

TRANSBORDER FREIGHT DATA ANALYSIS

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BACKGROUND

Transportation systems are the backbone of modern economies, enabling movement of goods and services across borders.

The Bureau of Transportation Statistics (BTS) collects essential data on these systems to inform better decisions in safety, sustainability, and logistics.

PROJECT GOAL

Goal:

To analyze BTS freight transportation data in order to:

- Identify inefficiencies
- Uncover trends
- Suggest actionable improvements

METHODOLOGY

Used the CRISP-DM framework (Cross Industry Standard Process for Data Mining):

1. Business Understanding
2. Data Understanding
3. Data Preparation
4. Analysis
5. Evaluation
6. Deployment

TOOLS USED

- Python (Pandas): Data cleaning & transformation
- Power BI: Interactive dashboard & visualization

BUSINESS QUESTIONS

1. What is the total trade value and freight cost for Canada/Mexico?
2. What is the average cost and value per kg of traded goods?
3. How has the trade value changed over time?
4. What is the distribution of containerized vs non-containerized goods?
5. What proportion of trade is domestic vs foreign?
6. How does trade value differ between imports and exports?
7. Which transportation modes are the most and least cost-efficient?
8. How does trade value compare between Canada and Mexico, by imports and exports?

DATA OVERVIEW

Source: Bureau of Transportation Statistics (bts.gov)

- Combined monthly Excel files into yearly datasets
- Merged yearly files into a single dataset
- Reviewed documentation to decode column values
- Explored data for cleaning.

DATA PREPARATION

- Cleaned and loaded data into Power BI
- Renamed ambiguous column headers
- Replaced coded values using the data dictionary
- Created calculated fields:
 - Cost per Kg
 - Value per Kg
- Checked for:
- Missing values
- Duplicate records
- Inconsistent formatting

DASHBOARD



An interactive dashboard created in Power BI

ANALYSIS

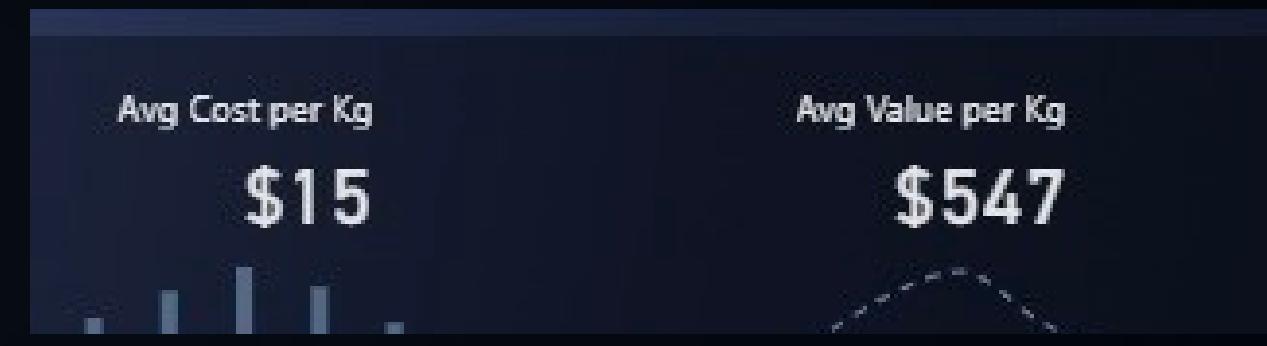
Q1 – What is the total trade value and freight cost?



From 2020–2024, the total trade value across borders is \$32 Trillion, with \$431 Billion in freight charges.

Trade volumes are high, but freight costs are substantial; indicating potential for cost-saving improvements in logistics.

Q2 – What is the average cost and value per kilogram of traded goods?



Avg Cost per Kg: \$15
Avg Value per Kg: \$547

Insight:
Goods carry significant value per kilogram, but transportation costs vary widely by mode; suggesting room for efficiency.

ANALYSIS

Q3 – How has the trade value changed over time (2020–2024)?

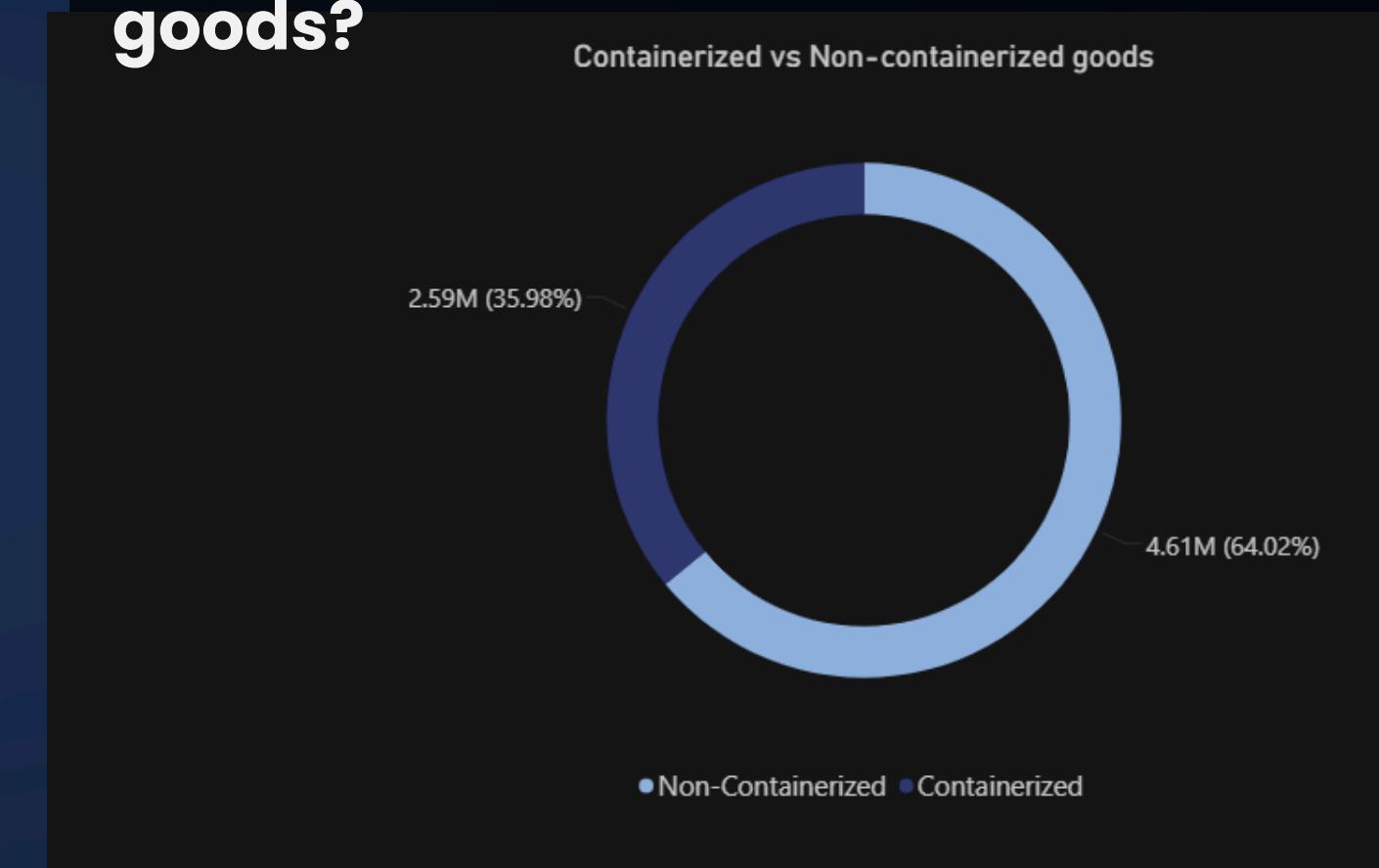


From 2020–2024, the total trade value across borders is \$32 Trillion, with \$431 Billion in freight charges.

Insight:

Trade activity has steadily increased since 2020, reflecting strong post-pandemic recovery and rising cross-border demand.

Q4 – What is the distribution of containerized vs non-containerized goods?



Containerized: 64%

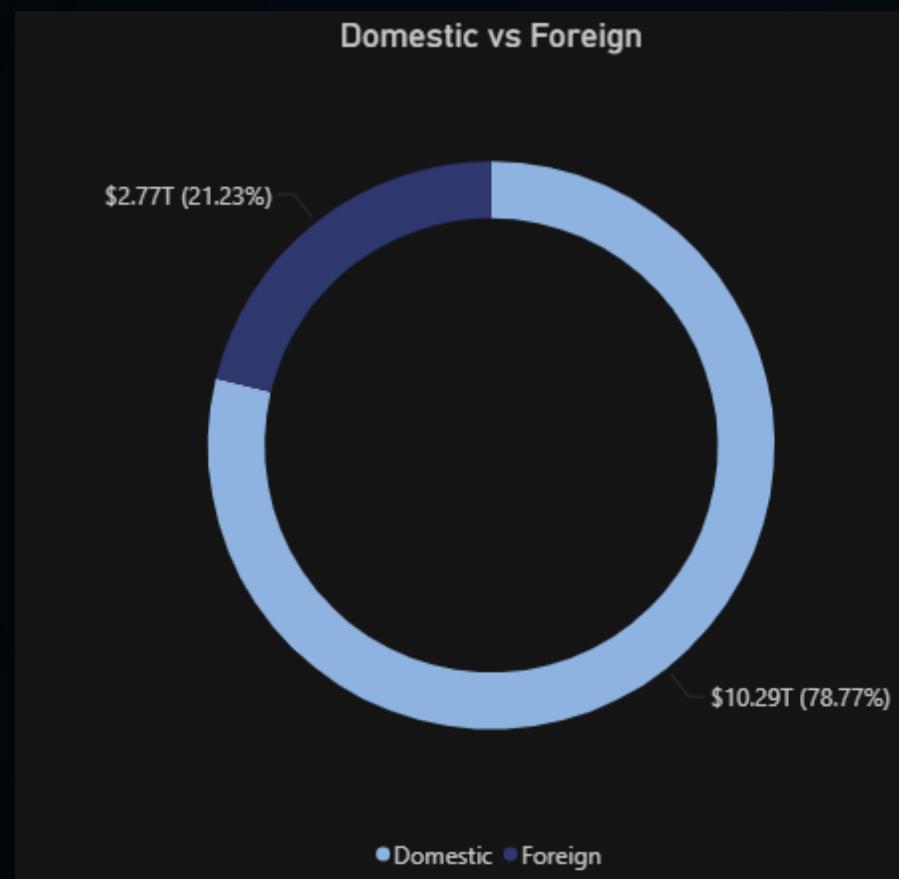
Non-Containerized: 36%

Insight:

The majority of freight is containerized, underscoring the importance of efficient port and container infrastructure.

ANALYSIS

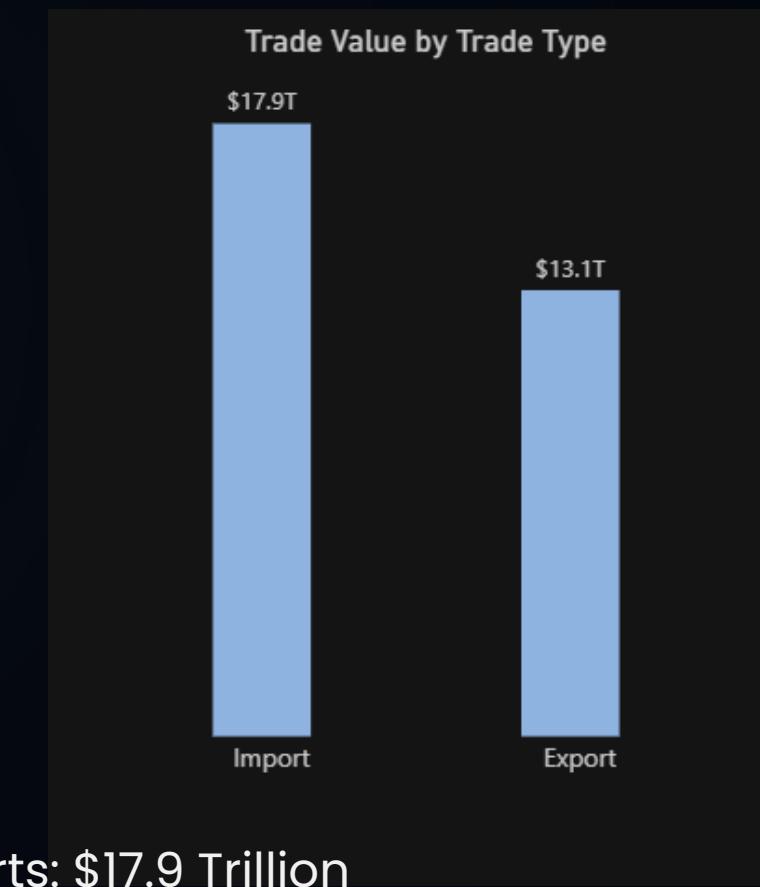
Q5 – What proportion of trade is domestic vs foreign?



- Foreign trade: 78.7%
- Domestic trade: 21.3%

Foreign trade dominates, highlighting the critical role of international logistics and border infrastructure.

Q6 – How does trade value differ between imports and exports?

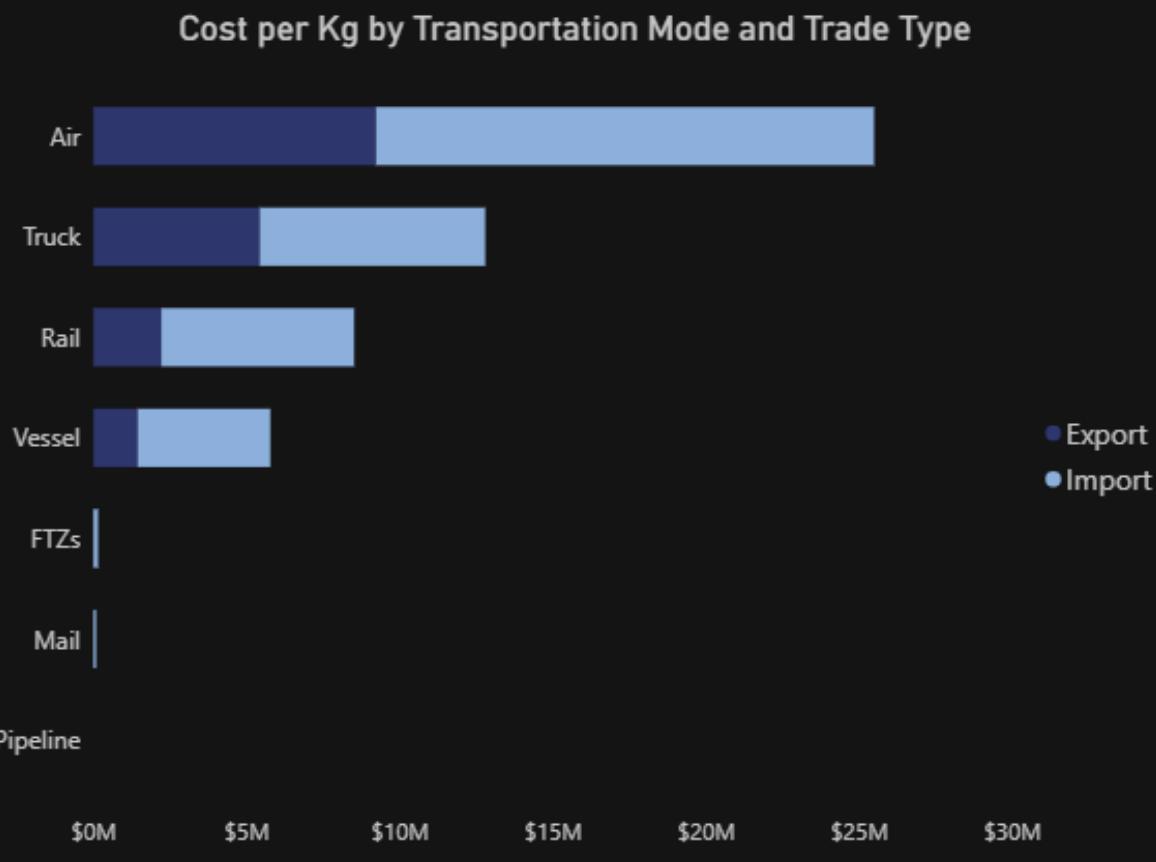


- Imports: \$17.9 Trillion
- Exports: \$13.1 Trillion

Imports consistently exceed exports, pointing to a trade imbalance that may affect long-term logistics and policy planning.

ANALYSIS

Q7 – Which transportation modes are the most and least cost-efficient?

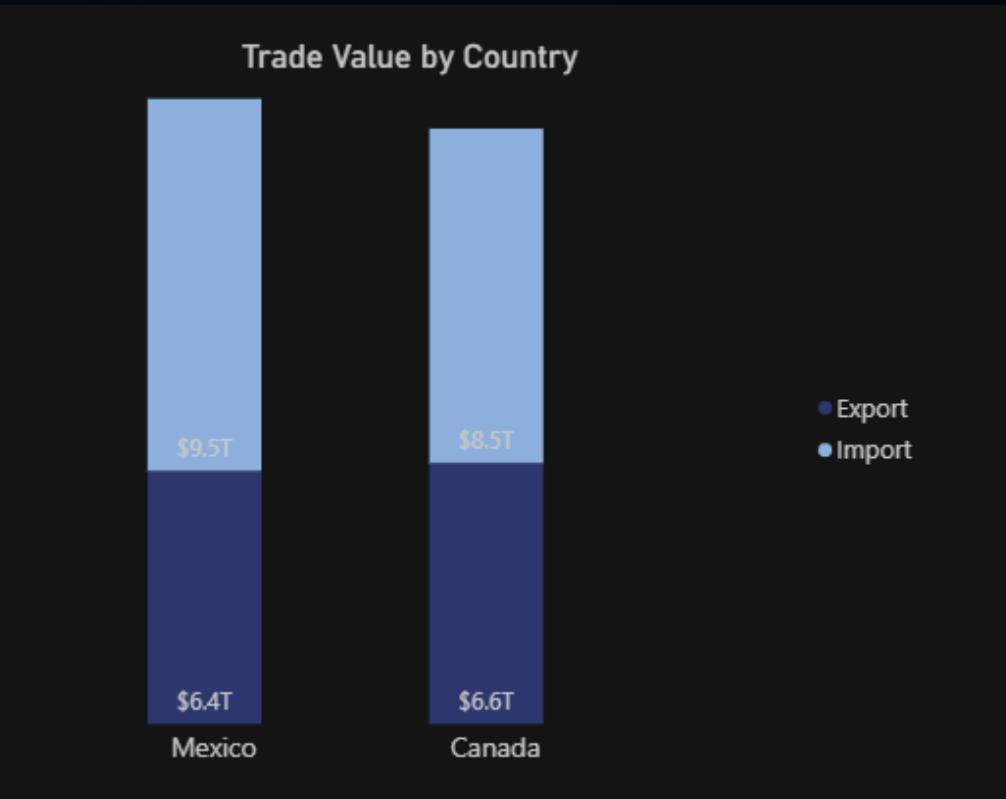


- Most cost-efficient: Mail, FTZs, Vessel, Pipeline
- Least cost-efficient: Air

Insight:

Air should be reserved for high-value or time-sensitive cargo due to high costs.

Q8 – How does trade value compare between Canada and Mexico (import/export)?



- Canada has higher export value
- Mexico leads in imports

Insight:

Trade flow dynamics differ therefore strategy should be tailored per country.

FINAL INSIGHTS & RECOMMENDATIONS

Recommendations from analysis:

- Shift bulk freight to rail/vessel to cut costs
- Monitor and address U.S. trade imbalance
- Invest in infrastructure for containerized goods
- Tailor logistics strategies by country (Canada vs Mexico)

THANK YOU