



**TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.**

**PORT OPERATIONS,
ADMINISTRATION AND
ECONOMICS**

4. Ports, Maritime Shipping and International Trade



MARA 416

Professor: Dr. Jean-Paul Rodrigue

Context

- *The demand for port traffic is derived from global trade, which has undergone a wide range of economic, technological, and geopolitical developments. Shifts in global trade, production, maritime shipping, transport systems, and logistics are affecting port activity levels and operations.*

Table of Contents

- A. Maritime Shipping as a Driver of Globalization
- B. Ongoing Growth of International Trade
- C. The Shift in Global Trade Patterns
- D. Geopolitics and Trade
- E. The Containerization of Trade
- F. International Trade and Maritime Shipping Services



TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS



A. Maritime Shipping as a Driver of Globalization



Read this section

The Driving Forces of Globalization

- Economic Integration

- Factor driving the increasing importance of international trade.
- Historically:
 - Trade was prevalent but set up under constraining conditions.
 - Trading over long distances remained slow and expensive, limiting its scale and scope.
- Early 20th century:
 - Transport technologies such as steamships had become ubiquitous and efficient.
 - Emergence of a complex international trade system.
 - The steamship enabled economies of scale that could not have been achieved beforehand.
- Mid-20th century:
 - Global regulatory regime became sufficiently open to allow for an expanded form of globalization.

The Driving Forces of Globalization

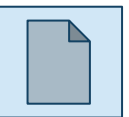
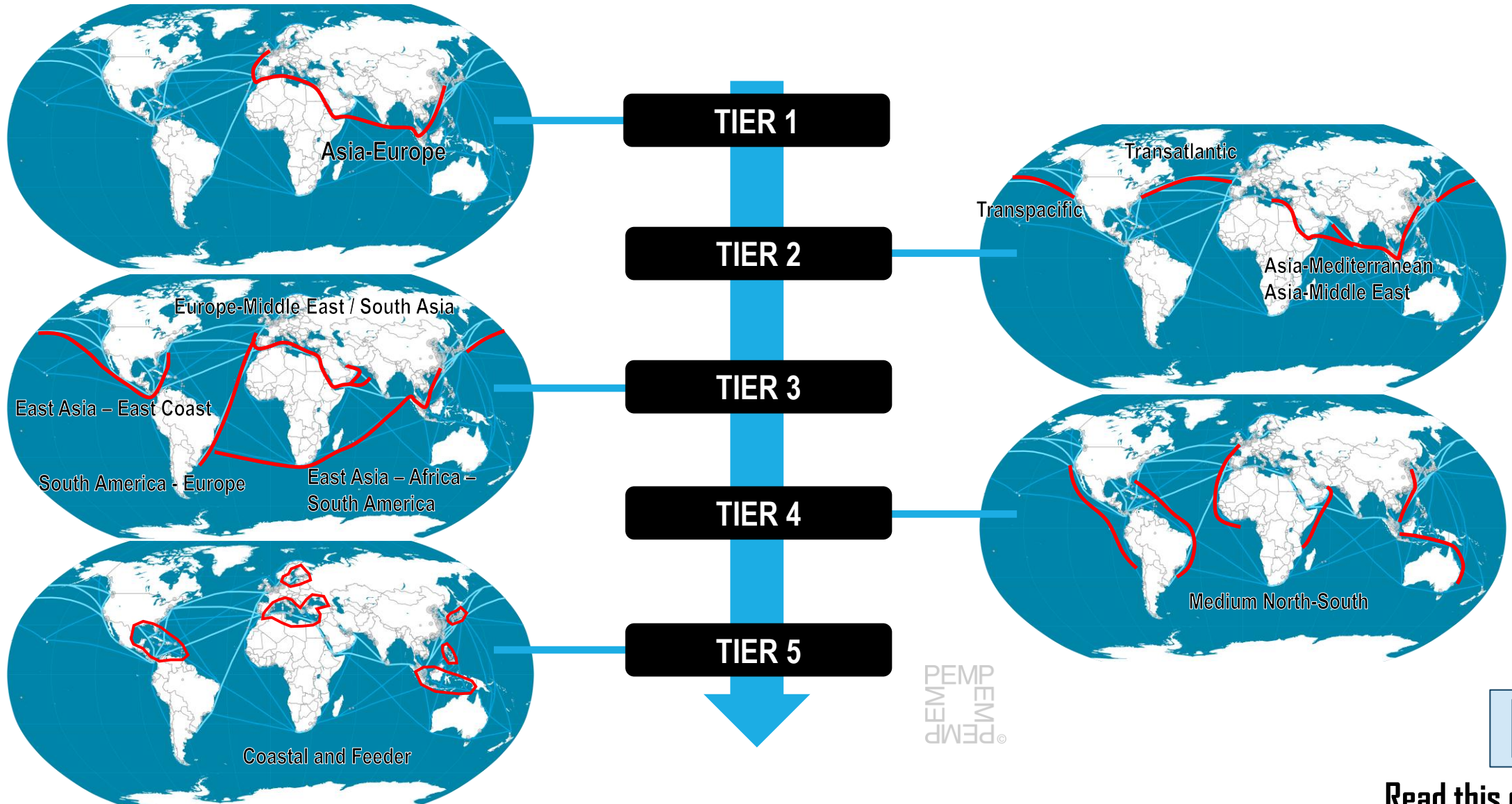
- Global trade is impossible without transportation
 - Efficient transport a key trade facilitator.
 - Almost all cargo carried by maritime shipping is considered international trade.
 - Active internal trade in countries:
 - Long coastlines (e.g., the United States, Brazil, and China).
 - Archipelagic (Japan, Indonesia, the Philippines).
- Transport costs (both freight costs and time costs)
 - A key component of total trade costs.
 - Costs incurred in delivering goods to final users:
 - Beyond the marginal cost of producing the good.
 - Policy barriers, information costs, and legal and regulatory costs.
 - Lower trade costs contribute to trade growth:
 - For developing economies, a 10% reduction in transportation costs was associated with a 20% growth in international trade.

The Driving Forces of Globalization

- Distance

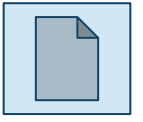
- A factor that plays a lesser role in the intensity of maritime trade relations.
- Capacity and direct connectivity of maritime shipping networks more relevant.
- International trade influences the structure of maritime shipping networks.
- Organized according to a hierarchy.
- Most important shipping routes are related to the most important trade relations.

Global Hierarchy of Shipping Lanes



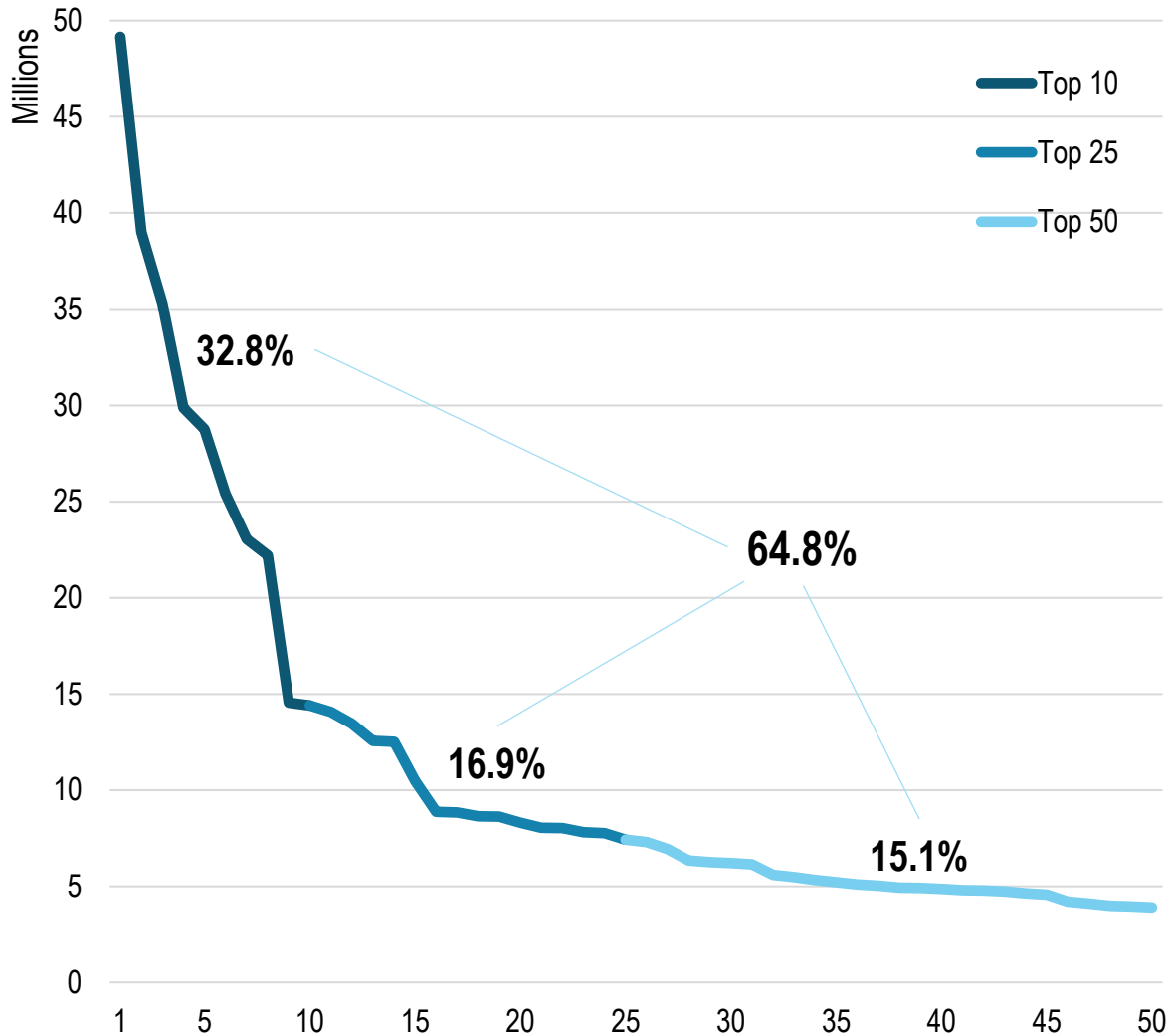
Read this content

Global Hierarchy of Container Ports

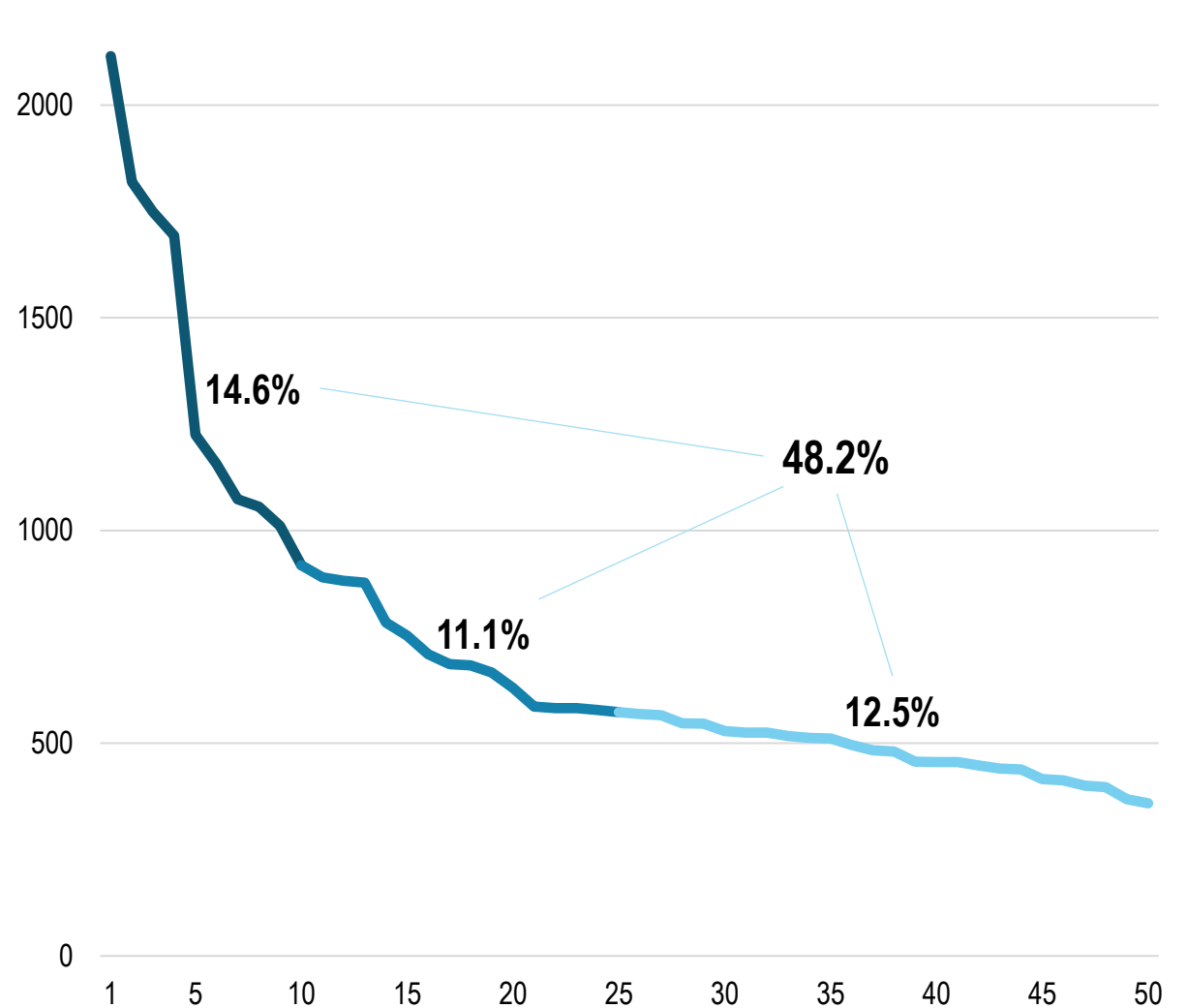


[Read this content](#)

TEU (2023)



LSCI (2023)





**TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.**

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS

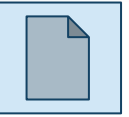


B. Ongoing Growth of International Trade



Read this section

Growth Factors of International Trade



Read this content

INCOME GROWTH



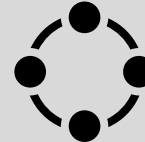
- Additional consumption of goods and services
- Some are imported

TRANSPORT COSTS



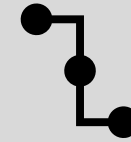
- More options and opportunities for trade
- Smaller goods value-to-transport cost ratio

INTEGRATION



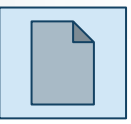
- Tariff rate reductions
- Trade agreements
- Common commercial policy

SUPPLY CHAINS



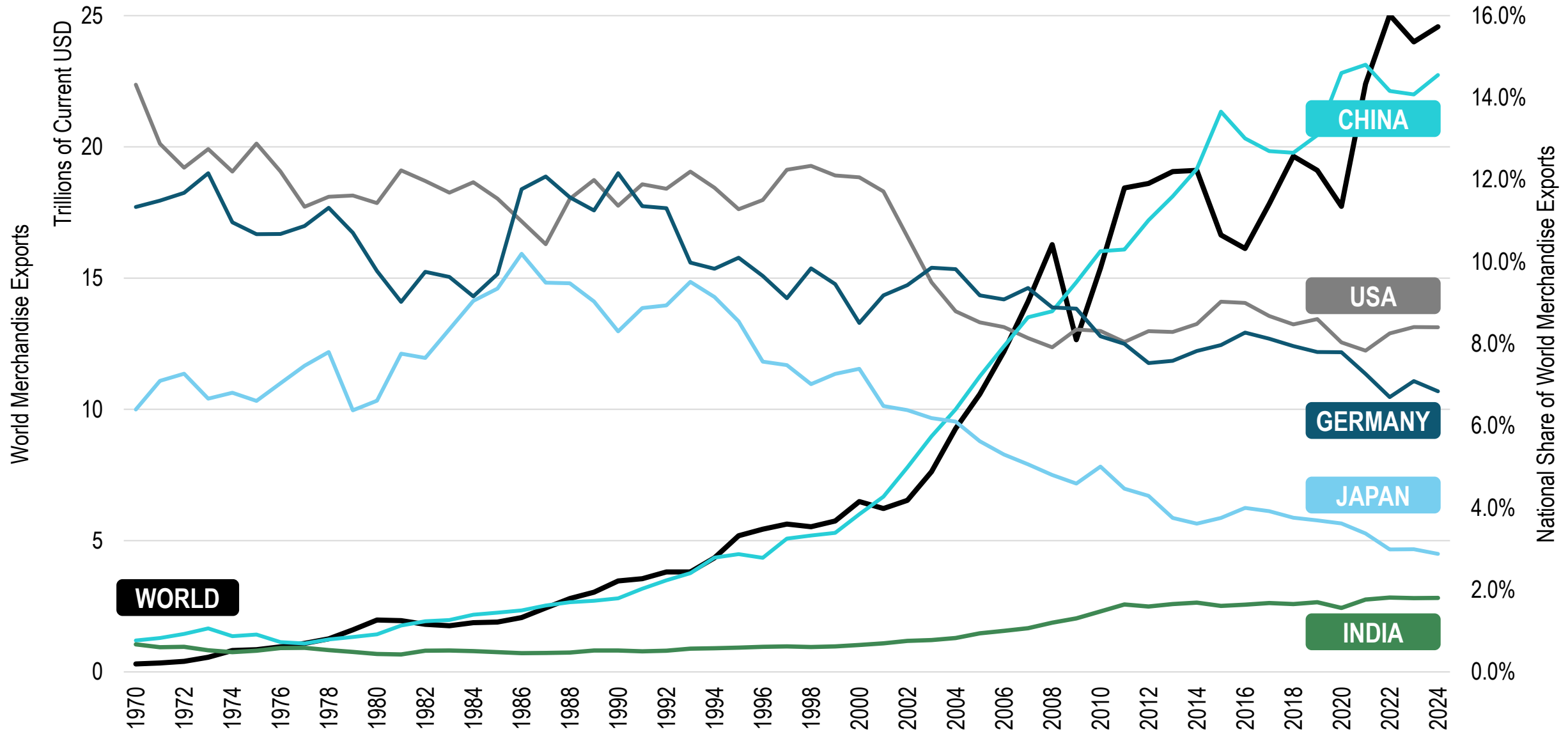
- Global supply chains
- Outsourcing and offshoring
- More parts traded

PEMP
EMEM
EMEM



Merchandise Exports, World and Selected Countries 1970-2024

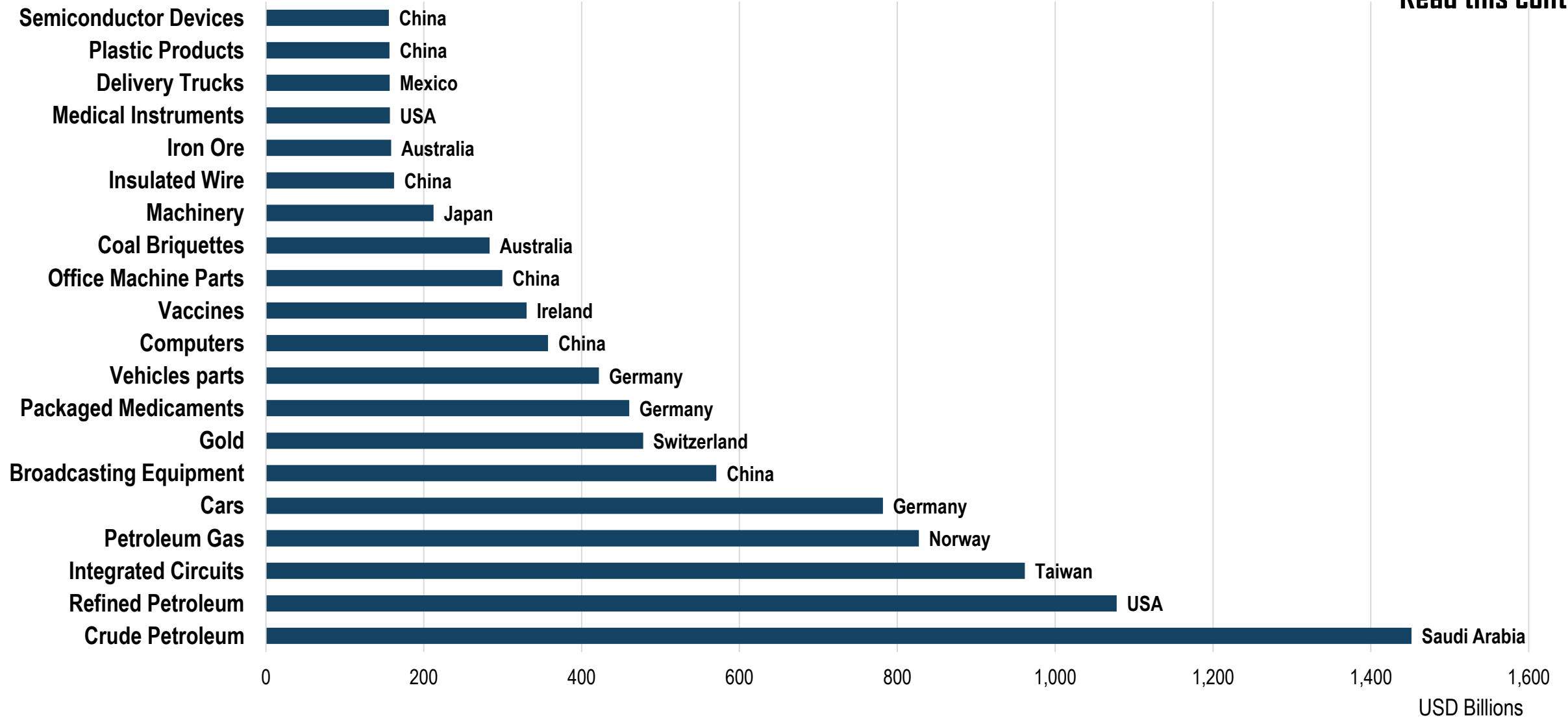
[Read this content](#)



World's Most Traded Goods and Lead Exporter, 2022



[Read this content](#)





TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS



C. The Shift in Global Trade Patterns



Read this section

Trade Relations Factors

- Geographical proximity
 - Intensity of trade relations function of proximity.
 - Unless notable advantages can be found further away.
 - European Union:
 - Significant trading linkages with adjacent areas in Eastern Europe, North Africa, and the Middle East.
 - North America:
 - Maintains important trade linkages with Latin America, notably Mexico, as part of the USMCA (United States-Mexico-Canada Agreement).
 - Shorter distances have a significant impact on the modes of transportation used for trade.
 - Maritime shipping less suitable for long-distance trade.
 - Exception of short-sea shipping.
 - Key advantage of maritime shipping:
 - Substantially mitigates the negative effects of long distances on trade.

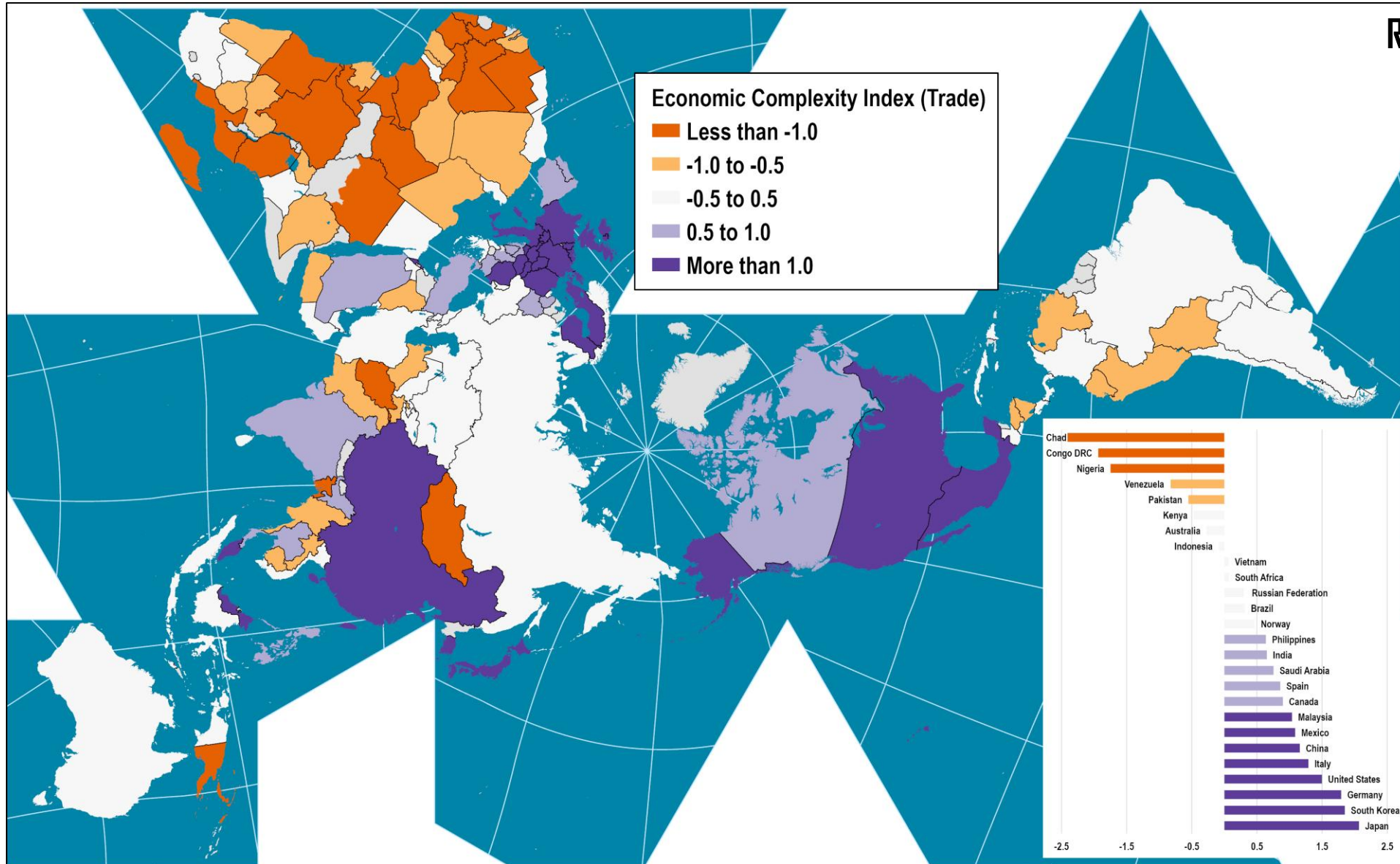
Trade Relations Factors

- Resource availability
 - Scarcity and availability of resources.
 - Shaped maritime networks since the Industrial Revolution> Remain the main component, ton-wise, of maritime shipping.
 - Energy, mineral, and agricultural trades:
 - Distinct shipping networks and specialized port facilities.
 - Designed to handle bulk cargoes, including petroleum, natural gas, coal, grains, alumina, and iron ore.
- Economic complexity
 - Diversity of a nation's economy associated with complex trade structure and more trade per capita.
 - Ability to manufacture a wide range of products that are difficult to replicate.
 - Economies that produce simpler, easier-to-replicate products are at a disadvantage.

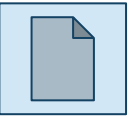
Economic Complexity Index (ECI) – Trade, 2023



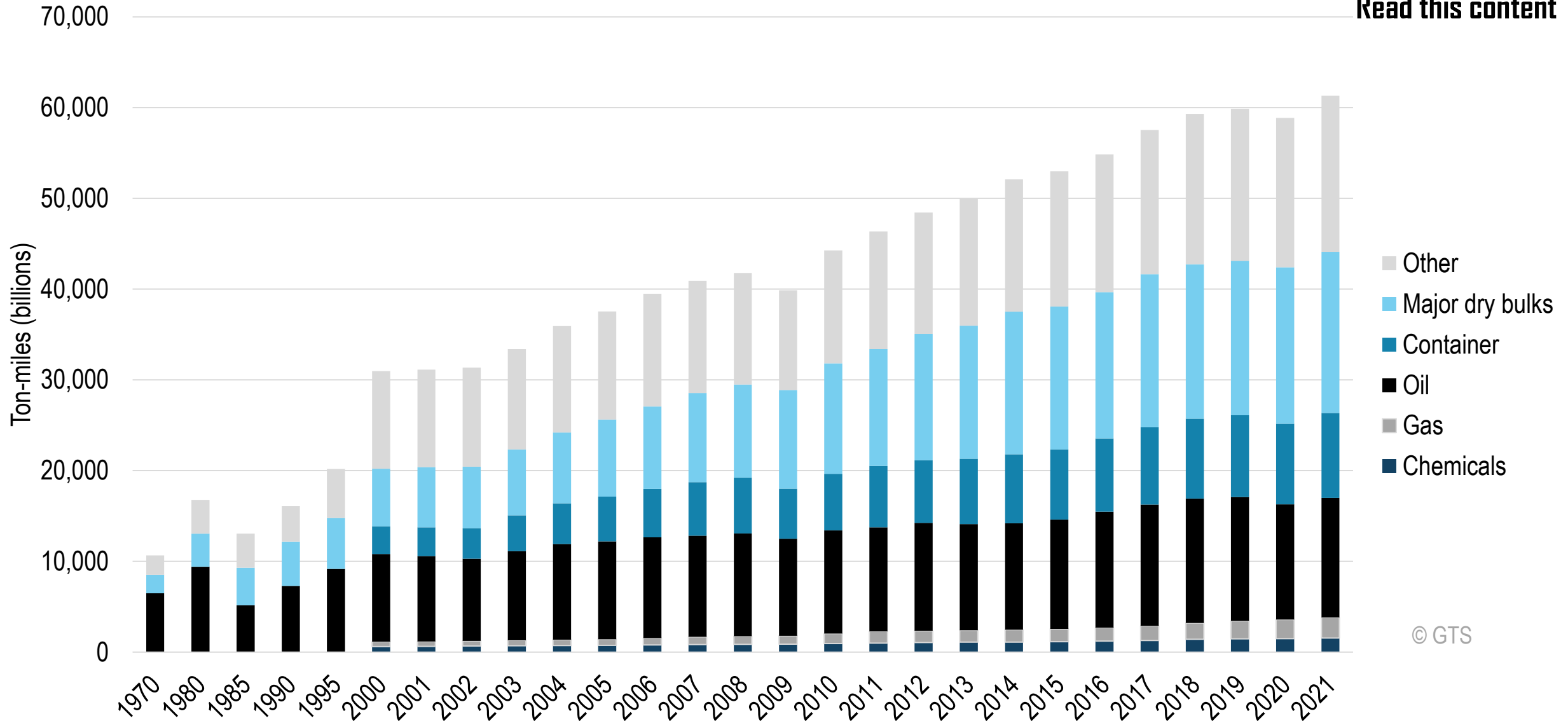
Read this content



World Seaborne Trade by Cargo Type, 1970-2021



[Read this content](#)

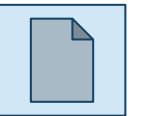
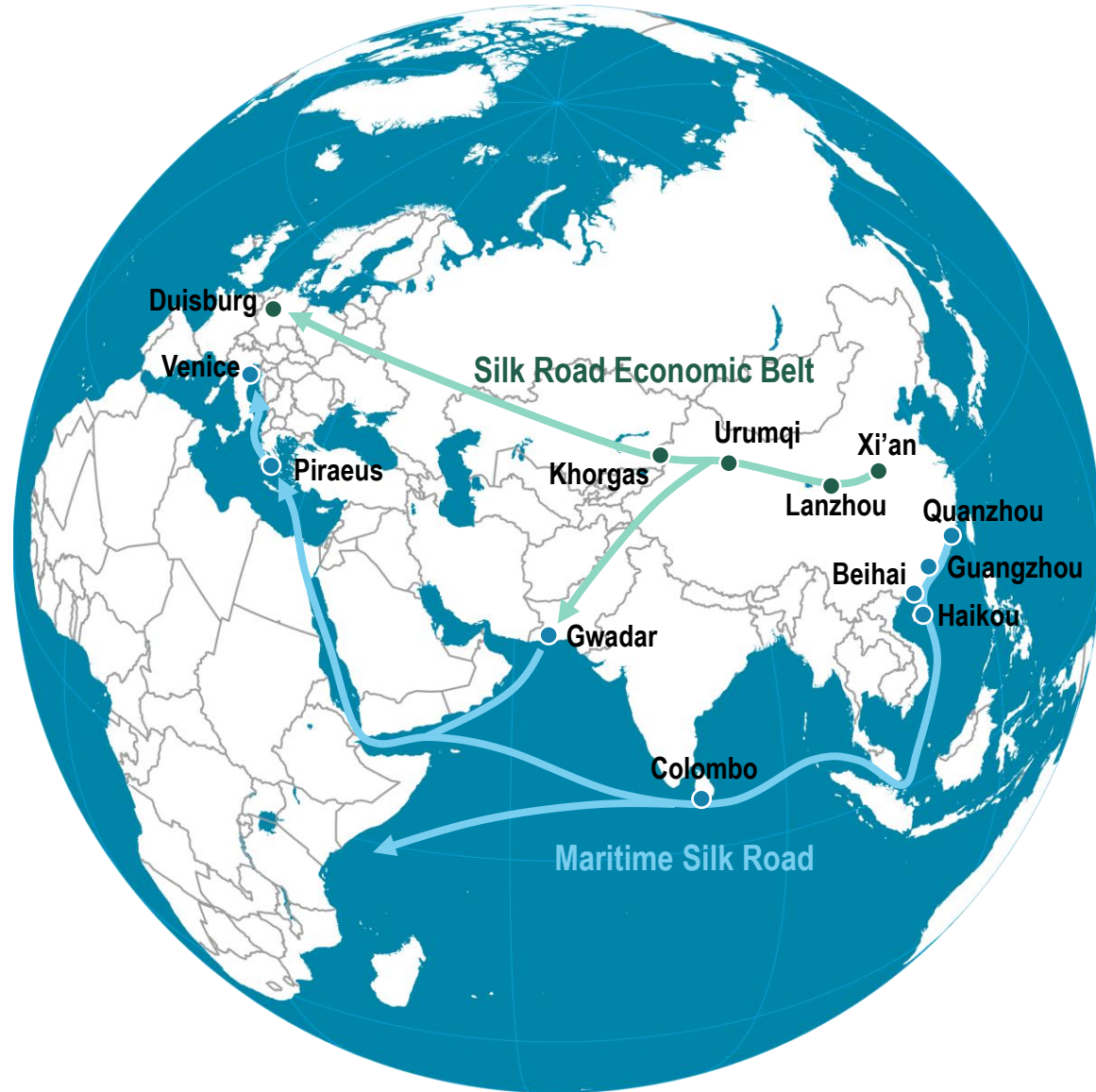


© GTS

Trade Relations Factors

- History and culture
 - Long and enduring trade relations emerged.
 - Others have declined and disappeared due to historical factors.
 - Colonial trade networks:
 - Endured in relations such as those between Europe and Africa or between the United States and Latin America.
 - China:
 - Commercial historical ties with Central Asia and Southeast Asia.
 - Recreated and expanded in recent decades (BRI).
- Trade networks tend to endure because of the reciprocal systems of supply and demand on which they depend.

The Belt and Road Initiative



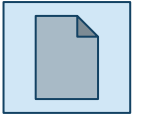
[Read this content](#)

Trade Relations Factors

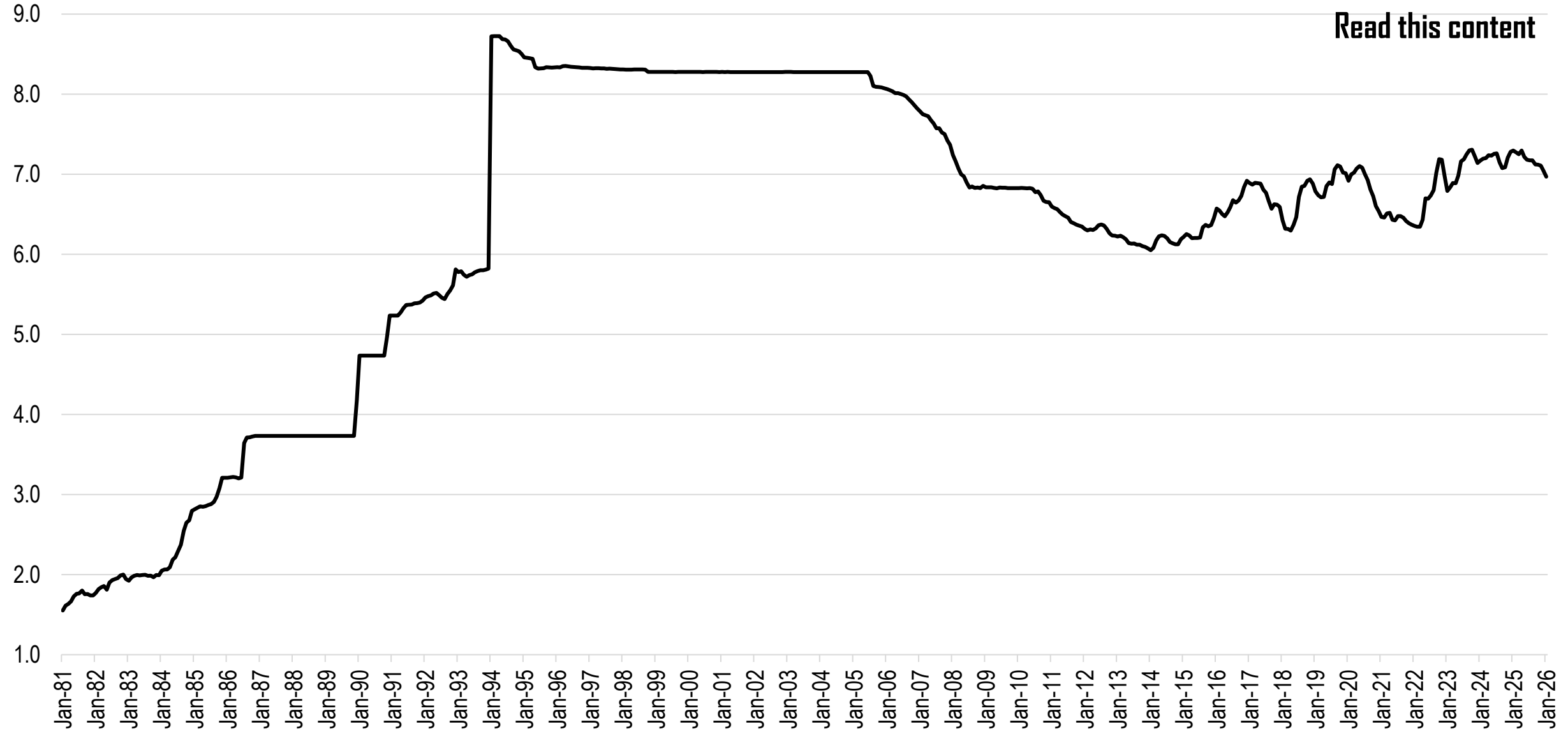
- Geopolitics

- Trade promoted or inhibited due to political factors.
- Impacting exchange rates, tariffs, quotas, and embargoes.
- Trade has been a source of conflict and a tool to pressure antagonistic regimes or trade policies (e.g., tariffs) deemed nonreciprocal.
- Ability of nations to use unencumbered international shipping lanes and strategic passages to access global markets.

Yuan Exchange Rate (per USD), 1981-2026 (Monthly)



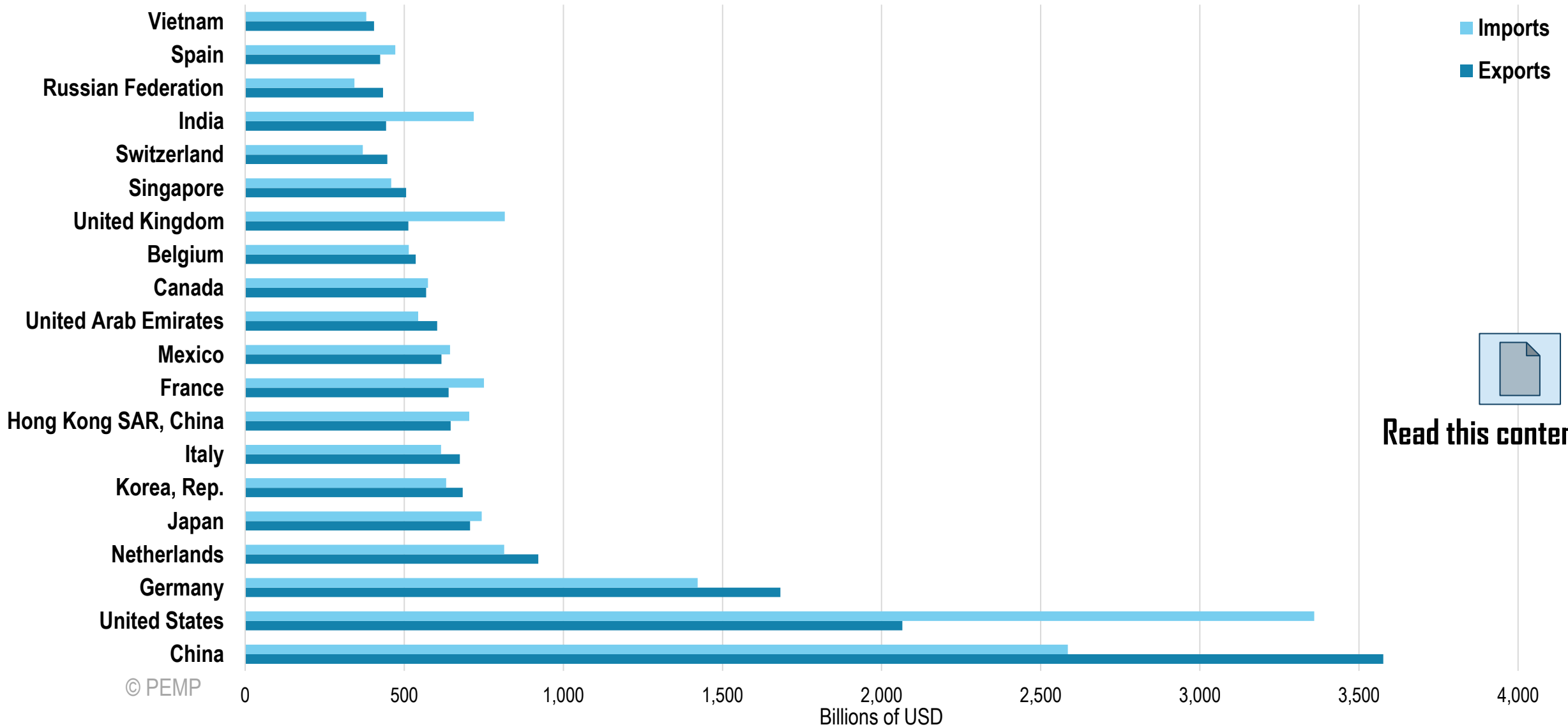
[Read this content](#)

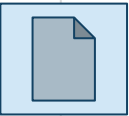


Imbalances in Trade Flows

- A fundamental characteristic of trade flows
 - Trade imbalances directly reflect imbalances in shipping flows.
 - China exports more than it imports with partners such as the United States and the European Union.
 - Bulk trade:
 - Energy and minerals.
 - Common for a return trip to be empty.
 - Containerized trade:
 - Load factors of return trips are lower, and the share of empty containers is higher.
 - Imbalanced trade structure is also reflected in the composition of container imports and exports.
 - Trade imbalances necessitate the repositioning of empty containers, which account for approximately 20% of global container movements.

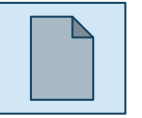
World's 20 Largest Exporters and Importers of Merchandise, 2024



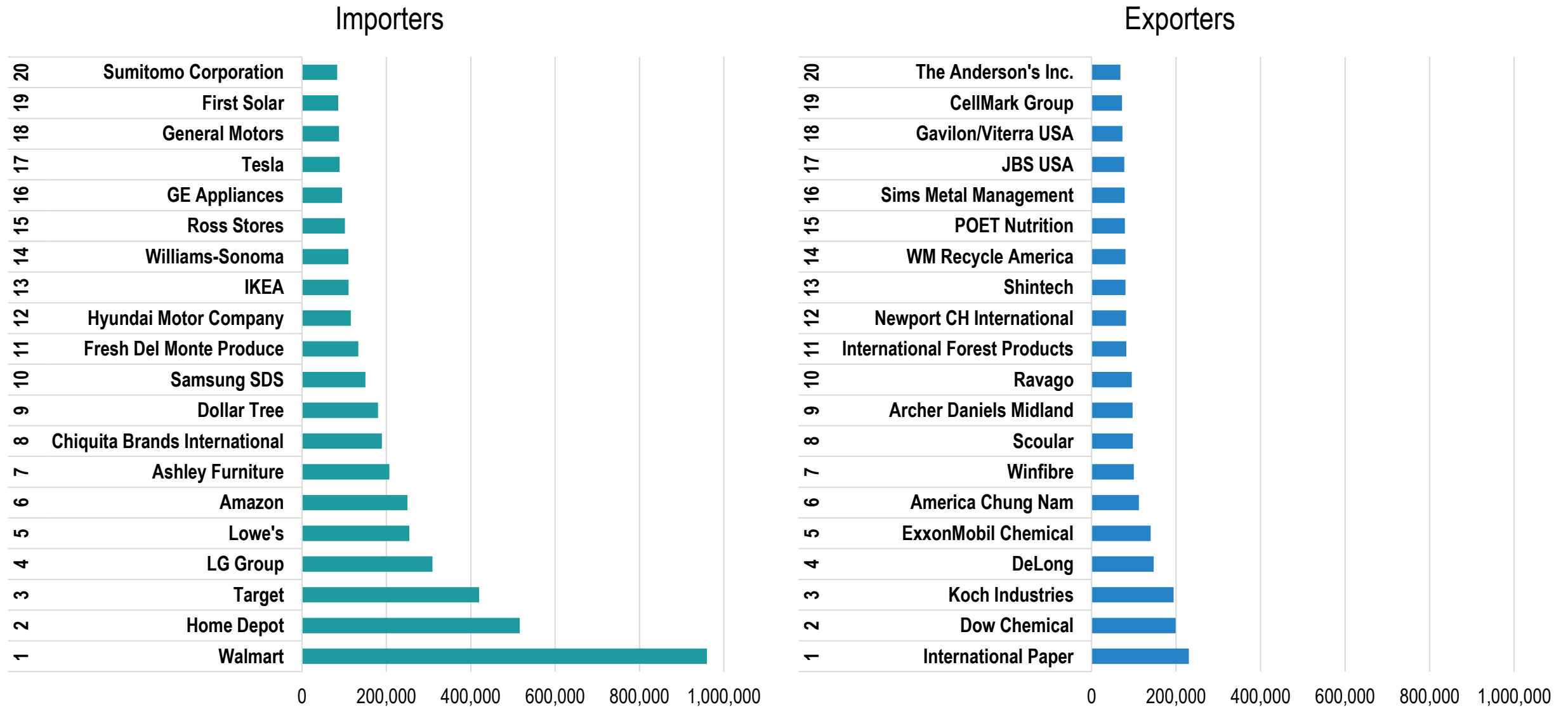

Read this content

© PEMP

American Foreign Trade by Maritime Containers, 2024 (in TEUs)



[Read this content](#)





**TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.**

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS



D. Geopolitics and Trade



Read this section

Geopolitical Tensions and Disruptions

- Geopolitics

- Decisions motivated by the constraints of geography.
- Distinction between domestic and foreign boundaries.
- Broader understanding of what is considered inside and outside the nation-state.
- Classical geopolitics focused solely on the role of states.
- Contemporary geopolitics encompasses a wide variety of geopolitical agents:
 - Corporations and NGOs.
- Practices that enable territorial control, trade, and the extraction of natural resources.

Contemporary Geopolitical Landscape

- Globalization under question
 - Expansion of world trade in the 1990s and 2000s.
 - Global financial crisis of 2008–09.
 - Consensus on the universal economic benefits of globalization began to erode.
 - Costs and advantages of global integration have diverged significantly between countries:
 - Many nations have started to prioritize national sovereignty over multilateralism.
 - Domestic interests over international cooperation.
 - Local constituencies over global populations.
 - New pattern of global trade:
 - Policy interventions and evolving business strategies.
 - Homeland production (onshoring).
 - Nearshoring (relocating production to nearby rather than distant countries).
 - Friendshoring (prioritizing trade with geopolitically aligned nations on a preferential basis).
 - Achieving full autonomy is extremely difficult.

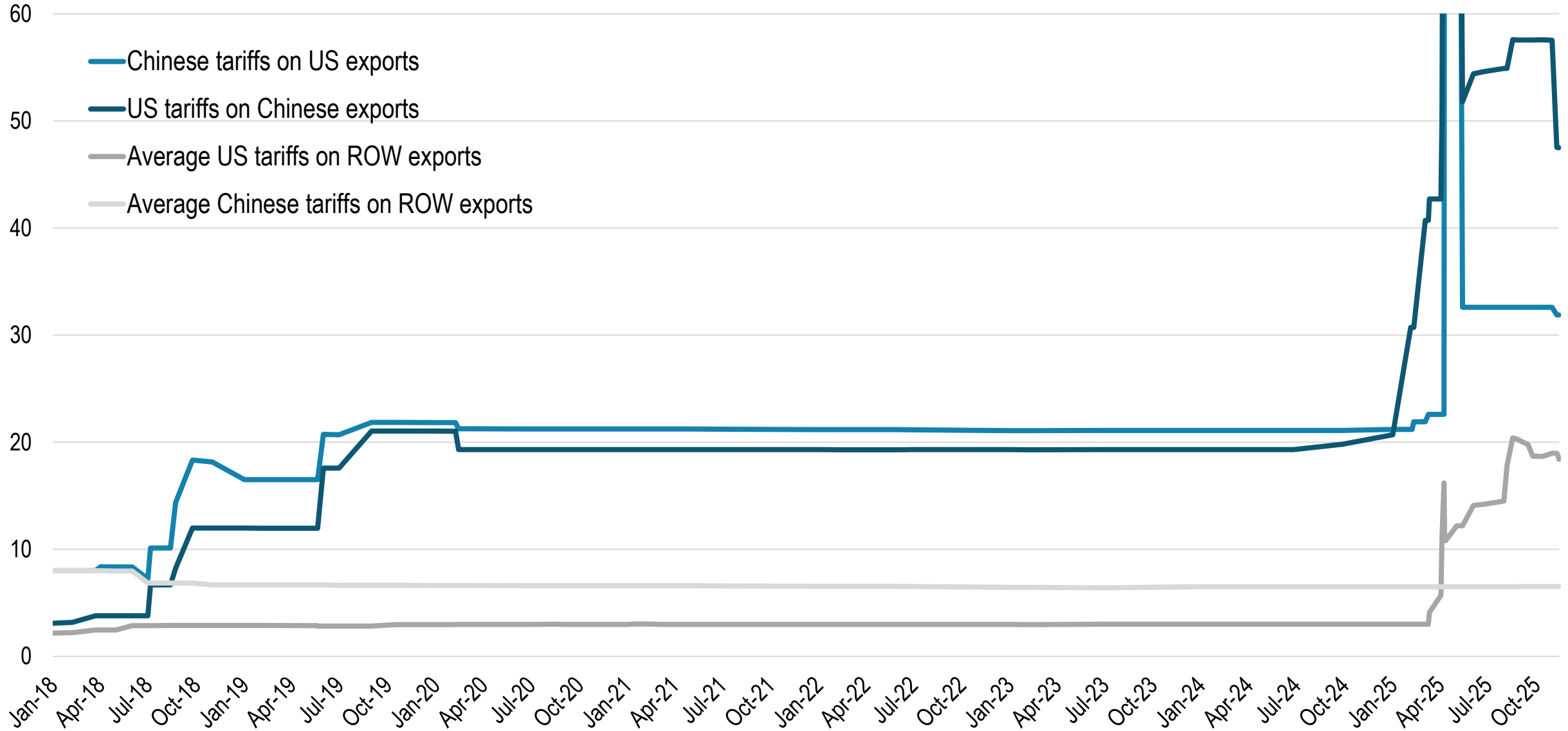
Geopolitical Implications for International Trade

- Trade decoupling and realignment
 - Countries may reduce their dependence on rival nations.
 - New trade alliances.
 - Strongest in critical sectors, including energy, rare earth materials, and high-tech goods.
- Strategic autonomy
 - Independent decisions and act autonomously in critical areas.
 - Minimizing vulnerability to external pressures.
 - Key economic components:
 - Diversifying trading partners.
 - Reducing reliance on single suppliers for critical goods (e.g., rare earth minerals, food, energy, or medical supplies).
 - Enhancing production in strategically vital sectors, such as semiconductors, pharmaceuticals, renewable energy technologies, agriculture, and military equipment.

Geopolitical Implications for International Trade

- Friendshoring and trading with aligned countries
 - Decisions by multinational companies regarding production locations and sourcing strategies.
 - Increasingly influenced by geopolitical objectives.
 - Prioritizing trade with countries that share similar norms, values, or political systems.
 - Referring to relocating economic activity to nations with aligned norms and values.

US-China Tariffs, 2018-2025





**TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.**

PORT OPERATIONS, ADMINISTRATION AND ECONOMICS



E. The Containerization of Trade



Read this section

The Emergence of the Container

- Deployment

- Driving successive waves of globalization and growth in global trade since the 1970s.
- First containership, the Ideal X, by Malcolm McLean in 1956.
- First transatlantic container service in 1966 between the US East Coast and Northern Europe.
- First specialized cellular containerships were delivered in 1968.
- Adoption of standard container sizes in the late 1960s (TEU).
- Faster vessel turnaround times in ports.
- Reduction in cargo damage levels and associated insurance fees.
- Integration with inland transport modes such as trucks, barges, and trains.

First Containership, Port Newark, 1956



ACT 1 (Associated Container Transport), 1970

One of the first purpose-built containerships
217 meters LOA
1,130 TEU



The Emergence of the Container

- Standardization
 - Standard around which physical distribution systems could operate.
 - Reduced maritime costs between production and consumption centers worldwide.
 - Sourcing strategies of multinational enterprises and facilitating the development of global production networks.
 - New supply chain practices:
 - Requirements for container shipping in terms of frequency, schedule reliability/integrity, global service coverage, rate setting, and environmental performance.
 - Ongoing increase in global container throughput.

Main Physical Characteristics of ISO Containers



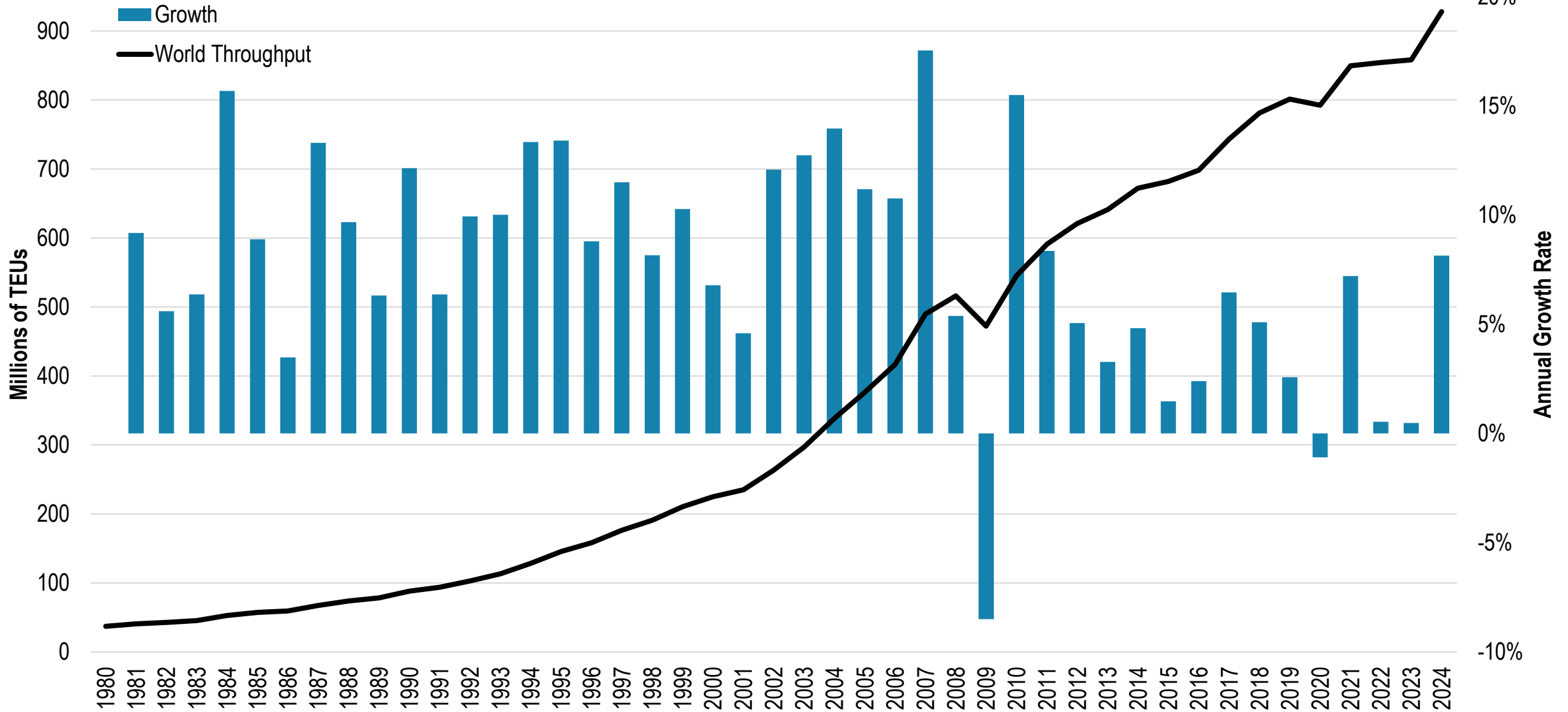
Read this content

Container Type	Cubic Capacity	Tare Weight	Payload Weight	Gross Weight	Dimensions (L/W/H)
20' Standard Container	33.2 cubic meters (1,170 cubic feet)	2,400 kg (5,290 lb)	28,080 kg (61,910 lb)	30,480 kg (67,200 lb)	6.058 m / 2.438 m / 2.591 m (20'0" / 8'0" / 8'6")
40' Standard Container	67.5 cubic meters (2,385 cubic feet)	4,000 kg (8,820 lb)	26,480 kg (58,380 lb)	30,480 kg (67,200 lb)	12.192 m / 2.438 m / 2.591 m (40'0" / 8'0" / 8'6")
40' High Cube Container	76.4 cubic meters (2,690 cubic feet)	4,200 kg (9,260 lb)	26,280 kg (57,940 lb)	30,480 kg (67,200 lb)	12.192 m / 2.438 m / 2.896 m (40'0" / 8'0" / 9'6")
40' High Cube Reefer	67.7 cubic meters (2,391 cubic feet)	4,810 kg (10,604 lb)	29,190 kg (64,353 lb)	34,000 kg (74,957 lb)	12.192 m / 2.438 m / 2.896 m (40'0" / 8'0" / 9'6")
45' High Cube Container	86 cubic meters (3,040 cubic feet)	4,740 kg (10,450 lb)	27,800 kg (62,350 lb)	33,020 kg (72,800 lb)	13.716 m / / 2.438 m / 2.896 m (45'0" / 8'0" / 9'6")
48' High Cube Container	98.8 cubic meters (3,489 cubic feet)	5,140 kg (10,865 lb)	25,340 kg (56,350 lb)	30,480 kg (67,197 lb)	14.630 m / 2.591 m / 2.908 m (48'0" / 8'6" / 9'6 1/2")

World Container Throughput, 1980-2024



[Read this content](#)



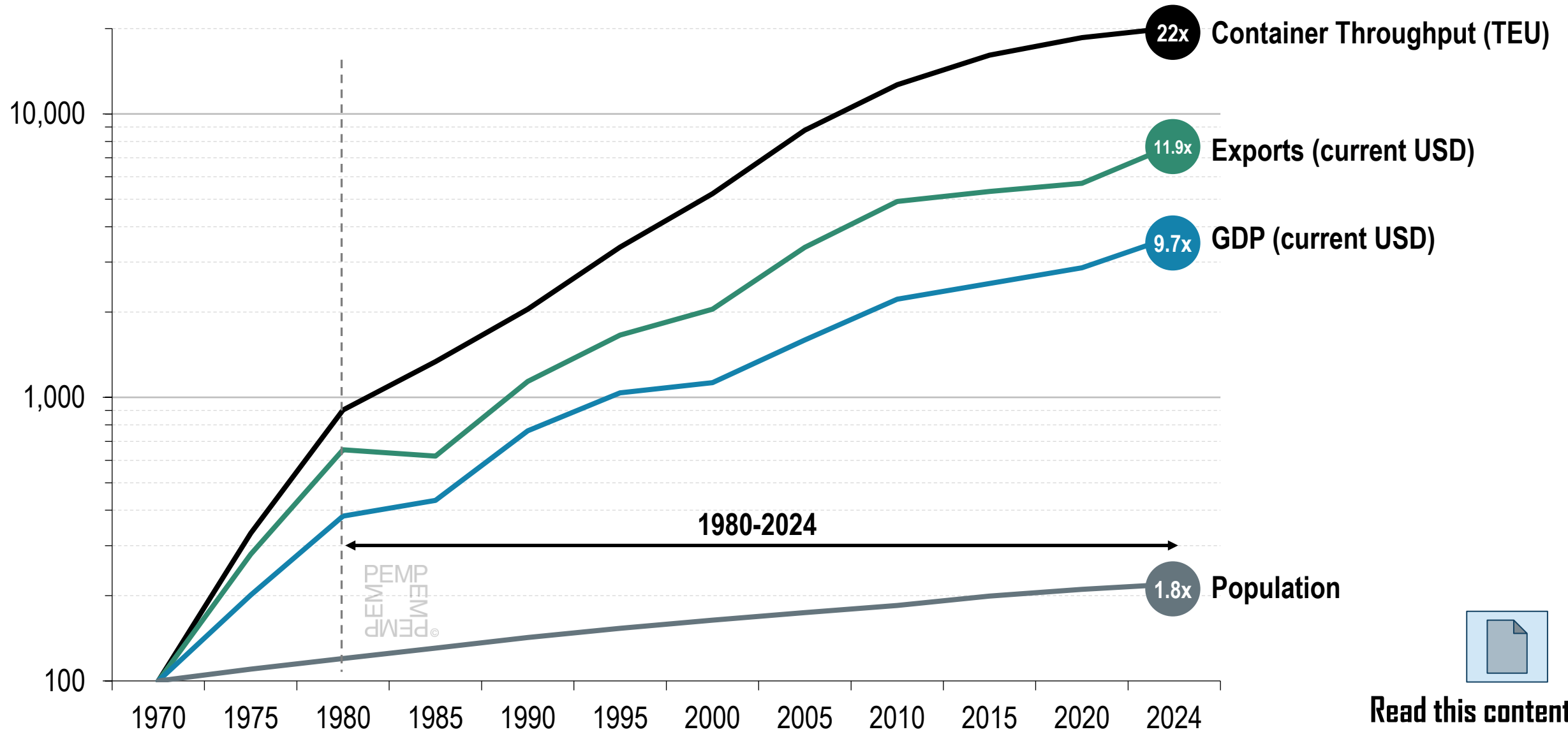
The Emergence of the Container

- The container within supply chains
 - Transport of load units (containers) across several transportation modes.
 - More than a box; a vector for production and distribution.
 - Ubiquitous transport product.
 - Servicing mobility requirements at almost all stages of supply chains.
 - Carried everywhere there are transport infrastructures.

Containerized Trade Networks

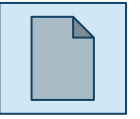
- Multiplier effects
 - Containerization outpacing the growth of the value of exports and the GDP.
 - Each additional unit of GDP or export was associated with a higher level of container flows.
 - Referred to as the TEU-to-GDP multiplier.
 - More than 75% of container freight flows are related to consumer spending on retail goods.

Global Trade and Container Throughput (1970=100)

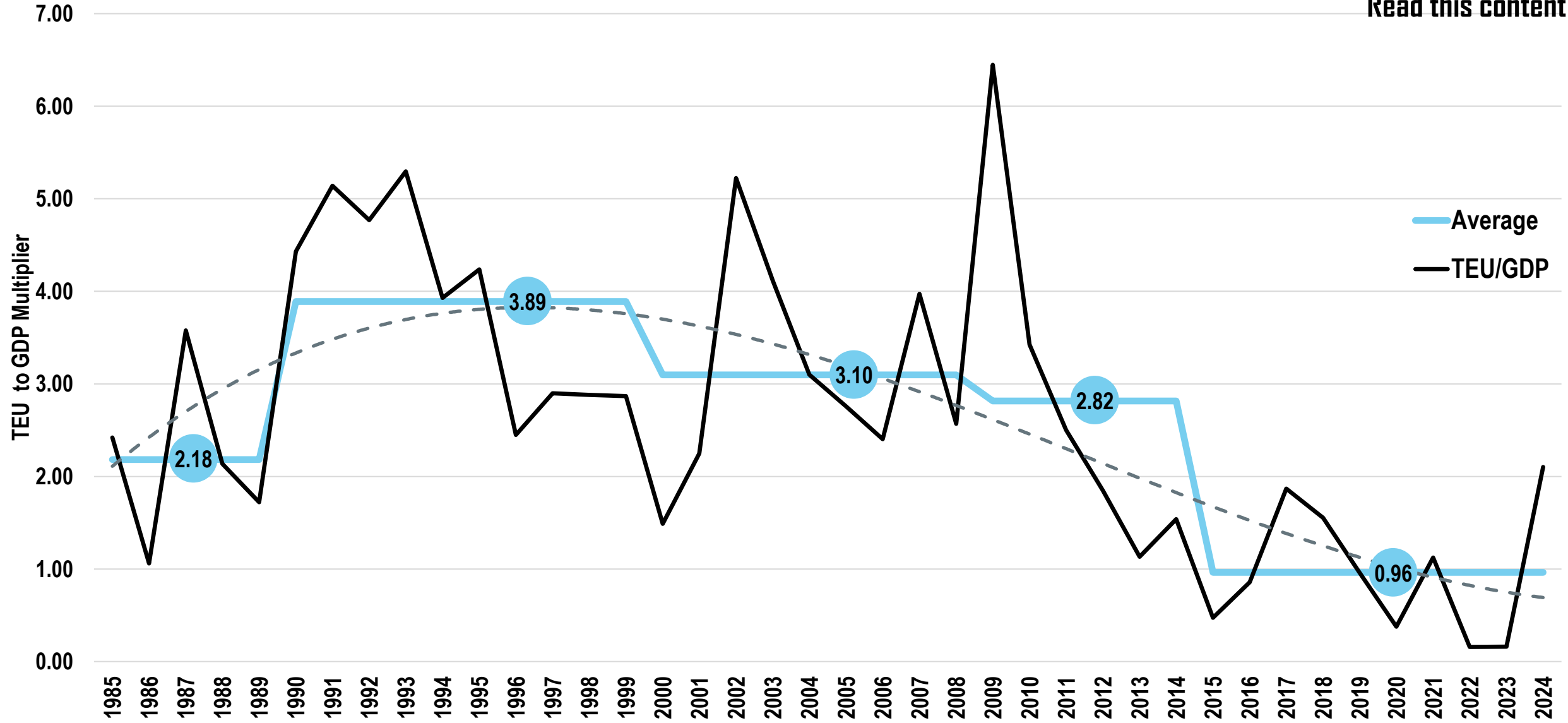


[Read this content](#)

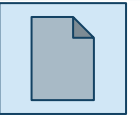
TEU to GDP Multiplier, 1985-2024




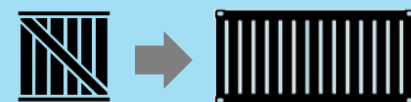
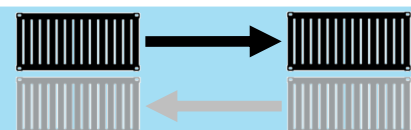
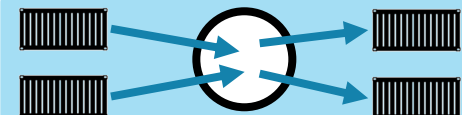
[Read this content](#)



Containerization Growth Factors



Read this content

FACTOR	VOLUME GROWTH	VOLUME DECLINE
DERIVED 	<ul style="list-style-type: none">• Economic and income growth• Outsourcing and offshoring• Complex supply chains	<ul style="list-style-type: none">• Economic recessions• Trade protectionism• Automation in manufacturing
SUBSTITUTION 	<ul style="list-style-type: none">• Capture of bulk and break-bulk markets• Low container shipping rates• New niches (commodities and cold chain)	<ul style="list-style-type: none">• Peak substitution• High container shipping rates
INCIDENTAL 	<ul style="list-style-type: none">• Trade imbalances• Repositioning of empty containers	<ul style="list-style-type: none">• Trade protectionism (imports or exports)• Capacity optimization
INDUCED 	<ul style="list-style-type: none">• Transshipment (hubbing, relay and intersection)• Multiple container handling	<ul style="list-style-type: none">• Changes in shipping networks (more direct services)

PEMP
PEMP
PEMP
PEMP

Containerized Growth Dynamics

- Derived growth
 - Organic growth.
 - Growth is an economic development outcome.
 - Growth in the average distance over which containerized freight is being carried.
 - Greater containerized capacities are required.
 - Average voyage days per vessel increase.
 - Number of vessel roundtrips per year decreases.

Containerized Growth Dynamics

- Substitution-based growth
 - Initially, substitution was the primary factor behind containerization.
 - Gradually captured the breakbulk cargo market.
 - Rising containerization degrees (the ratio between the containerized throughput of the port and the total general cargo volumes).
 - Break-bulk cargo that could be containerized has been containerized.
 - Substitution process is essentially near completion in developed economies.
 - Niche markets remain: commodities and temperature-sensitive cargo.

Containerized Growth Dynamics

- Incidental growth
 - Trade imbalances in the global economy.
 - Impact physical flows and transport rates.
 - Leading to specific container repositioning strategies.
 - Containerized flows are rarely balanced.
 - Empty containers must be repositioned to locations where export cargo is available.
- Induced growth
 - Setting of intermediary hubs that connect different circulation systems through transshipment.
 - Substantially higher growth rates than observed for gateway traffic.
 - Transshipment rate: 18% in 1990 to 35% in 2018.

Value of Containerized Trade, 2020



Read this content

