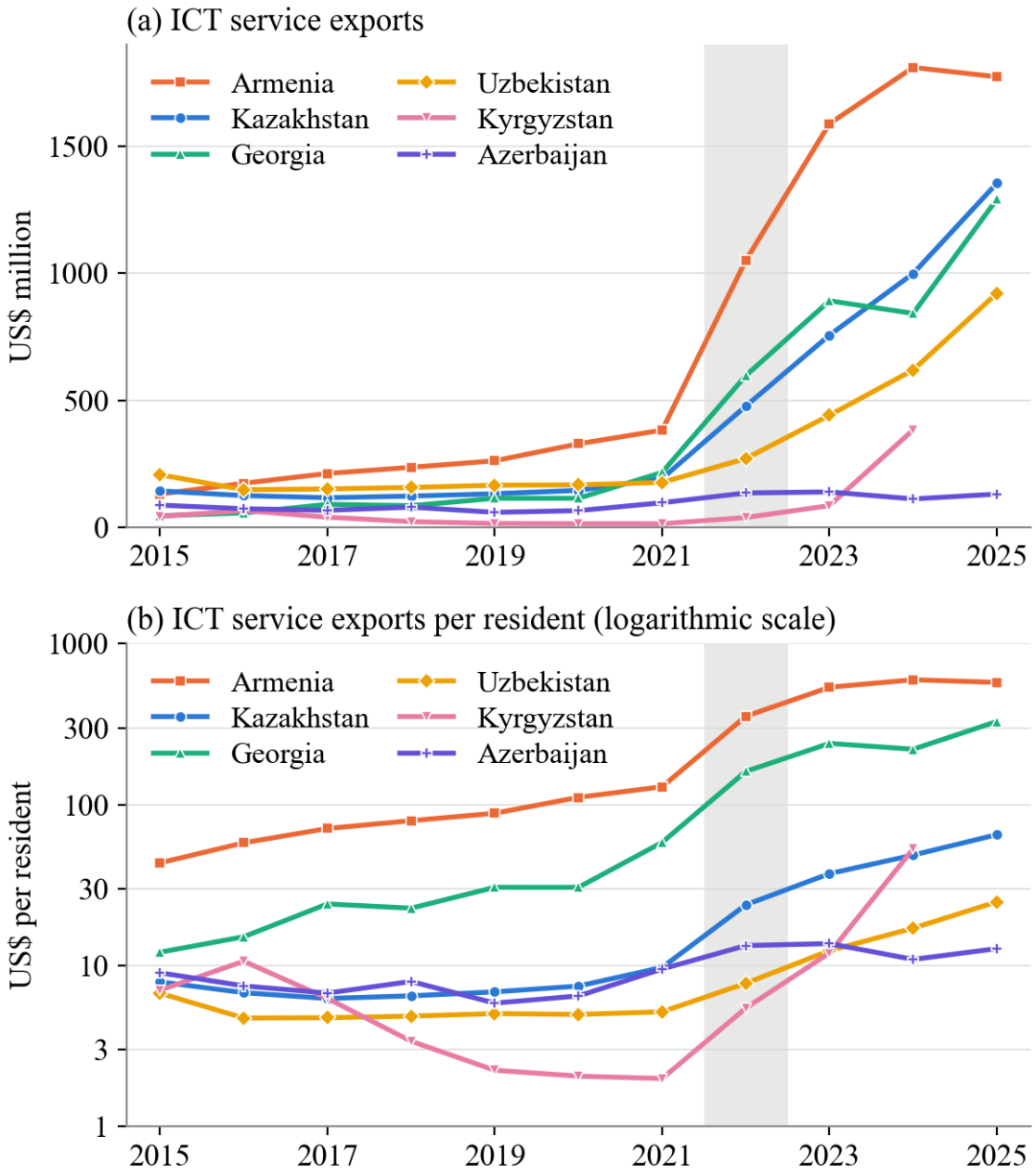


Figure 1. ICT service exports of the six countries, 2015-2025: (a) million current US dollars; (b) US dollars per resident, logarithmic scale. The shaded band marks 2022. Kyrgyzstan has no 2025 value. Source: World Bank [8, 10].

Table 2. Take-off, growth and weight of ICT service exports by country

Country	Take-off year	Growth 2015-2020, % a year	Growth 2020-2024, % a year	Largest rise, year (%)	Per resident 2024, US$	ICT share of service exports 2019 / 2024, %
Kazakhstan	2021	0.3	62.1	2022 (+148.7)	48.5	1.7 / 8.4
Armenia	2022	20.3	53.2	2022 (+174.9)	597.2	10.6 / 31.0
Georgia	2021	20.4	64.9	2022 (+176.7)	220.9	2.5 / 10.9
Uzbekistan	2022	-4.2	38.9	2023 (+63.2)	17.0	5.3 / 9.5
Kyrgyzstan	2022	-20.1	129.7	2024 (+351.5)	53.1	1.4 / 11.6
Azerbaijan	2021	-5.6	14.3	2021 (+47.8)	10.9	1.6 / 1.4

Take-off year: the first year in 2016-2024 that began two years in a row of growth of at least 25% (the years are the same for thresholds from 25% to 32%). Growth: average annual (compound) rate between the end years. Largest rise: the year in 2016-2024 with the largest percentage increase over the previous year. Source: calculated from World Bank data [8, 10].

Kazakhstan's growth and the comparison with Armenia

Between 2019 and 2024 Kazakhstan's ICT exports rose from 131.6 to 999.6 million US dollars, 7.6 times or by 659.5%. Their weight in the country's service exports grew too: ICT made up 1.7% of all service exports in 2019 and 8.4% in 2024. Over the same years Kazakhstan's other service exports grew only 1.43 times, so the growth was specific to ICT and not just a recovery of services after the pandemic. ICT exports also grew faster than other service exports from 2019 to 2024 in Armenia (6.92 against 1.84 times), Georgia (7.40 against 1.53), Uzbekistan (3.75 against 2.00) and Kyrgyzstan (26.07 against 2.75), but not in Azerbaijan (1.90 against 2.16). For the six countries together, ICT exports grew from 1,076.2 million dollars in 2021 to 4,767.9 million in 2024, or 4.43 times.

In 2024 Armenia exported 1.81 times more ICT services than Kazakhstan, although Kazakhstan's population was 6.8 times larger. Per resident, Armenia exported 597.2 dollars and Kazakhstan 48.5 dollars, 12.3 times less. ICT services made up 31.0% of Armenia's service exports and 8.4% of Kazakhstan's. This gap is not new. Armenia's exports per resident were 5.5 times Kazakhstan's in 2015, 12.9 times in 2019 and 14.9 times in 2020, before the events of 2022. The gap stayed between 13.3 and 14.9 times in 2020-2023 and then narrowed to 12.3 times in 2024 and 8.8 times in 2025, when Kazakhstan's exports rose by 35.6% and Armenia's fell by 2.0%. Part of these changes comes from exchange rates. From 2015 to 2019 the tenge fell from 221.7 to 382.7 per US dollar while the Armenian dram stayed between 478 and 483, so Kazakhstan's exports measured in dollars were held down in the years when the gap widened. From 2021 to 2023 the dram rose from 503.8 to 392.5 per dollar, which raised the dollar value of Armenia's exports in the years of its fastest growth [10].

Relocation of developers and export growth

Table 3 compares the estimated inflow of developers with the change in exports. Ranked by the change in ICT exports per resident from 2021 to 2024, the order was Armenia, Georgia, Kyrgyzstan, Kazakhstan, Uzbekistan and Azerbaijan. Ranked by the inflow of developers, it was Georgia, Armenia, Kazakhstan, Uzbekistan, Kyrgyzstan and Azerbaijan.

The two orders agree at the top and at the bottom (Spearman ρ = 0.77, two-sided p = 0.103). The result depends on the details. With 2022 as the end year ρ was 0.71 (p = 0.136), with 2023 it was 0.89 (p = 0.033), without Kyrgyzstan 0.90 (p = 0.083), without Azerbaijan 0.60 (p = 0.350), and with Tajikistan added 0.85 (p = 0.025). When growth is measured as the ratio of 2024 to 2021 exports, which does not depend on size, the agreement almost disappears (ρ = 0.20, p = 0.714): relative to their own 2021 level, Kyrgyzstan and Kazakhstan grew the most. Most importantly, ranking the six countries by their exports per resident in 2019 or in 2021, before the inflow, gives exactly the same agreement with the inflow (ρ = 0.77), and with Tajikistan added the 2021 level gives ρ = 0.81. The countries that received the most developers were the ones that already exported the most per resident, so this comparison cannot separate the effect of the relocation from the earlier strength of their IT sectors.

Table 3. Arrivals of software developers from Russia and Belarus and the change in ICT service exports

Country	Developers in 2021	Arrivals by Nov. 2022	Increase, %	Change per resident 2021-2024, US$	Exports 2024 / 2021
Georgia	180	169	94	+162.7	3.90
Armenia	233	97	42	+468.1	4.74
Kazakhstan	393	50	13	+38.8	5.21
Uzbekistan	185	15	8	+11.9	3.52
Kyrgyzstan	125	9	7	+51.1	28.33
Azerbaijan	not listed	not listed	below 5	+1.4	1.16

Developers: highly active GitHub developers located in the country in early 2021, arrivals from Russia and Belarus up to November 2022, and the increase in per cent, from Table 3 of Wachs [6]; countries with an increase below 5% are not listed there. Exports: World Bank [8, 10].

Discussion

By the 25% rule the take-off came in 2021 or 2022 in all six countries, and Kazakhstan's largest rise came in 2022, the same year as Armenia's and Georgia's; for Armenia and Georgia, a lower threshold would place the start of fast growth in 2016. When my mentor asked me when Kazakhstan's growth started and whether Armenia and Georgia started in the same year, I sent my chart of the six countries with this answer: "Kazakhstan’s ICT services exports started growing rapidly around 2021–2022. Armenia and Georgia also experienced strong growth during this period, although the pace differed across countries. I think this may be related to the expansion of digital services, increased international demand for IT specialists, and the relocation of technology professionals and companies after 2022." This was my first observation from the chart, and the calculations agree with it: Kazakhstan's growth sped up in 2021 and jumped in 2022, Georgia took off a year before Armenia, and the pace after 2022 differed, from steady growth in Uzbekistan to a stop in Azerbaijan.

My prediction about Kazakhstan was confirmed. Before seeing the yearly numbers I wrote (in Russian, translated by my mentor with the help of an AI assistant): "It seems to me that it grew significantly. This may be thanks to the development of digital technologies, the opening of new companies and the growing demand for IT services abroad. Also, there are now many opportunities for young specialists, who could have sped up this growth." The

exports grew 7.6 times from 2019 to 2024, much faster than Kazakhstan's other service exports. The data used here do not show which of the reasons I gave was most important.

About Armenia I had been told the 2024 totals, so my answer was an explanation, not a prediction. I wrote (also translated): "I think that Armenia sells more IT services abroad because the IT sector there is well developed and there are many specialists working for foreign companies. It seems to me that Armenian IT companies attract more foreign clients. This means that for the development of IT exports not only the size of the population matters, but also the quality of education and the level of technology." The yearly data add something I did not know: Armenia's lead per resident grew from 5.5 times in 2015 to 12.9 times in 2019, before the events of 2022, although part of that change reflects the fall of the tenge. This is consistent with explanations based on long-term factors such as skills, education and the IT sector itself, which the World Bank report on Armenia names [2, p. 52], and with the wider finding that human capital matters for service exports [3]. This study did not measure education or the number of specialists, so it cannot test this part of my explanation.

The relocation of IT specialists and companies may be part of the story for 2022, but the evidence here is indirect. Georgia and Armenia received the largest inflow of developers relative to their own developer base and had the largest rise in exports per resident, and Azerbaijan, which received the smallest inflow, had almost none. This agrees with the EBRD's report that relocated businesses and ICT professionals boosted services in Armenia and Georgia [4], and with the World Bank's view that welcoming companies from Russia, Ukraine and Belarus stimulated Armenia's ICT sector [2, p. 52]. However, the same ranking appears when countries are ordered by their exports before 2022, relative growth does not follow the inflow, and the agreement is not statistically clear with six countries. Georgia's and Kazakhstan's growth also sped up in 2021, before the large moves of 2022, and Uzbekistan's growth continued for years after them. So the data cannot tell whether relocation caused the growth; the expansion of digital services and the foreign demand that I mentioned may also matter, and these data cannot separate them.

One more point is useful for anyone who follows Kazakhstan's goal. In January 2025 the minister reported IT exports of 471 million dollars for the first nine months of 2024, 26% more than a year earlier, and the goal of one billion dollars in 2026 [11]. In April 2026 the National Bank's data showed exports of 1,142.7 million dollars under the item "computer services" for 2025, 36% more than in 2024, and this was reported as reaching the goal a year early [12]. The World Bank's ICT series is wider, because it also includes telecommunications and information services: for 2025 it shows 1,355.2 million dollars, about 212 million dollars more than computer services alone. When IT exports of Kazakhstan are compared across sources, it is important to check which of the two measures is used. The statement about growth of "more than 20 times" over five years [1] does not say which years or which measure it refers to, while the World Bank series grew 7.6 times from 2019 to 2024.

This study has several limitations. The values are in current US dollars, so changes in exchange rates and prices are mixed with changes in volume; for the Armenia comparison this matters, as shown above. The World Bank series does not show which part of ICT grew in each country. The data do not show who earned the exports: local companies, relocated companies or individual specialists. Kyrgyzstan's jump in 2024 is unusually large and was not examined. The take-off rule is a simple choice, and its result for Armenia and Georgia depends on the threshold. The relocation measure counts only highly active GitHub

developers who could be located, and some of the numbers behind it are very small (9 arrivals in Kyrgyzstan and 15 in Uzbekistan) [6]; it also ends in November 2022, so later arrivals are not counted. With six countries, the comparison in Table 3 can only describe, not prove. Finally, the newest values may change when the database is updated.

Conclusion

Kazakhstan's ICT service exports stayed roughly flat from 2015 to 2020, took off in 2021 and had their largest rise in 2022, the same year as Armenia and Georgia. All six countries had fast growth in 2021-2022, but in Uzbekistan and Azerbaijan part of it was a return to earlier levels, and in Azerbaijan it did not last. Kazakhstan's exports grew 7.6 times from 2019 to 2024, much faster than its other service exports, and reached about one billion US dollars, and their share of the country's service exports rose from 1.7% to 8.4%. Armenia exported 12.3 times more per resident than Kazakhstan in 2024 and 8.8 times more in 2025. Its lead grew before 2022, which is consistent with long-term strengths of its IT sector, although exchange rates also played a part. Countries that received more relocated developers had a larger rise in exports per resident, but they were also the countries that exported most before 2022, so the role of relocation remains open. A natural next step would be to use Kazakhstan's own statistics of service exports by type and by partner country, to see which services and which buyers were behind the growth.

Data availability

All data are publicly available from the World Bank World Development Indicators [8, 10] and from Table 3 of Wachs [6]. The downloaded files, my table and the script that calculates every number in this paper are available from me or my mentor on request.

Author contributions and use of AI tools

I chose this topic from the research directions proposed by my mentor, because it joins IT, economics and data analysis. When my mentor told me the 2024 totals for Kazakhstan and Armenia, I wrote, in Russian, my explanation for Armenia and my prediction for Kazakhstan before seeing the yearly data. After that, my mentor told me the growth of Kazakhstan's exports from 2019 to 2024, the per-resident gap with Armenia and the shares of ICT in service exports, and gave me a data task. For this task I downloaded the World Bank data, built the table of the six countries he proposed for 2015-2024 in Google Sheets, drew the first line chart, recalculated in my table the ratio of Armenia's to Kazakhstan's exports in 2024 and Kazakhstan's growth from 2019 to 2024, and wrote the answer about when the growth started that is quoted in the Discussion. My mentor set the research questions, chose the take-off rule, the comparison years and the comparison with the developer data, checked my table against the World Bank data interface, added the other indicators, wrote the calculations in Python with the help of an AI assistant (Claude, Anthropic), prepared the figure and found the other sources. The English text, including the translations of my Russian answers, was drafted by my mentor with the help of the same AI assistant, based on the results and on my own written answers, and I reviewed and approved it. No data, results or citations were generated by AI: all numbers come from the sources listed below, and all cited sources were checked against the originals. I take full responsibility for the final manuscript.

Conflicts of interest

The author declares no conflicts of interest.

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МАЗМҰНЫ – СОДЕРЖАНИЕ – CONTENT

ӘЛЕУМЕТТІК-ЭКОНОМИКАЛЫҚ ЖӘНЕ ҚҰҚЫҚ ҒЫЛЫМДАРЫ - СОЦИАЛЬНО-ЭКОНОМИЧЕСКИЕ И ЮРИДИЧЕСКИЕ НАУКИ - SOCIO-ECONOMIC AND LEGAL SCIENCES

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