

INCOME TRENDS AND STATISTICAL EVALUATION OF AZERBAIJAN'S TRANSPORT SECTORS

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Abstract

This study presents a statistical assessment of revenue generated from cargo transportation in Azerbaijan's sea transport sector. By applying descriptive statistical methods, the research investigates long-term patterns, variability, and distributional characteristics of maritime income from 2000 to 2024. The analysis indicates considerable fluctuations influenced by cargo volume shifts, economic developments, and sector-specific changes. Measures such as average income, variance, skewness and kurtosis outline the fundamental properties of income distribution, offering deeper insight into the operational dynamics of maritime transport. These results confirm the enduring significance of sea transport as a major contributor to national transport revenues.

The research also conducts a statistical evaluation of income derived from freight transportation in Azerbaijan's railway sector during 2000–2024. It explores the strategic importance of railway transport in the modern economy and its central role within Azerbaijan's logistics network. The analysis includes freight income trends, descriptive indicators, covariance and correlation outcomes, and factors shaping revenue—such as cargo volume, tariff regulations and infrastructure progress. Furthermore, the study emphasizes the influence of key international transport corridors, including the Trans-Caspian International Transport Route (Middle Corridor), the Baku–Tbilisi–Kars line, the North–South Corridor and the TRACECA initiative. Overall, the findings provide a detailed overview of income behavior in the railway sector and underline its relevance for national economic growth and global transport integration.

Additionally, the study investigates income patterns in Azerbaijan's air transport sector using statistical data. It compares total transport revenue with income derived specifically from air transportation and evaluates income from both air cargo and passenger services. The research applies various statistical techniques such as graphical analysis, descriptive statistics, covariance, correlation and standard deviation to measure variability across income categories. A two-sample t-test is used to compare mean differences among income groups. The results reveal that air transport revenue rises in parallel with total transport income, while strong positive relationships exist between air passenger and air cargo earnings. Overall, the analysis demonstrates that the air transport sector represents a vital and growing component of Azerbaijan's transport economy.

The sea transport sector represents a strategically important component of Azerbaijan's overall transport and logistics system. Situated along the western coast of the Caspian Sea, the country combines modern port facilities—particularly the Baku International Sea Trade Port and several specialized oil terminals—with an expanding fleet of commercial and technical vessels that operate on domestic, regional, and international routes. Maritime transport supports both general cargo and energy-related shipments and plays a vital role in Azerbaijan's plans to strengthen transit connections between Europe and Asia.

Keywords: Azerbaijan, Sea transport, logistic system, air transport, railway transport, economic growth, incomes.

Introduction. In recent years, the performance of Azerbaijan's maritime industry has been mixed. While port revenues and transit-related shipments have grown during many periods, cargo volumes and other operational indicators have fluctuated due to global energy market dynamics, seasonal conditions, and regional infrastructure limitations. Official statistics show steady increases in port income across certain years, alongside variable levels of maritime cargo tonnage depending on segment type, such as international cargo, coastal shipments, and oil-related transshipment. Revenue in the maritime sector is drawn from diverse sources, including port fees, terminal handling charges, freight and charter services, bunkering operations, marine support activities, and petroleum logistics. Despite its strong contribution to national transport earnings and foreign exchange inflows, the sector faces ongoing structural and environmental challenges such as port congestion,

fluctuating Caspian Sea water levels, dredging requirements, and geopolitical uncertainties that influence future investments and income stability. These risks must be assessed together with opportunities arising from new transit initiatives and the expansion of port capacity.

Railway transport is another core element of Azerbaijan's transport system and plays an essential role in the national economy. Railways offer a cost-effective and efficient means for moving large quantities of goods, making them a central pillar of the country's logistics network. Continuous investment in rail infrastructure, modernization of rolling stock, and improvements in passenger services have strengthened the sector and enhanced its long-term financial performance. The development and upgrading of the railway network have also contributed significantly to balanced regional

growth and the broader expansion of Azerbaijan's economic potential.

Income generated from railway operations depends on multiple variables, including freight volume, passenger numbers, tariff policies, infrastructure development, and overall operational efficiency. Seasonal trends, logistical challenges, and fluctuations in fuel prices further shape yearly revenue levels. The recent modernization of the network and expansion of major lines have contributed to rising income from both freight and passenger services. Statistical tools such as descriptive indicators, trend analysis, covariance, and correlation help identify revenue patterns, assess performance, and forecast income dynamics. Consistent upward trends reflect improvements in network accessibility and operational capability, supporting domestic economic development and the growth of foreign trade.

Azerbaijan's railway system is also deeply integrated into international transport routes such as the Trans-Caspian International Transport Route (Middle Corridor), the Baku–Tbilisi–Kars Railway, the North–South Transport Corridor, and TRACECA. These corridors establish multimodal links between Europe and Asia, attract additional freight flows, and strengthen Azerbaijan's position within global logistics chains. Examining income trends in the railway sector therefore offers valuable insight into its strategic role in economic development and international connectivity.

The development of air transport in Azerbaijan also has a long historical trajectory that continues to shape the country's aviation sector today. Aviation activities began as early as 1910, initially in experimental form, but gradually evolved into organized air services by the 1920s, including cargo transportation. Over time, and particularly during the Soviet era, technological advancements and expanding airport capacity increased the ability to handle air freight. Airports in Baku, Ganja, and Nakhchivan grew into important hubs for both domestic and international cargo flows.

Following independence, Azerbaijan made substantial investments in airport infrastructure, aircraft modernization, and specialized cargo facilities. The establishment of the Baku Cargo Terminal significantly enhanced the country's capacity to process large volumes of freight. Today, air cargo transport plays a key role in facilitating trade and connecting Azerbaijan to global markets, enabling the fast movement of machinery, electronics, medical supplies, perishable goods, and other critical products.

Income from air cargo operations now constitutes an essential part of the aviation sector's earnings, reflecting both domestic demand and the increasing use of Azerbaijan as a regional transit center. Continuous improvements in aviation infrastructure and logistics services further strengthen the competitiveness of the country's air transport industry. Examining income generated from air transport therefore provides important insights into the broader economic impact of aviation and its contribution to national development.

Recent publications. In recent years, researchers have published several studies analyzing the income dynamics of railway freight transport through statistical

and econometric methods. Railway transport is recognized as a key driver of economic development and trade efficiency, linking industrial production with regional and international markets. Recent publications relevant to the income structure of Azerbaijan's sea transport sector mainly originate from official state institutions and industry bodies. The State Statistical Committee of Azerbaijan annually publishes data on transport revenues, cargo volumes, and sectoral indicators.

Literature Review

The development of freight transportation systems, logistics regulation, and the relationship between macroeconomic indicators and sectoral growth has been extensively examined by international and local scholars. Existing studies reveal that transportation infrastructure and freight coordination play a vital role in economic performance, while economic shocks, pricing mechanisms, and regulatory frameworks significantly influence sector efficiency.

Gao et al. (2020) emphasize the regional differentiation in freight mode coordination in China, arguing that efficient multimodal freight integration depends on the economic development level, industrial structure, and geographical conditions of regions. Their findings highlight that integrated logistics corridors increase transport efficiency and reduce costs, especially in regions with advanced infrastructure.

Ko et al. (2022) conduct a data-driven assessment of short-distance freight rail transportation potential within the U.S. Lake Superior region. The study identifies log movements as a key indicator for estimating rail demand and concludes that optimizing short-haul freight can reduce road congestion and environmental load. This complements Gao et al. (2020), indicating the need for regional adaptation in freight planning rather than uniform nationwide strategies.

The COVID-19 outbreak brought significant volatility to freight volumes worldwide. Saxena and Yadav (2022) apply an ARIMA model to analyze rail freight volume and revenue during the pandemic, establishing that freight transport experienced short-term decline followed by gradual stabilization. The study underscores the importance of forecasting tools for crisis management in the transport sector.

Ng et al. (2024) extend this discussion by applying econometric modeling to evaluate pandemic-driven disruptions and recovery patterns in the U.S. rail freight industry. Their results suggest a nonlinear recovery trajectory, influenced by policy responses and supply chain resilience measures. Together, these studies show that pandemic shocks have high short-term impact but long-term adaptability is achievable through strategic planning.

Li and Wu (2024) investigate dynamic pricing in rail freight transport under carbon emission penalties. Their results demonstrate that carbon pricing influences freight operator behavior, pushing them toward environmentally sustainable strategies. The study contributes to the emerging literature on green logistics and provides a quantitative basis for environmental policy evaluation in transport markets.

A group of studies focuses on the macroeconomic relationship between sectors and economic development, with particular emphasis on Azerbaijan.

Huseynova (2023) examines economic growth parameters in Russia and Azerbaijan using cointegration analysis and finds long-run relationships between macroeconomic indicators, reflecting shared economic trends shaped by energy markets.

Huseynova & Hajizada (2024) analyze the stability of Azerbaijan's banking sector under crisis conditions using econometric models. The findings confirm the resilience of financial institutions, though external shocks remain influential. Complementing this, SM & SS (2025) demonstrate a long-run link between the tourism sector and Azerbaijan's economic growth, stressing tourism as a growth-enhancing industry.

Alirzayev & Huseynova (2025) evaluate the J-curve effect and Marshall-Lerner condition for Azerbaijan, providing evidence of export–import elasticity effects and confirming currency depreciation impacts on trade balance in the short and long run. Similarly, Huseynova & Gambarli (2023) investigate the cointegration and causality between the U.S. stock market and global markets, revealing significant transmission mechanisms of financial shocks.

Collectively, these works demonstrate that economic growth in Azerbaijan is closely interconnected with external trade, tourism, and financial, transport integration.

Several studies address regulatory aspects and modernization trends in transport policy. Huseynova & Qurbanova (2025) discuss the state's role in regulating transport and logistics services for foreign trade development, arguing that infrastructure investment and policy harmonization are essential for enhancing transit capacity.

The regulatory basis is reinforced by national documents such as the Law “On Transport”, which establishes operational and safety rules, and the Assessment of regulatory framework readiness in international trade (economy.gov.az), which highlights current gaps in legal harmonization with global trade standards. Additionally, the 2024–2026 Action Plan prioritizes expansion of international transit corridors and strengthening Azerbaijan's role as a regional logistics hub.

Yusifov et al. (2019) also stress strategic development directions in Azerbaijan's logistics sector,

noting the potential for digitalization, diversification of cargo routes, and structural reforms aimed at improving competitive positioning in Eurasian transport. Limited research exists on digital logistics ecosystems and AI-driven optimization in Azerbaijan.

Overall, the literature suggests that efficient freight coordination, resilient transport systems, and robust policy frameworks are central to economic performance. International studies highlight advanced modeling and forecasting tools, while regional research on Azerbaijan focuses on economic integration, banking stability, tourism, and logistics regulations. Future research may benefit from integrating digital transformation, sustainability, and multimodal optimization strategies into transport and trade studies.

Methodology. This study conducts a statistical analysis of railway transport income in the Republic of Azerbaijan, covering both cargo and passenger services from 2000 to 2024. Descriptive statistics are applied to summarize key variables, including cargo volume, passenger numbers, revenue. Trend analysis, covariance, and linear correlation methods are used to explore relationships between these variables and assess their impact on income. Official data sources, including the State Statistics Committee of Azerbaijan and transport reports, are utilized, while EXCEL is employed for calculations, tables, and graphical representations. This methodology provides a concise, reliable framework for understanding the financial and operational dynamics of Azerbaijan's railway sector and supports forecasting of future trends.

The research applies a quantitative descriptive statistical approach based on secondary data obtained from official transport sector reports. Data for total transportation income, income from sea transport, and income specifically from sea transportation of goods were processed using standard statistical tools. Indicators such as mean, median, mode, standard deviation, sample variance, skewness, kurtosis, and confidence intervals were calculated to summarise the income structure and distribution. Graphs and comparative tables were used to identify long-term trends between 2000 and 2024. The analysis focused on identifying distribution patterns (right-skewness, peakness or softness), variability levels, and the comparative behaviour of different income categories within the transport sector. No primary data collection was carried out; all analysis is based on documented statistical sources.

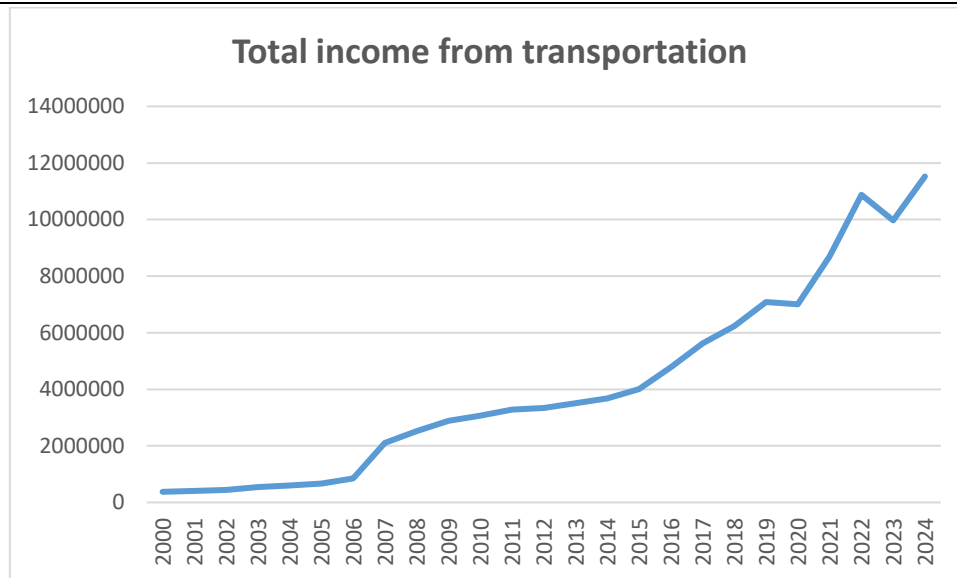


Figure 1.1

Figure 1.1 shows the general income from all transportation services in Azerbaijan from the early 2000s to 2024.

- At the beginning (2000-2005), the income was low and stable, showing slow development in the transport sector.
- Around 2006, the income started to increase more noticeably, meaning overall transport activities (road, rail, air, sea) were growing.
- From 2010 to 2017, the graph shows a steady upward trend, which reflects improvements infrastructure, higher demand, and growing transit activities.

- After 2018, the rise becomes faster. This period shows strong expansion, especially due to new logistics projects, transit corridors, and more trade passing through Azerbaijan.

- Around 2020, there is a small dip, possibly connected to global disruptions (like the pandemic), but the income quickly rises again.

- By 2023-2024, the income reaches its highest level showing that Azerbaijan's transport sector has grown significantly and continues to expand.

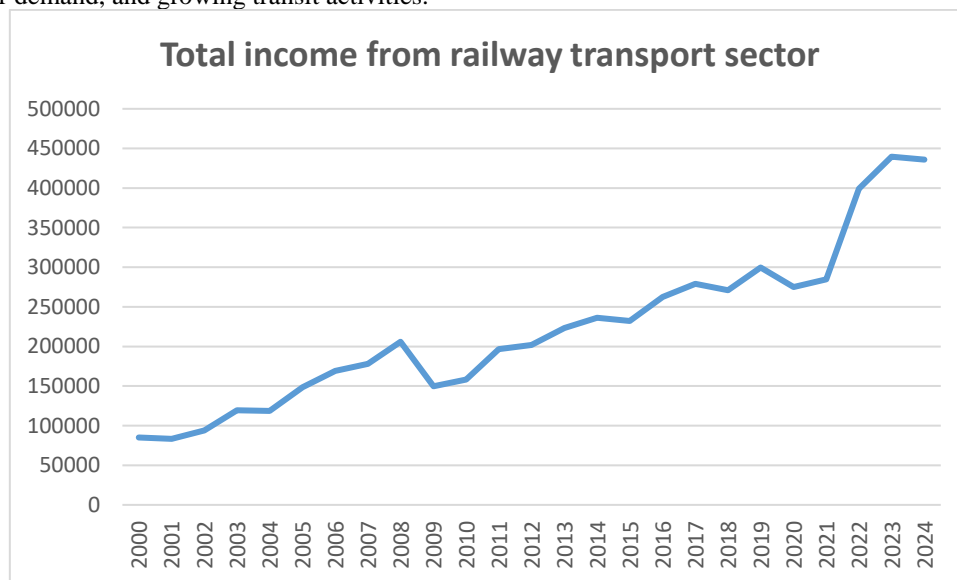


Figure 1.2

Figure 1.2 shows income specifically from railway services in Azerbaijan from 2000 to 2024.

- From 2000 to 2005, the income was low and increased slowly, reflecting limited railway activity at that time.
- Between 2006 and 2014, the line rises steadily, meaning the railway sector was gradually becoming more active and efficient.

- After 2015, the income contributes to grow, showing improvements linked to modernization projects, new wagons, and better railway services.

- There are small ups and downs, but the overall direction is positive.

- The most significant jump happens around 2021-2023, where income rises sharply. This relates to:

- Increased transit through Azerbaijan,
- The Middle Corridor becoming important,
- Rising trade flows from Asia to Europe.

- In 2024, the income remains very high compared to earlier years.

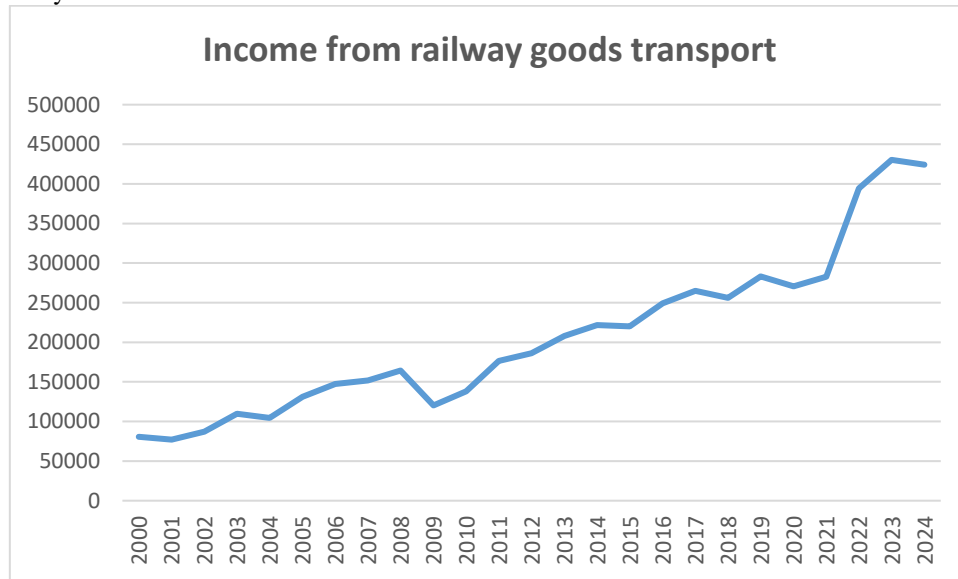


Figure 1.3

Figure 1.3 shows how much income Azerbaijan earns from transporting goods by railway from 2000 to 2024.

- At the start (2000-2004), the income was low but slowly rising, showing limited but increasing goods movement.
- Around 2005-2008, the graph shows a clear increase, meaning more freight activities and more demand for rail cargo services.
- In 2009, there is a small drop, possibly linked to global economic slowdown, but the income quickly recovers.
- After 2010, the line increases steadily and continuously, showing:

- more transit goods,
- bigger trade flows through Azerbaijan,
- modernization of railway infrastructure.
- Between 2020-2023, the income rises sharply. This strong jump reflects:
 - Growth of Middle Corridor,
 - Increased East-West transit,
 - Higher international and domestic freight volumes.
- In 2024, the income slightly decreases but stays very high compared to earlier years.

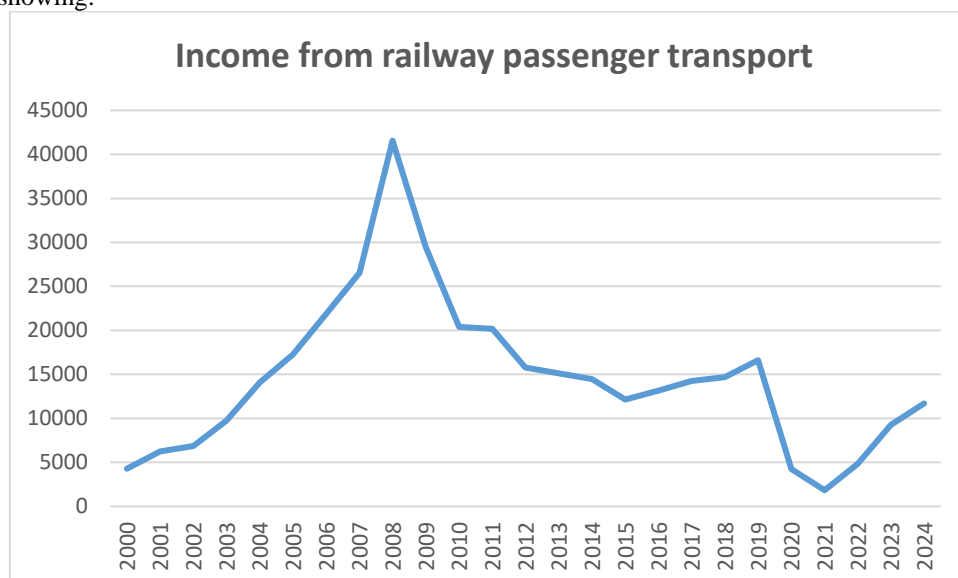


Figure 1.4

Figure 1.4 shows income earned from carrying passengers by railway from 2000 to 2024.

- From 2000 to 2006, passenger income increases quickly, meaning more people were using trains.

- It reaches a strong peak around 2007-2008. This was the highest point in passenger transport income.

• After 2008, the graph shows a sharp decline, which continues for several years. Reasons may include:

- Modernisation works on rail lines,
- Growing use of cars and buses,
- Changes in travel habits.

• Between 2012-2018, the income stays low and stable, with small ups and downs.

• In 2020, income drops significantly again, likely affected by COVID-19 restrictions and reduced travel.

- After 2021, income begins to rise again, showing slow recovery.
- By 2023-2024, the line moves upward, but levels are still much lower than in the early 2000s.

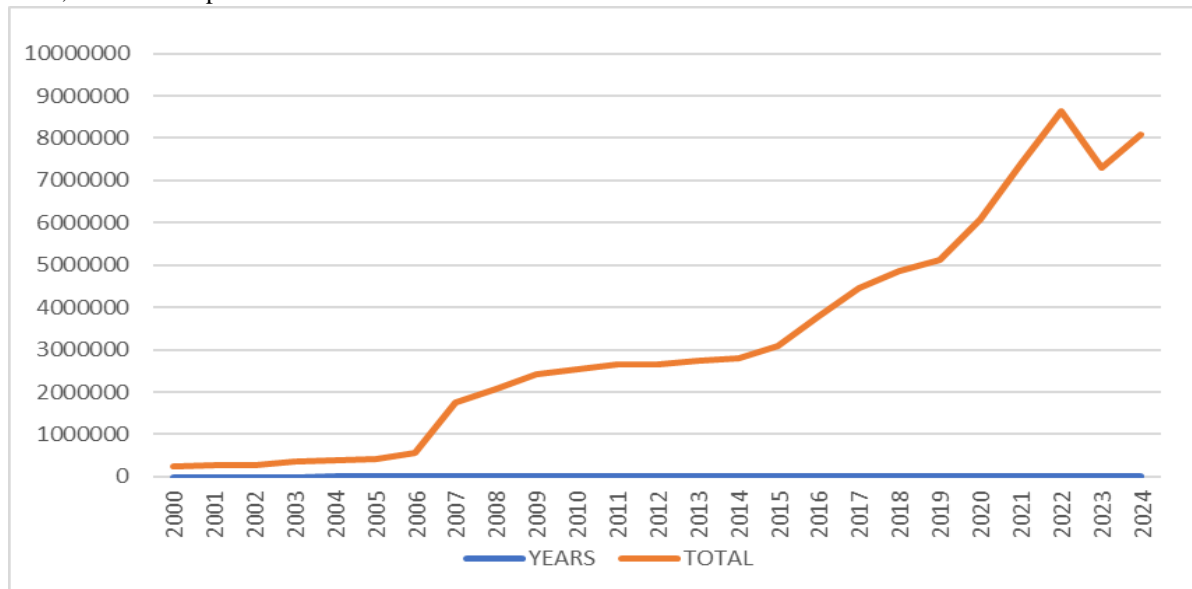


Figure 1.5

Figure 1.5 illustrates the overall revenue generated from all transportation services in Azerbaijan between the early 2000s and 2024.

• From 2000 to 2005, the income remained low and almost unchanged, indicating that the transport sector was developing slowly during this period.

• After 2006, the revenue began to rise more clearly, showing growth across all transport modes, including road, rail, air, and sea.

• Between 2010 and 2017, the graph presents a consistent upward movement, which suggests better infrastructure, increasing demand, and expanding transit operations.

• Post-2018, the increase becomes sharper, reflecting rapid sector expansion supported by new logistics projects, international transport corridors, and a rise in trade flows through Azerbaijan.

• Around 2020, a slight decline appears, likely related to global challenges such as the pandemic, but the income recovers shortly after.

• By 2023–2024, the revenue reaches its peak, demonstrating that Azerbaijan's transportation sector has achieved strong growth and continues to develop.

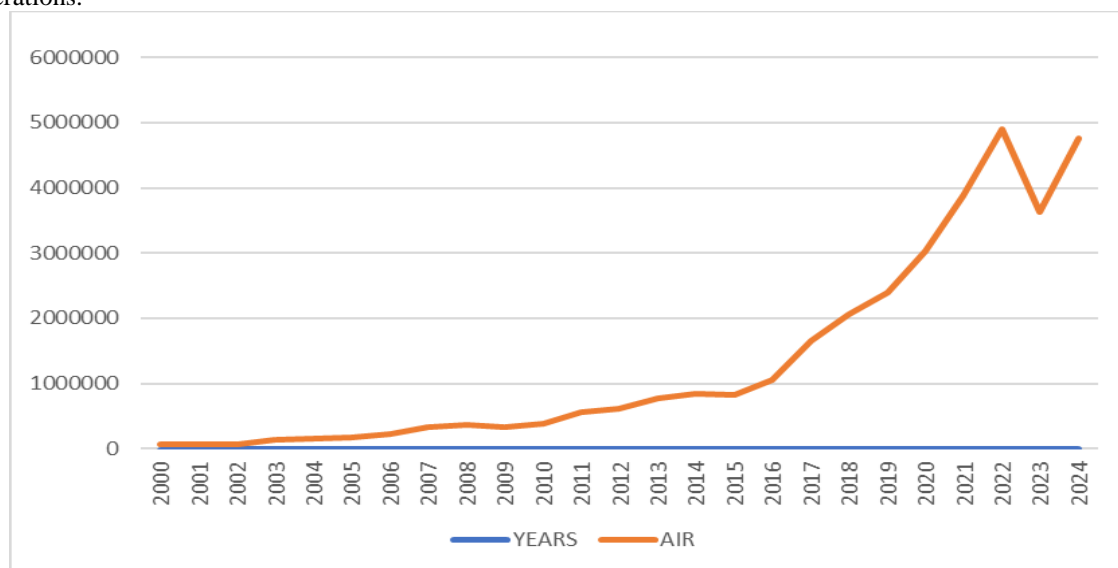


Figure 1.6

Figure 1.6 shows the income from the air transport sector in Azerbaijan from the early 2000s to 2024.

- Between 2000 and 2005, the income was quite low and stable, showing that the aviation sector was still at an early stage of development.
- After 2006, the revenue started to increase gradually, meaning that air travel demand, international flights, and cargo activities were growing.
- From 2010 to around 2017, the graph demonstrates a steady upward trend, reflecting improvements in airport infrastructure, the expansion of national airlines, and higher passenger traffic.

- After 2018, the growth becomes faster. This period shows strong development in the aviation sector, supported by new routes, increased transit flights, and rising air cargo operations.

- Around 2020, there is a noticeable decline, most likely caused by global air travel restrictions during the pandemic. However, the income begins to recover soon after.

- By 2023–2024, the income reaches its highest point, showing that air transportation in Azerbaijan has expanded strongly and continues to grow.

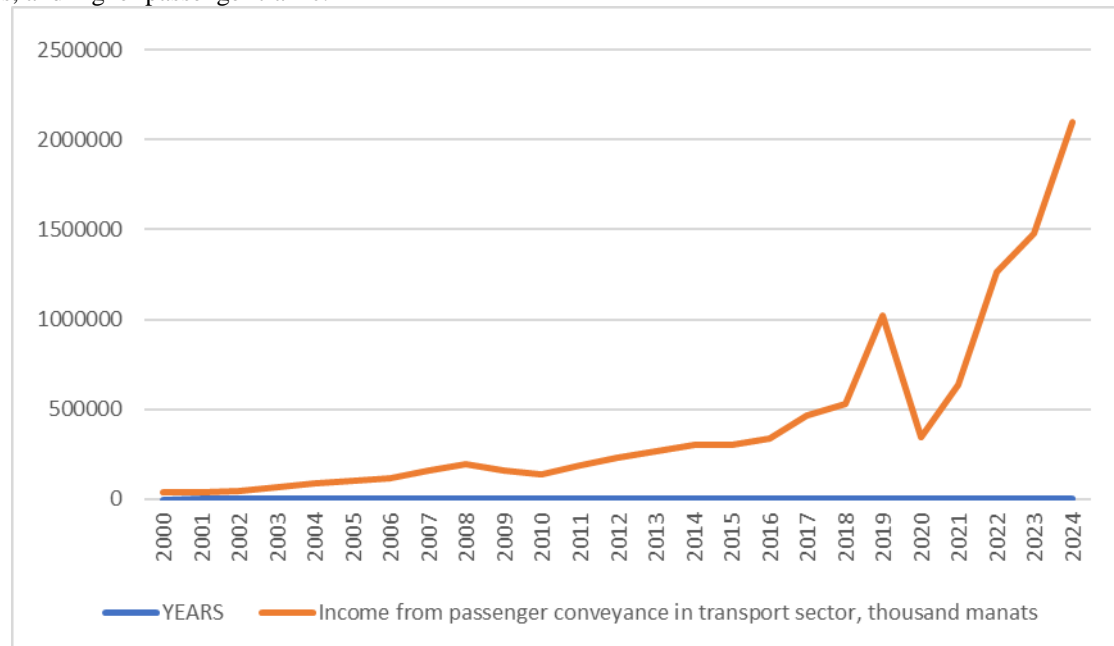


Figure 1.7

Figure 1.7 shows the income from passenger conveyance in the air transport sector in Azerbaijan from the early 2000s to 2024.

- From 2000 to 2005, the income remained low and almost unchanged, which indicates limited passenger traffic and slow development in the aviation market.
- After 2006, the revenue began to rise gradually, reflecting increasing demand for domestic and international flights.
- Between 2010 and 2017, the graph shows a stable upward trend, suggesting improvements in airport services, more flight destinations, and an overall rise in passenger numbers.

- After 2018, the increase becomes more rapid. This period demonstrates strong growth driven by higher transit passengers, expanded airline operations, and improved air travel accessibility.

- Around 2020, the income drops noticeably due to global travel restrictions caused by the pandemic, reducing passenger movements. However, recovery starts shortly after this period.

- By 2023–2024, the income reaches its peak, showing that passenger transportation by air in Azerbaijan has grown significantly and continues to expand.



Figure 1.8

Figure 1.8 shows the income from the transportation of goods in the air transport sector in Azerbaijan from the early 2000s to 2024.

- From 2000 to 2005, the income was low and remained nearly stable, showing that air cargo activities were still limited during this period.
- After 2006, the revenue started to increase gradually, indicating a rise in air freight demand and the development of cargo services.
- Between 2010 and 2017, the graph shows a steady upward trend, which reflects improvements in cargo infrastructure, better logistics systems, and growing international trade.

- After 2018, the growth becomes faster, showing strong expansion in air cargo operations supported by transit routes, new logistics hubs, and higher volumes of imported and exported goods.

- Around 2020, there is a slight decline due to global disruptions and reduced trade activity, but the income begins to rise again soon after.

- By 2023–2024, the income reaches its highest level, demonstrating that air cargo transportation in Azerbaijan has grown significantly and continues to develop.

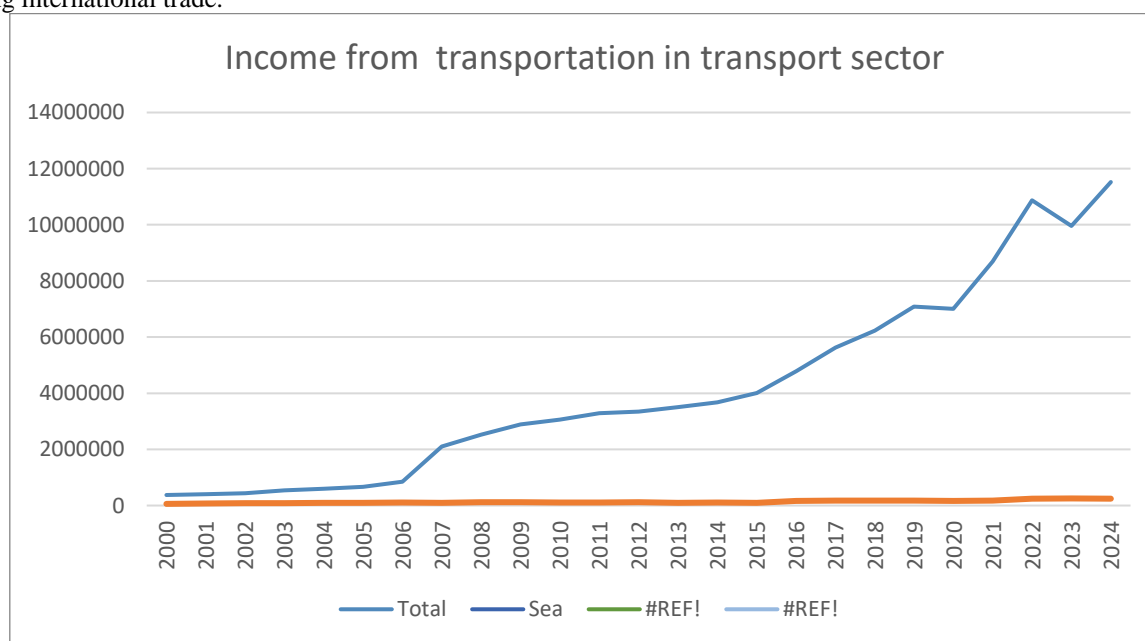


Figure 1.9

Figure 1.9 illustrates how total income from transportation in transport sector, income from sea transportation of goods in transport sector and income from sea transportation of passenger in transport sector change by the year from 2000 to 2024.

Blue line illustrates total income from transportation in transport sector

Red line illustrates income from sea transportation in transport sector

Green line illustrates income from sea transportation of goods in transport sector

And last one purple line illustrate income from sea transportation of passenger in transport sector.

Key Decline Periods and Causes

1. 2008–2009 Global Financial Crisis A sharp decline is visible around 2008–2009. This corresponds to the global financial crisis, which led to reduced trade volumes worldwide. Maritime cargo turnover in the Caspian Sea region, including Azerbaijan, decreased.

Source: State Statistical Committee of Azerbaijan (SSC) transport reports, 2009.

2. 2014–2016 Oil Price Shock Income from sea transport significantly dropped during 2014–2016. The global oil price collapse reduced both petroleum shipment volumes and related port revenues. Since a large share of Azerbaijan's maritime income is tied to oil logistics, the impact was immediate.

Source: SSC annual transport statistics; ASCO financial report 2015.

3. 2020 – COVID-19 Pandemic The graph shows a distinct fall in 2020. The pandemic caused disruptions in logistics chains, lowered demand for industrial products, and reduced passenger sea transport almost completely.

Sources: Trend News Agency (2020), Report.az maritime overview (2020), SSC transport indicators.

4. 2022–2023 Regional Geopolitical Shifts Some instability is observed in 2022–2023 due to regional transport rerouting caused by international sanctions and shifts in Eurasian trade corridors. Although the Middle Corridor gained importance, short-term fluctuations appeared while logistics systems adapted.

Source: Baku International Sea Trade Port annual report (2023).

Table 1.1

Descriptive statistics of total income from transportation and total income from railway transport sector

| Total income from transportation | | Total income from railway transport sector | |
|----------------------------------|-------------|--|-------------|
| Mean | 4162191.32 | Mean | 221860.52 |
| Standard Error | 683116.394 | Standard Error | 20040.00953 |
| Median | 3341800 | Median | 205828 |
| Mode | #N/A | Mode | #N/A |
| Standard Deviation | 3415581.97 | Standard Deviation | 100200.0476 |
| Sample Variance | 1.1666E+13 | Sample Variance | 10040049546 |
| Kurtosis | -0.30500832 | Kurtosis | 0.139673363 |
| Skewness | 0.79606331 | Skewness | 0.726624947 |
| Range | 11147389 | Range | 356243 |
| Minimum | 375131 | Minimum | 83348 |
| Maximum | 11522520 | Maximum | 439591 |
| Sum | 104054783 | Sum | 5546513 |
| Count | 25 | Count | 25 |
| Largest(1) | 11522520 | Largest(1) | 439591 |
| Smallest(1) | 375131 | Smallest(1) | 83348 |
| Confidence Level(95.0%) | 1409882.94 | Confidence Level(95.0%) | 41360.54684 |

Table 1.1 presents the results of the analysis of statistical characteristics. The Skewness value for total income from transportation is positive number, it means that distribution is on the right side. The Skewness value for total income from railway transport sector is positive number, it means that distribution is on the

right side. The Kurtosis value for total income from transportation is negative number, it means that distribution is softness. The Kurtosis value for total income from railway transport sector is positive number, it means that distribution is peakness.

Table 1.2

Descriptive statistics of total income from railway transport sector and income from railway goods transport.

| <i>Total income from railway transport sector</i> | | <i>Income from railway goods transport</i> | |
|---|----------|--|----------|
| | | | |
| Mean | 221860.5 | Mean | 207198.5 |
| Standard Error | 20040.01 | Standard Error | 20434.17 |
| Median | 205828 | Median | 186087 |
| Mode | #N/A | Mode | #N/A |
| Standard Deviation | 100200 | Standard Deviation | 102170.9 |
| Sample Variance | 1E+10 | Sample Variance | 1.04E+10 |
| Kurtosis | 0.139673 | Kurtosis | 0.073506 |
| Skewness | 0.726625 | Skewness | 0.82625 |
| Range | 356243 | Range | 353224 |
| Minimum | 83348 | Minimum | 77093 |
| Maximum | 439591 | Maximum | 430317 |
| Sum | 5546513 | Sum | 5179963 |
| Count | 25 | Count | 25 |
| Largest(1) | 439591 | Largest(1) | 430317 |
| Smallest(1) | 83348 | Smallest(1) | 77093 |
| Confidence Level(95.0%) | 41360.55 | Confidence Level(95.0%) | 42174.06 |

Table 1.2 presents the results of the analysis of statistical characteristics. The Skewness value for total income from railway transport sector is positive number, it means that distribution is on the right side. The Skewness value for income from railway goods transport is positive number, it means that distribution is on the

right side. The Kurtosis value for total income from railway transport sector is positive number, it means that distribution is peakness. The Kurtosis value for income from railway goods transport is positive number, it means that distribution is peakness.

Table 1.3

Descriptive statistics of total income from railway transport sector and income from railway passenger transport.

| <i>Total income from railway transport sector</i> | | <i>Income from railway passenger transport</i> | |
|---|----------|--|----------|
| | | | |
| Mean | 221860.5 | Mean | 14661.92 |
| Standard Error | 20040.01 | Standard Error | 1775.138 |
| Median | 205828 | Median | 14240 |
| Mode | #N/A | Mode | #N/A |
| Standard Deviation | 100200 | Standard Deviation | 8875.689 |
| Sample Variance | 1E+10 | Sample Variance | 78777863 |
| Kurtosis | 0.139673 | Kurtosis | 2.324375 |
| Skewness | 0.726625 | Skewness | 1.193048 |
| Range | 356243 | Range | 39716 |
| Minimum | 83348 | Minimum | 1837 |
| Maximum | 439591 | Maximum | 41553 |
| Sum | 5546513 | Sum | 366548 |
| Count | 25 | Count | 25 |
| Largest(1) | 439591 | Largest(1) | 41553 |
| Smallest(1) | 83348 | Smallest(1) | 1837 |
| Confidence Level(95.0%) | 41360.55 | Confidence Level(95.0%) | 3663.705 |

Table 1.3 presents the results of the analysis of statistical characteristics. The Skewness value for total income from railway transport sector is positive number,

it means that distribution is on the right side. The Skewness value for income from railway passenger transport is positive number, it means that distribution is on the

right side. The Kurtosis value for total income from railway transport sector is positive number, it means

that distribution is peakness. The Kurtosis value for income from railway passenger transport is positive number, it means that distribution is peakness.

Table 1.4

Descriptive statistics of income from railway goods transport and income from railway passenger transport.

| <i>Income from railway goods transport</i> | | <i>Income from railway passenger transport</i> | |
|--|----------|--|----------|
| Mean | 207198.5 | Mean | 14661.92 |
| Standard Error | 20434.17 | Standard Error | 1775.138 |
| Median | 186087 | Median | 14240 |
| Mode | #N/A | Mode | #N/A |
| Standard Deviation | 102170.9 | Standard Deviation | 8875.689 |
| Sample Variance | 1.04E+10 | Sample Variance | 78777863 |
| Kurtosis | 0.073506 | Kurtosis | 2.324375 |
| Skewness | 0.82625 | Skewness | 1.193048 |
| Range | 353224 | Range | 39716 |
| Minimum | 77093 | Minimum | 1837 |
| Maximum | 430317 | Maximum | 41553 |
| Sum | 5179963 | Sum | 366548 |
| Count | 25 | Count | 25 |
| Largest(1) | 430317 | Largest(1) | 41553 |
| Smallest(1) | 77093 | Smallest(1) | 1837 |
| Confidence Level(95.0%) | 42174.06 | Confidence Level(95.0%) | 3663.705 |

Table 1.4 presents the results of the analysis of statistical characteristics. The Skewness value for income from railway goods transport is positive number, it means that distribution is on the right side. The Skewness value for income from railway passenger transport is positive number, it means that distribution is on the

right side. The Kurtosis value for income from railway goods transport is positive number, it means that distribution is peakness. The Kurtosis value for income from railway passenger transport is positive number, it means that distribution is peakness.

Table 1.5

Descriptive statistics of Income from transportation of air transport sector in Azerbaijan.

| <i>YEARS</i> | | <i>TOTAL</i> | | <i>AIR</i> | |
|-------------------------|---------|--------------|-------------|-----------------|-------------|
| Mean | 2012 | Mean | 3237867.92 | Mean | 1332094.52 |
| Standard Error | 1.47196 | Standard | 526746.506 | Standard Error | 307868.1451 |
| Median | 2012 | Median | 2645666 | Median | 617870 |
| Mode | #N/A | Mode | #N/A | Mode | #N/A |
| Standard Deviation | 7.3598 | Standard | 2633732.53 | Standard Devia | 1539340.726 |
| Sample Variance | 54.1667 | Sample V | 6.9365E+12 | Sample Variance | 2.36957E+12 |
| Kurtosis | -1.2 | Kurtosis | -0.57589481 | Kurtosis | 0.391702127 |
| Skewness | 0 | Skewness | 0.67630001 | Skewness | 1.285703421 |
| Range | 24 | Range | 8392942 | Range | 4841155 |
| Minimum | 2000 | Minimum | 241001 | Minimum | 63655 |
| Maximum | 2024 | Maximum | 8633943 | Maximum | 4904810 |
| Sum | 50300 | Sum | 80946698 | Sum | 33302363 |
| Count | 25 | Count | 25 | Count | 25 |
| Largest(1) | 2024 | Largest(1) | 8633943 | Largest(1) | 4904810 |
| Smallest(1) | 2000 | Smallest(1) | 241001 | Smallest(1) | 63655 |
| Confidence Level(95.0%) | 3.03798 | Confidence | 1087151.36 | Confidence Lev | 635408.6219 |

Based on table 1.5 skewness distribution of total income from transportation of air transport sector is positive number, it means that distribution is right sided and skewness distribution of income from transportation of air transport sector is also positive it means that

distribution is right sided. In table kurtosis also mentioned. Kurtosis for Total income from transportation of air transport sector is negative number it means distribution is softness. But kurtosis for income from

transportation of air transport sector is positive number
it means our distribution is peakness.

Table 1.6

| Descriptive statistics of Income from sea transportation in transport sector in Azerbaijan | | | |
|--|--------------|-------------------------|-------------|
| Total | | Sea | |
| Mean | 4162191.32 | Mean | 134266.76 |
| Standard Error | 683116.394 | Standard Error | 10978.75374 |
| Median | 3341800 | Median | 110778 |
| Mode | #N/A | Mode | # N/A |
| Standard Deviation | 3415581.97 | Standard Deviation | 54893.76868 |
| Sample Variance | 1.16662E+13 | Sample Variance | 3013325840 |
| Kurtosis | -0.305008323 | Kurtosis | 0.014025188 |
| Skewness | 0.796063313 | Skewness | 0.962746538 |
| Range | 11147389 | Range | 193870 |
| Minimum | 375131 | Minimum | 59051 |
| Maximum | 11522520 | Maximum | 252921 |
| Sum | 104054783 | Sum | 3356669 |
| Count | 25 | Count | 25 |
| Largest(1) | 11522520 | Largest(1) | 252921 |
| Smallest(1) | 375131 | Smallest(1) | 59051 |
| Confidence Level(95.0%) | 1409882.943 | Confidence Level(95.0%) | 22659.03404 |

Based on table 1.6 skewness distribution of total income from transportation in transport sector is positive number it means that distribution is right sided and skewness distribution of income from sea transportation in transport sector is also positive it means that distribution is right sided. In table kurtosis also mentioned.

Kurtosis for Total income from transportation in transport sector is negative number it means distribution is softness. But kurtosis for income from sea transportation in transport sector is positive number it means our distribution is peakness.

Table 1.7

| Descriptive statistics of income from sea transportation of goods in transport sector | |
|---|-------------|
| Income from sea transportation of goods in transport sector | |
| Mean | 132779.52 |
| Standard Error | 10800.26632 |
| Median | 110047 |
| Mode | #N/A |
| Standard Deviation | 54001.33158 |
| Sample Variance | 2916143813 |
| Kurtosis | -0.03757408 |
| Skewness | 0.948912941 |
| Range | 190371 |
| Minimum | 58627 |
| Maximum | 248998 |
| Sum | 3319488 |
| Count | 25 |
| Largest(1) | 248998 |
| Smallest(1) | 58627 |
| Confidence Level(95.0%) | 22290.65412 |

Based on table 1.7 skewness distribution for Income from sea transportation of goods in transport sector is positive number it means that distribution is right

sided. And kurtosis for Income from sea transportation of goods in transport sector is negative number it means distribution is softness.

Table 1.8

Descriptive statistics of income from passenger conveyance in seaway transport sector

| Income from passenger conveyance in seaway transport sector | |
|---|-------------|
| Mean | 1487.24 |
| Standard Error | 282.593355 |
| Median | 940 |
| Mode | #N/A |
| Standard Deviation | 1412.966775 |
| Sample Variance | 1996475.107 |
| Kurtosis | 4.479895441 |
| Skewness | 2.14711409 |
| Range | 5778 |
| Minimum | 401 |
| Maximum | 6179 |
| Sum | 37181 |
| Count | 25 |
| Largest(1) | 6179 |
| Smallest(1) | 401 |
| Confidence Level(95.0%) | 583.2440188 |

Based on table 1.8 skewness distribution for Income from sea transportation of passenger in transport sector is positive number it means that distribution is

right sided. And kurtosis for Income from sea transportation of goods in transport sector is peakness number it means distribution is peakness.

Table 1.9

Correlation matrix of total income from transportation and total income from railway transport sector.

| | <i>Total income from transportation</i> | <i>Total income from railway transport sector</i> |
|--|---|---|
| Total income from transportation | 1 | |
| Total income from railway transport sector | 0.960556 | 1 |

Table 1.9 Presents the results of the analysis of statistical characteristics.

The relationship between total income from transportation and total income from railway transport sector is strong linear.

Table 1.10

Correlation matrix of total income from railway transport sector and income from railway goods transport.

| | <i>Total income from railway transport sector</i> | <i>Income from railway goods transport</i> |
|--|---|--|
| Total income from railway transport sector | 1 | |
| Income from railway goods transport | 0.996342283 | 1 |

The relationship between total income from railway transport sector and income from railway goods transport is strong linear.

Table 1.11

Correlation matrix of total income from railway transport sector and income from railway passenger transport.

| | <i>Total income from railway transport sector</i> | <i>Income from railway passenger transport</i> |
|--|---|--|
| Total income from railway transport sector | 1 | |
| Income from railway passenger transport | -0.179927139 | 1 |

Table 1.11 presents the results of the analysis of statistical characteristics.

The relationship between total income from railway transport sector and income from railway passenger transport is weak linear.

Table 1.12

Correlation matrix of income from railway goods transport and income from railway passenger transport.

| | <i>Income from railway goods transport</i> | <i>Income from railway passenger transport</i> |
|---|--|--|
| Income from railway goods transport | 1 | |
| Income from railway passenger transport | -0.263326501 | 1 |

Table 1.12 presents the results of the analysis of statistical characteristics. The relationship between income from railway goods transport and income from railway passenger transport is weak linear.

Table 1.13

Correlation matrix of total income from transportation and total income from seaway transport sector.

| | Total | Sea |
|-------|-------------|-----|
| Total | 1 | |
| Sea | 0.945835422 | 1 |

Table 1.13 shown that total income from transportation in transport sector and income from sea transportation in transport sector has strong relation.

Table 1.14

Correlation matrix of total income from seaway transport sector and income from seaway passenger transport.

| | Sea | Income from passenger conveyance in seaway transportation |
|---|-------------|---|
| Sea | 1 | |
| Income from passenger conveyance in seaway transportation | 0.639340993 | 1 |

Table 1.14 shown income from sea transportation in transport sector and income from passenger conveyance in seaway transportation has middle relation.

Table 1.15

Correlation matrix of total income from seaway transport sector and income from seaway goods transport.

| | Sea | Income from transportation of goods |
|-------------------------------------|-------------|-------------------------------------|
| Sea | 1 | |
| Income from transportation of goods | 0.999797589 | 1 |

Table 1.15 shown income from sea transportation in transport sector and income from transportation of goods in seaway transportation has strong relation.

Table 1.16

Correlation matrix of income from seaway goods transport and income from seaway passenger transport.

| | Income from goods in seaway transportation | Income from passenger conveyance in seaway transportation |
|---|--|---|
| Income from goods in seaway transportation | 1 | |
| Income from passenger conveyance in seaway transportation | 0.623741467 | 1 |

Table 1.16 shown Income from passenger conveyance in seaway transportation and Income from transportation of goods in seaway transportation has middle relation.

Table 1.17

Correlation matrix of total income from transportation and income from air transport sector in Azerbaijan.

| | TOTAL | AIR |
|--------------|--------------|------------|
| TOTAL | 1 | |
| AIR | 0.96523 | 1 |

Table define that relation between total income from transportation and income from air transport sector in Azerbaijan is **strong**.

Table 1.18

Correlation matrix of income from air transport sector and Income from passenger conveyance in transport sector in Azerbaijan.

| | <i>AIR</i> | <i>Income from passenger conveyance in air transport sector, thousand manats</i> |
|----------------------|------------|--|
| AIR | 1 | |
| Income from p | 0.88698 | 1 |

Table define that relation between income from air transport sector and Income from passenger conveyance in transport sector in Azerbaijan is **strong**.

Table 1.19

Correlation matrix of income from air transport sector and Income from transportation of goods in transport sector in Azerbaijan.

| | <i>AIR</i> | <i>Income from transportation of goods in air transport sector, thousand manat</i> |
|-----------------------|------------|--|
| AIR | 1 | |
| Income from tr | 0.97668 | 1 |

Table define that relation between income from air transport sector and Income from transportation of goods in transport sector in Azerbaijan is **strong**.

Conclusion. The analysis of income dynamics in Azerbaijan’s railway sector shows that railway transport plays an essential strategic role in national development and international connectivity. Azerbaijan’s railway network functions not only as a domestic logistics system but also as an important component of several major regional and global transport corridors. The country participates in the Trans-Caspian International Transport Route (Middle Corridor), the Baku–Tbilisi–Kars Railway, the North–South Transport Corridor, TRACECA, and other international logistics routes. These corridors increase the volume of transit cargo passing through Azerbaijan and strengthen the country’s role as a key transport hub between Europe and Asia. As a result, the railway sector gains higher freight income, attracts new transit flows, and diversifies its economic revenue sources.

Modernization of infrastructure, digitalization of cargo operations, expansion of logistics centers, and integration with regional platforms have improved operational efficiency. The increase in cargo turnover along the Middle Corridor has been especially significant, since global supply chains increasingly rely on alternative Eurasian routes. The Baku–Tbilisi–Kars Railway also supports growing trade between Turkey, Georgia, Central Asia, and Europe, contributing to stable long-term income growth. Passenger transport has benefited from improved service quality and stronger regional mobility.

Despite these positive trends, revenue stability is still affected by both internal and external factors, such as geopolitical risks, seasonal fluctuations, changes in global trade demand, and the need for continuous infrastructure investment. Improving tariff competitiveness, strengthening institutional capacity, and expanding international cooperation will remain important for maintaining sustainable growth.

Overall, Azerbaijan’s railway sector has strong potential to further improve its financial performance by using its geographic advantages, strengthening its participation in international transport corridors, and continuing modernization efforts. As global supply chains continue to transform, Azerbaijan’s strategic railway network is well-positioned to support national economic development and reinforce the country’s role as a major regional transport and logistics hub.

The statistical analysis of income from sea transportation in Azerbaijan’s transport sector between 2000 and 2024 demonstrates clear links between economic conditions, global market shifts, and sector-specific developments. The data reveal that sea transport continues to be an essential contributor to national transport revenues, particularly due to its integration with oil logistics, cargo transit, and increasing regional trade flows.

Fluctuations in income—especially during periods such as the 2008–2009 financial crisis, the 2014–2016 oil price decline, and the 2020 COVID-19 pandemic—show that the maritime sector is sensitive to global economic disruptions. Meanwhile, recent geopolitical shifts highlight both risks and opportunities for Azerbaijan, as the Middle Corridor expands and international transport routes evolve.

Descriptive statistics indicate right-skewed distributions, suggesting that peak-income years significantly exceed average performance, mainly driven by oil-related activity. Variance and standard deviation values confirm that income streams remain highly variable, reflecting the dynamic nature of maritime trade.

Overall, the analysis underscores the importance of continued investment in port infrastructure, fleet modernization, and diversification of maritime services. Strengthening these areas will enhance the resilience of Azerbaijan’s sea transport sector and support sustainable revenue growth in the years ahead.

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