

Naval Density: A New Indicator for Tariff Evasion

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Key Points

- The trade war between the United-States of America and China has led to an increasing level of trade barriers and tariffs.
- Existing methods for measuring trade evasion - data mirroring and entrepôt trade data - are particularly limited for measuring US-China trade.
- The advent of AIS technology and the importance of naval trade between the US and China enable a new method for measuring trade evasion.
- All current methods rely on external data and there is very little empirical information on trade evasion.

Introduction

The last few years have seen a considerable increase in the global use of corrective trade measures.¹ This trend has accelerated tremendously in the last few months, since the beginning of Donald Trump's second term.² In the case of the United States-China trade war, tariffs have been the principal corrective trade measure utilized.³ They have reached an apex in the few last years as the US accused China of generalized anti-competitive behaviour and increased tariffs on technological and manufactured goods, as well as restricting high technology exports.⁴ While these tariffs have clear goals, their effectiveness remains questionable, which may be explained by the rate of evasion, which remains impossible to measure with accuracy.⁵

Measuring Tariff Evasion

Inherent to its covert nature, the scale of tariff evasion is hard to measure. However, two main approaches have been utilized to

¹ Sacerdoti and Borlini, "Systemic Changes in the Politicization of the International Trade Relations and the Decline of the Multilateral Trading System"; Mariotti, "'Win-Lose' Globalization and the Weaponization of Economic Policies by Nation-States."

² Grantham-Philips, "Trump Has Begun Another Trade War. Here's a Timeline of How We Got Here."

³ Siripurapu and Berman, "The Contentious U.S.-China Trade Relationship."

⁴ Sherman, "Biden Hits Chinese Electric Cars and Solar Cells with Higher Tariffs"; USTR, "Four Year Review of China Tech Transfer Section 301."

⁵ USTR, "Four Year Review of China Tech Transfer Section 301", 86.

attempt to estimate it: export/import mismatch analysis⁶ and entrepôt trade analysis.⁷

Export-Import Mismatch

The export/import mismatch approach relies on the fact that, during export, goods have to be declared twice: leaving the country of origin and entering the country of destination. Extrapolating from that, as the cost of and benefits of smuggling vary based on the country, the benefits generally being much greater on the import side, smugglers may be incentivized to only report on side of the transaction.⁸ This can most easily be measured with data on trade flows, such as from the UN Comtrade.⁹ Furthermore, as this data is reported by country, and the evasion is undertaken by corporations, it should remain accurate. This assumption seems widespread as the method has been used extensively to measure tariff evasion.¹⁰ However, because of the Chinese government's heavy involvement in the country's economy, doubt has been cast on the reliability of its trade data, especially following significant discrepancy between Chinese and American data in the 1990s.¹¹

Entrepôt Trade

The entrepôt trade approach has become more important in recent years with a recognition of increasingly complex trade routes and a greater availability of data. It involves measuring sudden increases in trade flows through entrepôt countries such as Singapore or Hong Kong, or third countries such as Belarus.¹² Entrepôts are not inherently suspicious, they have been the utilized since at least the roman empire¹³ for legitimate purposes such as leveraging economies of scale or procuring niche expertise.¹⁴ There are three main problems with this measurement method. The first is that an increase in trade complexity, such as a greater usage of tariffs, will increase the need for trade experts and encourage the use of entrepôt countries, confounding the results. The second is that the relatively small size of most entrepôt countries' economy and the massive amount of trade diversion necessary to dodge tariffs on trade superpowers such as China generally requires government acknowledgement or involvement in the practice, increasing the risk of data falsification (as seen in Belarus-

⁶ Bhagwati, "On the Underinvoicing of Imports."

⁷ Fisman, Moustakerski, and Wei, "Outsourcing Tariff Evasion."

⁸ Bhagwati, "On the Underinvoicing of Imports."; Fisman, "Measuring Tariff Evasion and Smuggling."

⁹ World Bank, "Mirror Data with UN COMTRADE."

¹⁰ Carrère and Grigoriou, "Can Mirror Data Help to Capture Informal International Trade?"; Day, "Assessing China's Merchandise Trade Data Using Mirror Statistics."; Fuse et al., "Detecting Illegal Inter-country Trade of Mercury Using Discrepancies in Mirrored Trade Data.";

¹¹ Information Office of the State Council of the People's Republic of China, "On Sino-US Trade Balance"; Curran, "Phantom Goods Disguise Billions in China Illicit Money Flows"; Michael F, "What's the Difference?" *disputed by* Holz, "The Quality of China's GDP Statistics."

¹² Fisman, Moustakerski, and Wei, "Outsourcing Tariff Evasion."

¹³ Smith, "The World Entrepôt."

¹⁴ Feenstra and Hanson, "Intermediaries in Entrepôt Trade."

Russia trade¹⁵ and Benin-Nigeria trade).¹⁶ The third, is that this method inherently only captures trade falsification through third countries, ignoring other means of trade avoidance, such as fraudulent manifests.

Estimating Tariff Evasion

Nevertheless, these two methods can be combined to provide a portrait of the situation, as shown by a recent study of the sanctions on Russia in response to its invasion of Ukraine. It estimated an evasion rate of around 8.5%.¹⁷ Applying this rate to the China-USA context allows for a benchmark of tariff evasion.

Doing so first requires determining the scale of US tariffs on China. Two tariff rules are relevant:

1. 2024 Section 301 tariffs on approximately US\$ 370 Billion in goods;¹⁸
2. The recently implemented 84% tariff on all Chinese imports¹⁹ or approximately US\$ 440 Billion in goods.²⁰

Based on 2024 UN Comtrade trade data²¹ and US International Trade Commission

¹⁵ Lukaszuk, “You Can Smuggle but You Can’t Hide.”

¹⁶ Golub, “Entrepôt Trade and Smuggling in West Africa.”

¹⁷ Lukaszuk, “You Can Smuggle but You Can’t Hide.”

¹⁸ United States Trade Representative, “China Section 301 - Tariff Actions and Exclusion Process.” (2025 values adjusted for inflation and reduced trade: Karen M. Sutter, “U.S.-China Trade Relations.”)

¹⁹ *At the time of writing, the retaliatory 50% has not been implemented:* US International Trade Commission, “Harmonized Tariff Schedule of the

tariff lines,²² the value of tariffs can then be computed to slightly more than US\$ 384 Billion, or an effective rate of 87 %.²³ Applying the evasion ratio, the cost would be slightly under US\$ 33 B.

Policy Proposal

As explained above, the existing methods of measuring tariff evasion can provide an estimate of the problem but remain highly vulnerable to government misreporting. Considering the scale of trade between the US and China, and the context of the latter, this vulnerability is notable. Therefore, a new solution, measuring “true” trade flows, is necessary. This paper proposes the use of naval density, more precisely the number of ships approaching the US West Coast every day, as an indicator.

Naval Density

Naval density provides a useful approximation for intensity of trade between the United States and China because the vast majority of trade between the two countries

United States (2025 Revision 8.”. *For more detail see* Grantham-Philips, “Trump Has Begun Another Trade War. Here’s a Timeline of How We Got Here.”

²⁰ US Census Bureau, “Current U.S. International Trade in Goods and Services (FT900).”

²¹ UN Comtrade, “Trade Data - USA-China All Imports.”

²² US International Trade Commission, “China Tariffs.”

²³ The US CPB only reports the value of section 301 tariffs. *See* U.S. Customs and Border Protection, “Trade Statistics.”

is done by boat,²⁴ and because trade with China represents the vast majority of trade between the US and Pacific Nations.²⁵ Therefore, the number of cargo ships and the volume of trade should be correlated. Discrepancies in the trend in ship data and the trend in trade data – such as Chinese trade declining while ship density increase – will highlight any attempts at trade evasion.

The necessary data can be obtained through the usage of ship's Automatic Identification System (AIS). The technology was originally implemented to avoid ship collisions,²⁶ but the increasing presence of onshore radio stations has allowed for continuous data collection by governments and port authorities. Because this method directly measures the transport of goods, it isn't liable to misreporting by foreign governments and isn't as vulnerable to document falsification. However, it does have a few weaknesses: it does not capture shipping by planes, it isn't well suited for

land-bordered trade partners (such as Mexico and Canada), and it lacks granularity. These flaws position this solution as an addition to the current toolkit, not a replacement.

Proof of Concept

The potential of this approach can be evaluated using a ship location dataset, from the NOAA, covering 2019 to 2024.²⁷ Observing Figure 1. a clear shift in ratio between the ships coming to the United States and the value of its trade with China is visible. As the barriers to trade have been raised, trade has decreased, but the number of ships has increased considerably. The pre-restriction, post-covid, period (Jun 2021-Oct 2022) provides a benchmark ratio between the two of 0.77. The post-trade restriction periods have a ratio of 1.09, 1.40, and 1.31. This could indicate a trade evasion rate of between 30 % and 40 %, considerably higher than previously estimated.

²⁴ Bureau of Transportation, "US International Trade by Value and Weight."

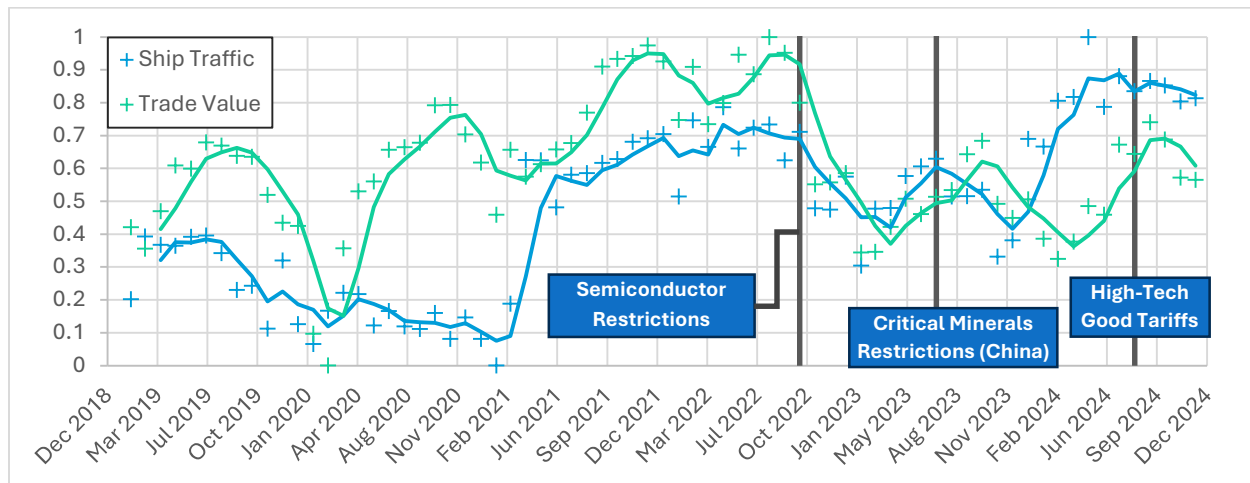
²⁵ UN Comtrade, "Trade Data - USA Imports."

²⁶ NATO Shipping Centre, "AIS (Automatic Identification System) Overview"; International

Maritime Organization, "International Convention for the Safety of Life at Sea (SOLAS), 1974."

²⁷ NOAA Office for Coastal Management, "Vessel Traffic."

Figure 1. Ship Traffic and Trade Value with China



Data Source: United Nations, “UN Comtrade”; NOAA Office for Coastal Management, “Vessel Traffic.” Restrictions from TDi Sustainability, “Trade Laws and Restrictions.”

Note: Ship Traffic only represents cargo and tanker ships (code 70-89, inclusively).²⁸

Conclusion and Recommendations

In conclusion, while there have been many attempts to measure trade evasion, very little empirical evidence exists on the scale of the issue. The proof of concept proposed here estimates a much greater problem than previous methods. Therefore, it is recommended that the US Customs and Border Protection agency:

- Run an evaluation of current good trafficking into the United-States; and
- Implement live tracking of tariff evasion, through naval traffic analysis.

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²⁸ U.S. Coast Guard, NOAA, and BOEM, “AIS Vessel Type and Group Codes Used by the Marine Cadastre Project.”

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