Optimizing TransBorder Freight Operations in North America

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GitHub Repo: https://github.com/Debv122/transborder-freight-analysis.git

Executive Summary

- Analyzed 2020 US TransBorder Freight Data (BTS)

- Focused on trends, inefficiencies, and sustainability in trade with Canada & Mexico

- Used CRISP-DM framework to drive structured, data-backed insights

- Recommendations target cost savings, environmental impact, and performance

Business Goal

Enhance the efficiency, uncover patterns, and propose actionable recommendations.

CRISP-DM Approach

- Business Understanding → Optimize freight operations

- Data Understanding → BTS 2020 Monthly Data

- Preparation → Cleaned, engineered key metrics

- Analysis → Trends, inefficiencies, and opportunities

- Evaluation → COVID impacts, seasonal trends

- Deployment → Recommendations + GitHub release

Analytical Questions

1. Which U.S. states have the highest and lowest trans-border trade values?

2. What are the top ports of entry/exit and how do they compare?

3. Which transport modes dominate and how do they vary by region/commodity?

4. What are the leading traded commodities and how do their values change over time?

5. How do trade flows fluctuate seasonally or during anomalies like COVID?

6. Where are the inefficiencies, zero-weight high-value shipments or underused routes?

7. What recommendations can improve efficiency, cost-effectiveness, and sustainability?

Key Visual Insights

- Top States: Texas, Michigan, California (Where Trade Is Happening)

- Top Ports: Laredo and Detroit dominate entry/exit points

- Modes of Transport: Trucks lead, but rail and vessels are underutilized

- Top Commodities: Vehicles, fuels, machinery

- Seasonal Trends & COVID Impact: Drop early 2020, recovery later

- Inefficiencies: Zero-weight, high-value records + underused routes

Key Findings

- Trucking dominates but strains sustainability

- Port & route bottlenecks exist

- Data anomalies signal operational/reporting gaps

- Seasonal and global disruptions clearly affect flow

Actionable Recommendations

1. Invest in underused rail & vessel routes

2. Encourage green logistics practices

3. Use AI for real-time freight monitoring

4. Improve cross-border policy harmonization

5. Strengthen data accuracy & standards

Conclusion

Data-backed logistics can shape more sustainable, cost-effective freight systems across North America. This project offers a blueprint for smarter cross-border trade.