Global Trade & Shipping Inequality
Statistical Analysis of 16 Years of International Commerce

Amandeep Cheema

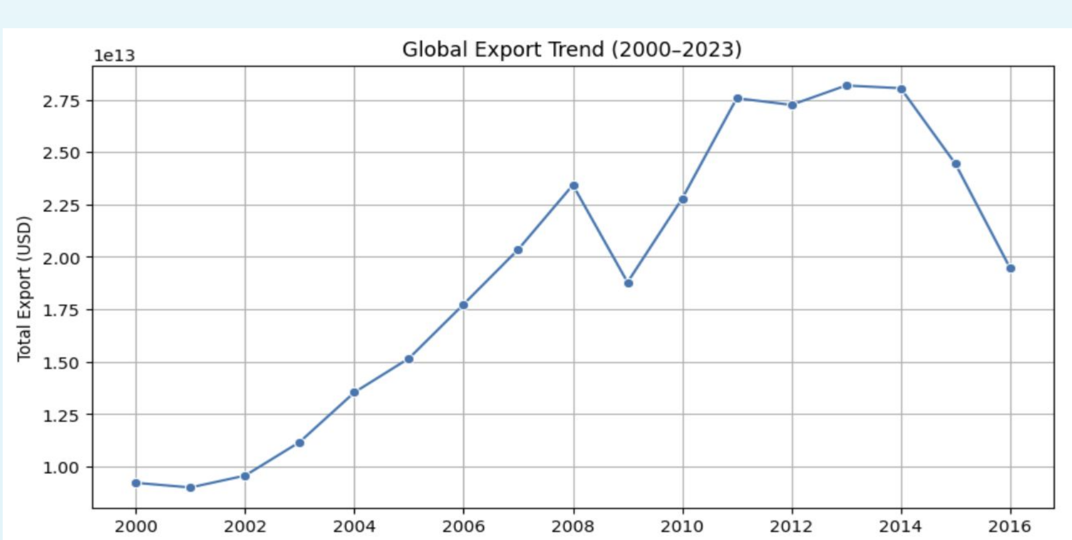
Koushik Vennalakanti

Abstract

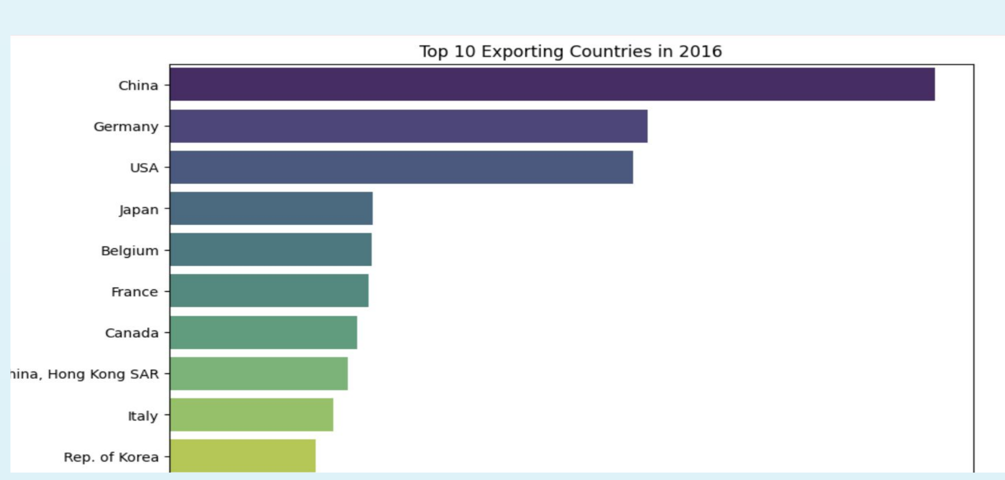
This study analyzes global trade patterns from 2000–2016 to understand how inequality, concentration, and structural shocks reshaped international commerce. Using **UN Comtrade data** and methods including Gini coefficients, Theil indices, Kruskal–Wallis tests, network correlations, and Pettitt break detection, we find a significant rise in trade inequality beginning around 2006, intensified by the 2008 financial crisis. Post-crisis trade did not return to earlier balance; instead, exports became increasingly concentrated among major economies, while global networks fragmented into regional clusters. Sectoral results show energy and industrial goods as most shock-sensitive. Findings highlight the need for diversification and resilience-focused trade policies.

Introduction

This study investigates how long-term global trade patterns evolved across three economic periods- pre-crisis,crisis, and recovery, using country-level export data from **2000–2016.** By examining temporal segments, sector shifts, and network behavior, the analysis highlights emerging instability, early inequality signals, and changing inter-country relationships that shaped modern trade dynamics.



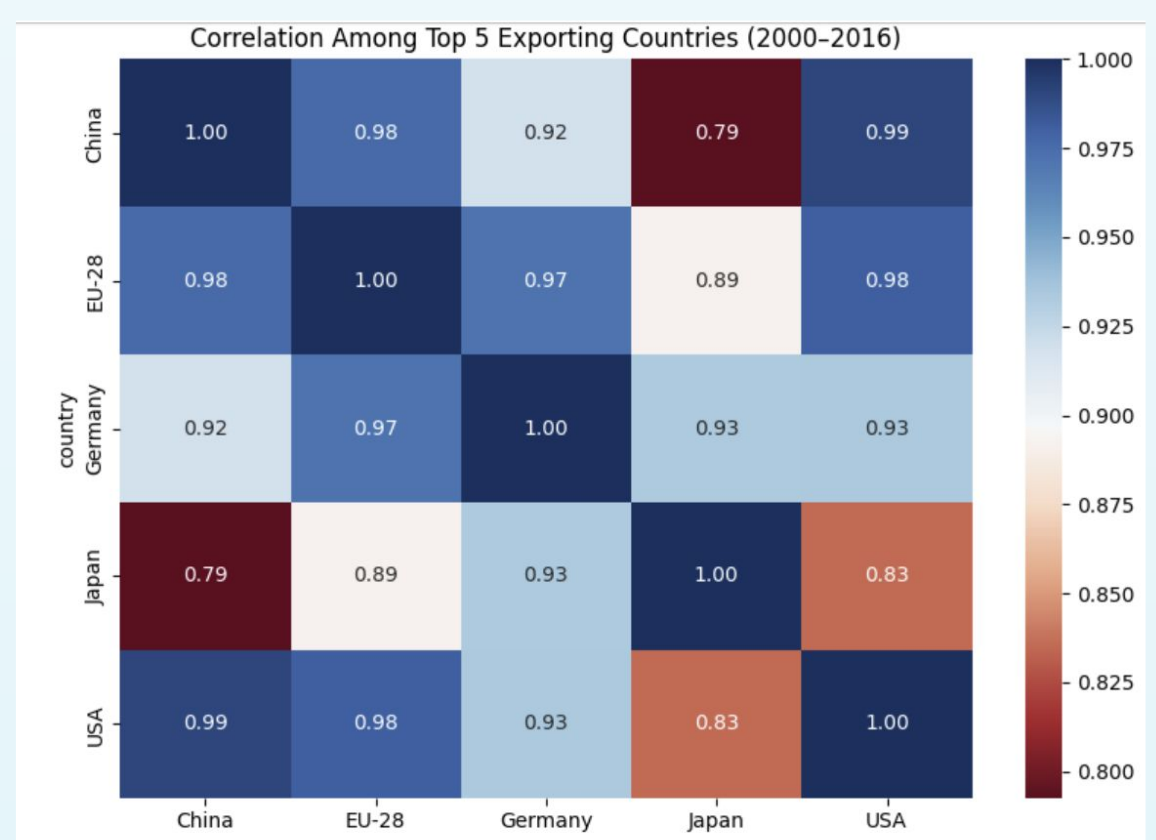
Global Export Trend



Top 10 Exporters -2016

Methodology

Our analysis integrates **distributional, temporal, and network-based statistical techniques to capture multiple dimensions of global trade dynamics**. We quantify variation within and across export sectors using inequality measures and decomposition methods. **Non-parametric testing** evaluates whether observed differences arise from meaningful structural changes rather than random fluctuation. **Time-series change-point** detection identifies moments of significant behavioral shift. Finally, **correlation networks** translate country-level export movements into visual structures, enabling comparisons of global connectedness and regional clustering across economic periods



Correlation HeatMap of Top 5 Exporting countries

Results

Trade Shifts Across Periods

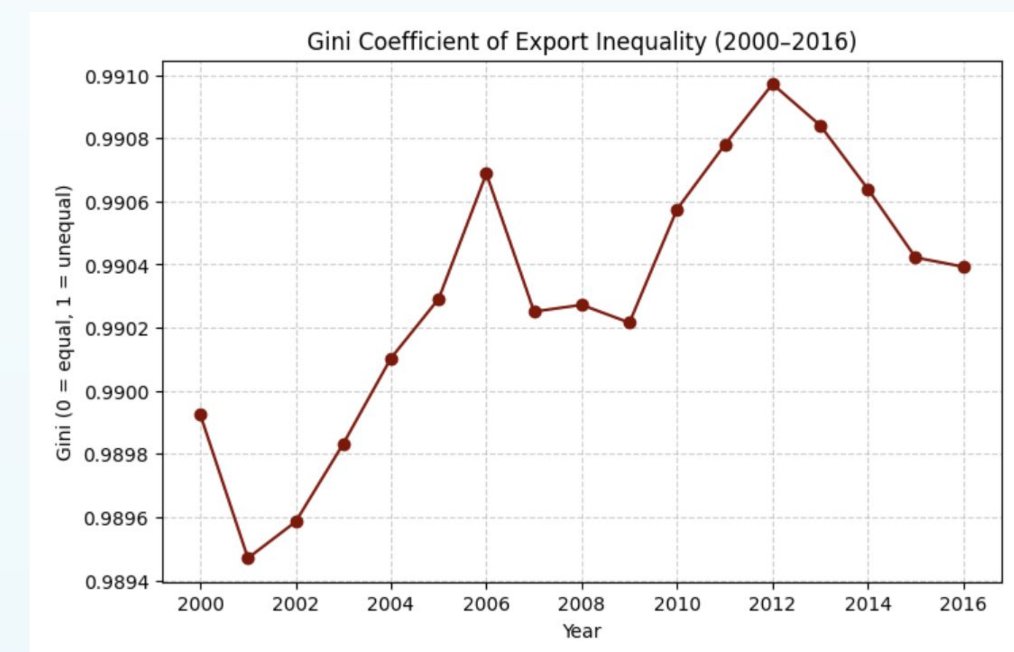
- Significant differences across pre-crisis, crisis, and recovery periods ($p < 7\times10^{-18}$).
- Post-2008 trade becomes more concentrated among top exporters.

Structural Turning Point

- Pettitt test detects a major shift in 2006, signaling rising instability before the crisis.

Market Concentration

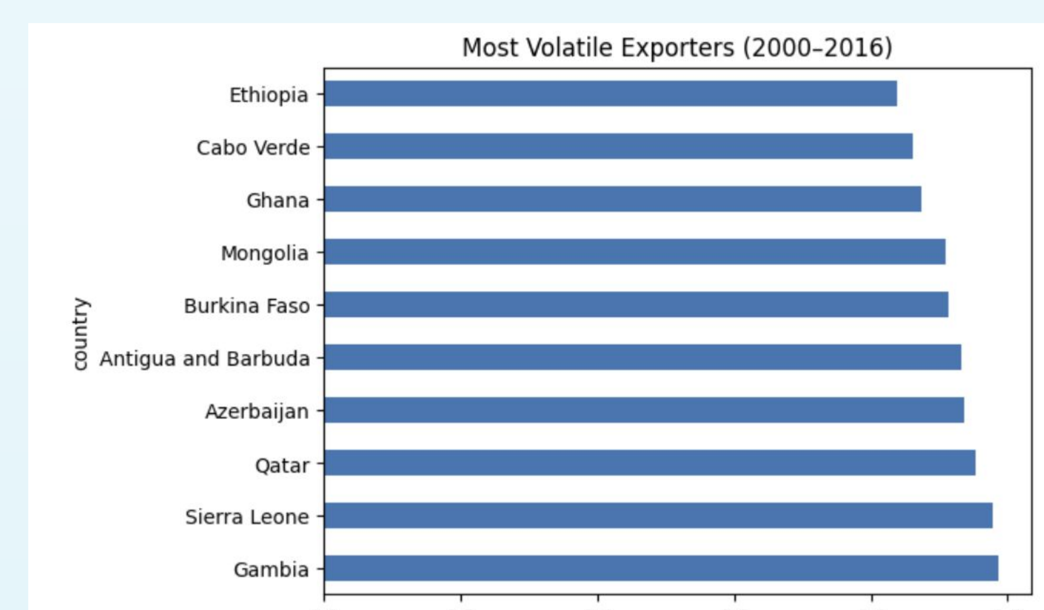
- HHI rises sharply after 2012; by 2016, exports dominated by **China, Germany, USA**.



Gini Coefficient Trend

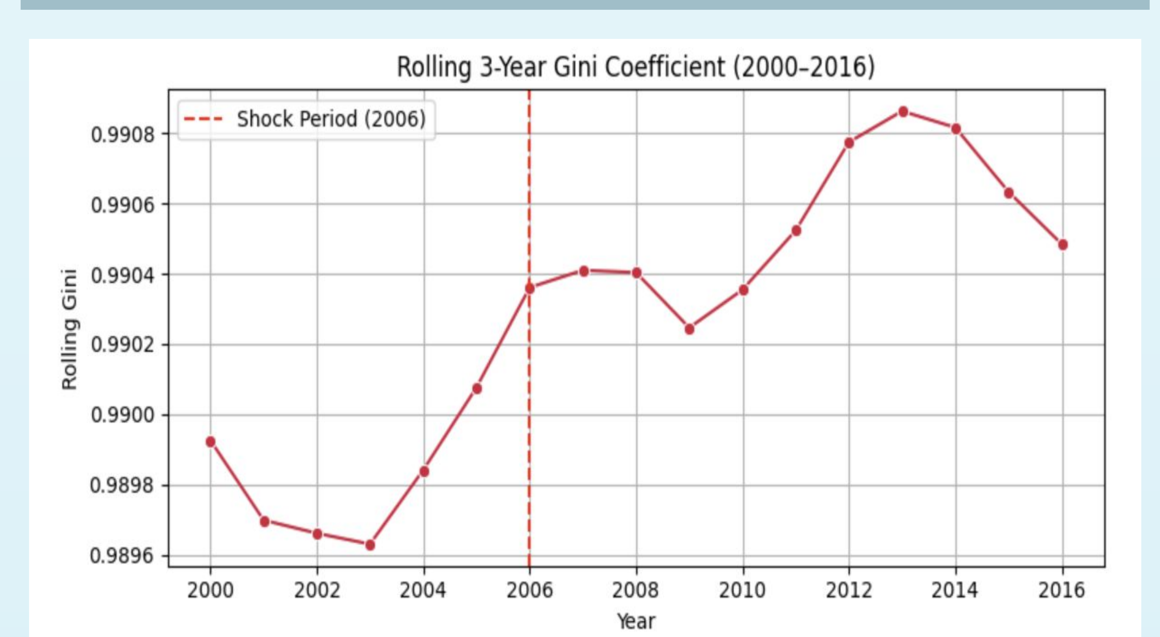
Trade Network Fragmentation

- Pre-crisis: dense, global connectivity.
- Post-crisis: **fragmented regional clusters** (Asia–Pacific, Europe, Oil exporters).



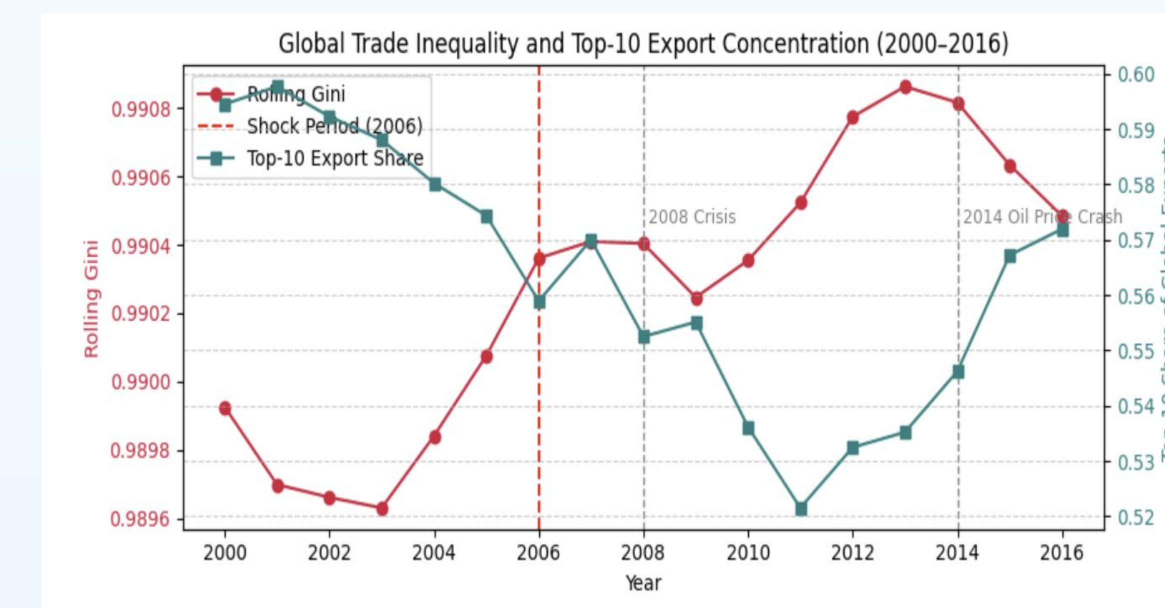
Most Volatile Exporters

Conclusion



Rolling Gini

Global trade underwent a **permanent shift** after the 2008 crisis. Inequality and market concentration increased, **volatility rose among smaller exporters**, and global connectivity fractured into regional clusters. Trade did not return to pre-crisis balance, indicating a lasting move from a unified global system toward a more unequal, regionally divided structure.



Inequality Vs Concentration

Recommendations

- **Diversify economic bases:** Reduce dependence on shock-sensitive sectors by expanding into multiple industries and building resilient export portfolios.
- **Strengthen regional cooperation:** Develop robust regional trading blocs and partnerships to stabilize markets and buffer against global disruptions.
- **Enhance national resilience:** Support flexible, multi-sector export strategies, especially for smaller economies, to better absorb future shocks and reduce vulnerability

Acknowledgements

We sincerely thank **Professor Masoud Yari** for his guidance, feedback, and support throughout this project and course **DSCI 321**.

Global export data were sourced from the **UN Comtrade Database.**