The Limited and Transitive Impact of The Houthi Attacks on International Trade: The Role of Transport Markets and Endogenous Trade Costs

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Abstract

Since November 2023, Houthi attacks on vessels in the Red Sea, the short route connecting South-East Asian and Europe-Mediterranean economies, have diverted maritime traffic to the longer Cape of Good Hope route. This paper documents the effects of this diversion: 1. A temporary 10% drop in imports *typically transported via the Red Sea*, with recovery a few months later, despite; 2. No significant impact on exports *typically transported via the Red Sea* relative to other exports; 3. An initial rise in freight rates from China to Europe, followed by an increase in rates from China to the US, consistent with co-integration and ECM estimates for 2011-24; 4. Low and subdued freight rates for return fares from Europe and the US to China despite the rerouting of vessels from Europe and the hike in freight rates on the other directions. These patterns are consistent with rapid adjustments of global exports and shipping lines, including trans-pacific lines, to the Cape of Good Hope detour of vessels, as well as delayed arrivals of imports *typically transported via the Red Sea* due to the longer route. This analysis aligns with the emerging literature on endogenous trade costs, contrasting with traditional models assuming exogenous costs, such as simplistic gravity models.

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"Today, *all ships that can sail and all ships that were previously not well utilised in other parts of the world have been redeployed to try to plug holes*."

Vincent Clerc, Maersk's CEO referring to the cascading effects of disruptions in the Red Sea, July 2024

Introduction

About 80% of global trade volume is transported by sea (UNCTAD), making disruptions to maritime trade impactful on global supply chains. Since November 2023, Houthi attacks have threatened maritime traffic in the Red Sea, a crucial route for about a fifth of global container trade, linking Asia, Oceania, and East Africa with Europe and the Mediterranean. These attacks have diverted vessels from the Red Sea route to the longer Cape of Good Hope route. Traditional literature on exogenous trade costs, particularly gravity models (De Benedictis and Taglioni, 2011), along with historical experiences like the Suez Canal closures in the 1960s and 1970s (Feyrer, 2021), suggest that increased sailing distances typically reduce trade levels both absolutely and relative to other routes.

This paper documents a 10% decline in imports between countries *typically transported via the Red Sea* route in December 2023-January 2024, relative to other imports, due to the diversion to the longer route. Recovery in these imports occurred by March 2024, even though maritime traffic did not return to the Red Sea. In contrast, exports *typically transported via the Red Sea* remained stable compared to other exports. Following the route diversion, freight rates from Asia to Europe initially spiked, then moderated as rates from Asia to the US increased. These changes align with the co-integration of freight rates from China to Europe and Asia to the US during 2011-24. Notably, by March 2024, simultaneously with the above imports recovery, a new system of relative freight rates stabilized. Interestingly, freight rates from Europe and the US to Asia remained significantly lower and saw limited increases, if any, despite the longer route.

We argue that these patterns align with an initial reduction in effective shipping supply between Asia and Europe due to the longer route, delaying import arrivals but not export departures, and increasing freight rates in this line. This reduction in transport supply on the Asia-Europe/Med lines was later offset by shifting capacity from other routes, including the Asia-US line. This resulted in increased freight rates from Asia to the US, a moderation in the rate hike from Asia to Europe, and a recovery of imports typically transported via the Red Sea relative to other imports. Meanwhile, freight rates from Europe and the US to Asia remained subdued due to lower demand for shipping goods to Asia, given the US and European trade deficit with Asia.

This paper relates to two main strands in the literature on trade costs: the conventional literature on presumed-exogenous trade costs, and the emerging literature analyzing endogenous trade costs. The paper's findings contradict the conventional literature assuming exogenous trade costs. Specifically, these findings are at odds with the simplistic versions of gravity equations, which uses distance as a proxy for

trade costs.[2] For instance, the interaction of freight rates of different lines and the increase of freight rates from China to the US by a factor of 3 without changes to the route are inconsistent with simplistic gravity model. Similarly, the limited and transitory impact of imports *typically transported via the Red Sea*, and the lack of impact on the parallel exports are at odds with a simplistic gravity model.

The most relevant study in the exogenous trade costs literature regarding the impact of the Houthi attacks on trade is Feyrer (2021), who estimated the impact on trade of the closing (1967) and opening (1975) the Suez Canal, the northern entry to the Red Sea. Feyrer (2021) found that the closure of the Suez Canal in 1967 was followed by a decline of trade between trade partners who typically used Suez during the next 6 years which reached about 12% four years after the shock. This decline was relative to "control" trade between countries which did not use Suez and were not affected by the closing and opening of the Suez Canal (p. 3).

In contrast, this study provides evidence of the interaction between freight rates for routes crossing and not crossing the Red Sea (Asia-Europe and Asia-US, respectively). Developments since the 1970s—such as globalization of value chains, increased use of containers and large vessels, current data on vessel location and usage, and changes in shipping market structure—may have enhanced the integration of maritime transport markets and strengthened the interaction between different shipping routes.

Hence this paper is in line with the emerging research on endogenous trade costs, which views transport costs as a result of supply and demand in the transport and general trade markets. This paper is particularly related to Brancaccio et al., (2020), who provided evidence that the transportation sector dampens the impact of shocks on trade flows. This paper also relates to Friedt & Wilson (2020) and Wong (2022), who highlighted with models the "return trip effect", which generates a diversion of imports and exports freight rates to the same trade partner when trade is imbalance. Empirically, while Friedt & Wilson (2020) used aggregate data, Wong (2022) used detailed data on freight depicting the impact of shocks to freight rates in one directions on freight rates and trade in the other direction.

Our results on the long run and short run relations between freight rates from China to Europe and the US indicate that trade costs are not only by demand and supply of shipping back and forth in the same line but also sensitive to demand and supply in other shipping lines. This integration of transport markets and the ability to move transport capacity between lines are the explanations we suggest for the limited and quickly fading impact of the diversion vessels to the longer Cape of Good Hope route on the level of trade between Asia and Europe.

The next section provides stylized facts about the impact of the Houthi attacks on global trade and the diversion of maritime traffic to the Cape of Good Hope route. Section 3 provides a simple theoretical

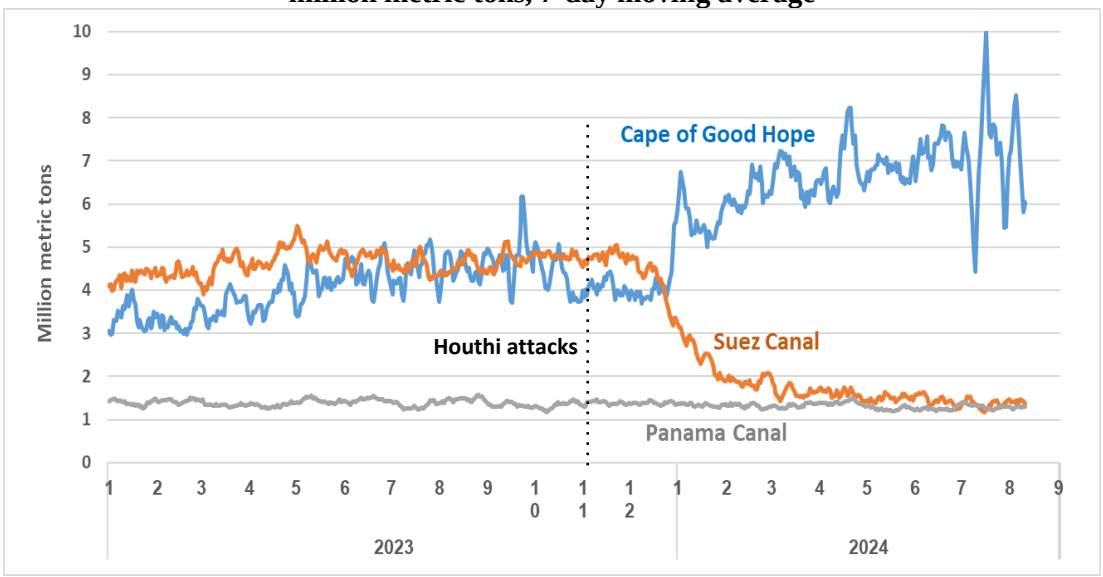
[2] Gravity equations in trade economics were pioneered by Tinbergen (1962) in the spirit of gravity models in physics. This model became the workhorse of empirical trade economics, and a few scholars formulated theoretical frameworks to interpret the estimations (Benedictis and Taglioni, 2011).

framework of freight markets in face of contraction of effective supply of transportation services due the diversion of maritime traffic. Section 4 describes the empirical strategy and the data, while section 5 provides further evidence for the rapid adjustment of freight rates and exports to the shock as well as for the transitive decline and recovery of imports typically transported via The Red Sea following Houthi attacks.

2. Disruption of global trade following the Houthi attacks

Houthi attacks on maritime vessels in the Red Sea target both commercial and military vessels, aiming to disrupt vital shipping routes. The current wave of attacks began in November 2023, as part of Houthi support for Hamas in the conflict against Israel. These assaults have significant implications for global shipping, as the Red Sea is a crucial corridor connecting the Mediterranean Sea to the Indian Ocean via the Suez Canal. About a fifth of global container traffic typically crosses this route. The disruptions increase shipping costs, prompting international naval forces to enhance security measures to safeguard maritime traffic and ensure the continued flow of global commerce. Consequently, large shipping companies have diverted their vessels from the shorter Red Sea route between Asia and Europe/Mediterranean to the longer route around Africa via the Cape of Good Hope (see Chart 1).

Chart 1: Daily transit trade volume, 2023-24
million metric tons, 7-day moving average

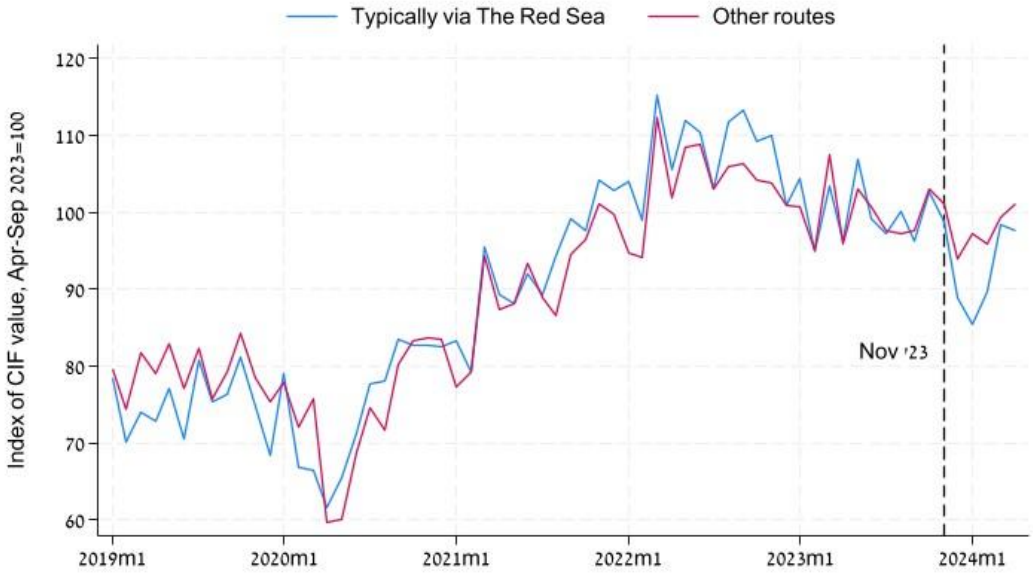


Source: IMF

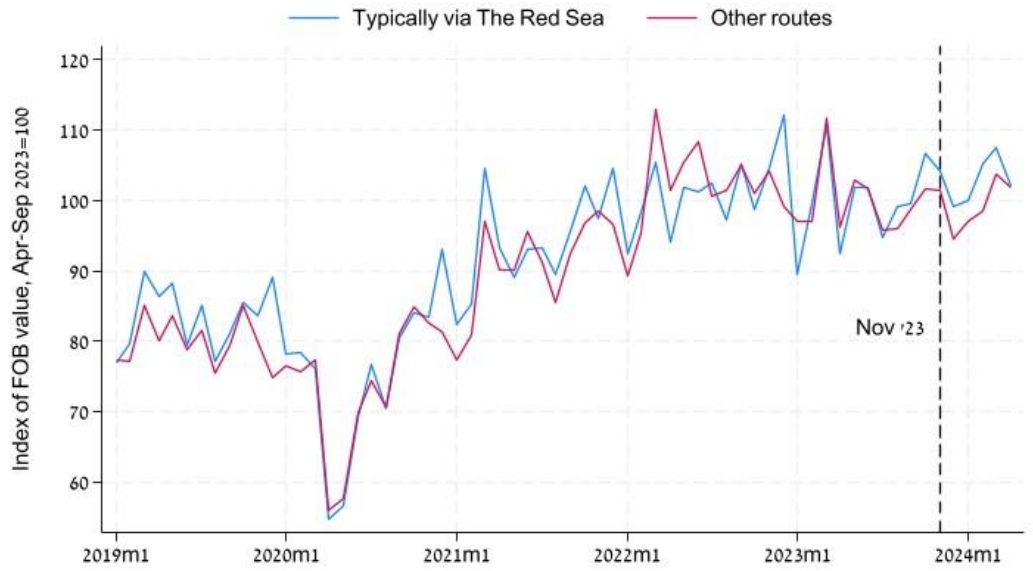
To examine the impact of shipping diversion on trade, we compare the trade value between country pairs that typically use the Red Sea route, such as the UK and India, with those that do not, like the UK and the US. This classification is based on the shortest maritime route (see data section). We analyze both the CIF value of imports, which includes insurance and freight costs, and the FOB value of exports. Evidently, before the attacks, from 2019 to November 2023, imports and exports via the Red Sea showed trends similar to those not crossing it, even during the COVID-19 value-chain disruptions (see Charts 2-I and 2-II).

Chart 2: Index of value of trade by routes typically passing The Red Sea and other routes, 2019-24

I. Imports, CIF value



II. Exports, FOB value



–Source: calculations based on Comtrade data.

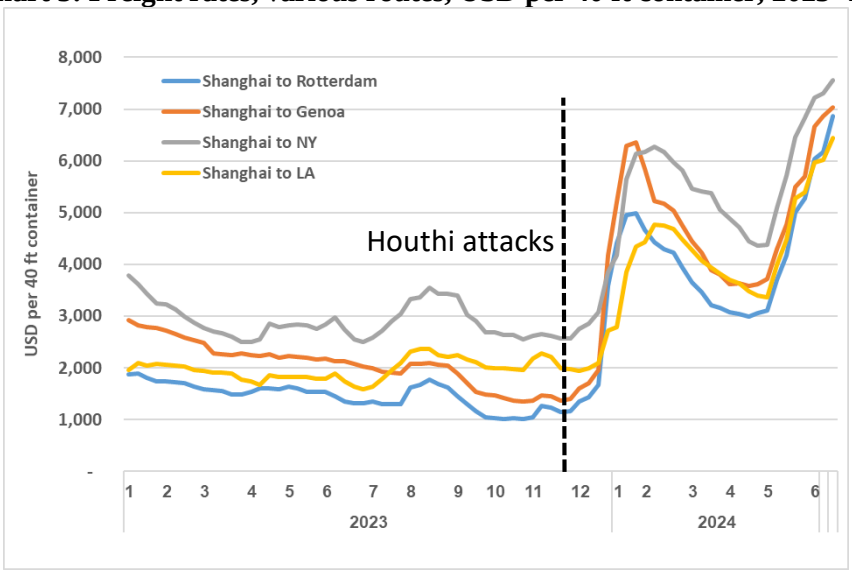
Yet, following the attacks and the diversion of vessels around Africa, imports, which *typically crossing the Red* Sea dropped by about 10% for December 2023-February 2024, relative to the trend of imports in other routes. The imports *typically crossing The Red Sea* recovered in March 2024 relative to imports in other routes, and the gap between these streams of imports practically closed. In contrast, exports *typically crossing The Red Sea* did not decline relative to other exports even after the trade diversion. The contrast between the impact of the diversion on imports *typically crossing The Red Sea* and the lack of impact on parallel exports suggest that the mechanism of the impact on the imports is the longer time of shipping of

goods via the new and longer Cape of Good Hope route. Moreover, the lack of impact of the route diversion on exports *typically crossing The Red Sea* suggests that exporters and shipping companies rapidly reacted to the shock and thus it affected both the "treated" and the "control" exports.

Before addressing the reaction of shipping companies, we aim to confirm that the decline in imports typically crossing the Red Sea is linked to the Houthi threat to maritime trade. We analyze a subsample of 25 countries that reported monthly trade by transportation mode (sea, land, air, etc.) until at least March 2024. This subsample is not representative of all countries reporting to Comtrade, so the evidence herein is merely indicative. Evidently, the relative changes in imports in this subsample resulted from shifts in maritime trade, while non-maritime imports *typically crossing the Red Sea* did not decline compared to other trade (see Charts A1-I-II). These findings support the claim that Houthi attacks on maritime transport in the Red Sea contributed to the decline in total imports at least in this subsample.

The reaction of shipping companies to the trade diversion from the short route via The Red Sea to the longer route around Africa is reflected in the freight rates. We focus on the freight rates of exporting goods from Shanghai, the largest container port in the world, to destinations in Europe and the US (Rotterdam, Genoa, NY and LA) following the Houthi attacks in the Red Sea. Notably, while the lines to Rotterdam and Genoa typically *transported via The Red Sea* and had to reroute around Africa due to the Houthi attacks, the lines to LA and NY[3] were not directly affected by the attacks.

Chart 3: Freight rates, various routes, USD per 40 ft container, 2023- 24



Source: Bloomberg

Evidently, freight rates from Shanghai to the European ports of Rotterdam and Genoa hikes immediately after the beginning of the attacks in December 2023. Indeed, the rates to the Italian port in Genoa increased more than the rates to Rotterdam in the Netherlands plausibly as the increase in distance around Africa is

[3] The short route from Shanghai to NY crosses the Panama Canal and thus changes in the rates on this line provide some indication whether the adverse impact of the draught in Central America had significant on international trade.

greater for the Mediterranean port. At the second stage, in January 2024, freight rates to NY and LA increased, while the rates to Rotterdam and Genoa begun receding. Since March 2024 freight rates from Shanghai to these destinations co-moved together presumably reacting to fluctuations in global demand and supply (Chart 3).

We assert that price dynamics at the beginning of 2024 reflected the decisions of shipping companies to balance transport capacity between lines to adjust to changing supply and demand in various regions. This assertion is illustrated by statement of the CEO of A. P. Moller – Maersk: "Today, *all ships that can sail and all ships that were previously not well utilised in other parts of the world have been redeployed to try to plug holes*. It has alleviated part of the problem, but far from all the problems across the industry, including for Maersk" (Maersk, July 2024). Specifically, shipping companies and alliances of shipping companies, shift transport capacity (vessels and containers) between the China-US routes to the China-Europe routes. The empirical section below tests the long and short run relations between series of freight rates outgoing from Shanghai to the the US and Europe since 2011 to capture the interaction between these lines.

Importantly, the return freight rates from Rotterdam and LA to Shanghai are significantly lower than the rates in the other direction and were less affected by the disruptions in the Red Sea. Indeed, freight rate from Rotterdam to Shanghai doubled[4] probably to cover additional fuel and other costs on the longer route around Africa, but this increase is dwarfed by the changes on the freight rates from Shanghai to LA or Rotterdam (Chart A2).[5] At any rate, this pattern suggests that vessels are fully utilized when they leave Shanghai but have unutilized capacity on their way to Shanghai. In other words, shipping capacity is an effective constraint on Chinese exports to Europe and the US but not on European and US exports to China.

The next section provides a simple theoretical framework for analyzing the impact of the Houthi attacks on the freight markets, including freight rates, and trade streams.

3. **Theoretical framework**

This section presents a simple theoretical framework of a market for freight services in international trade in the short run for an economy, whose exports are larger than its imports to the extent transporting export goods is a binding constraint. The supply of freight services is equal for imports and exports as a vessel has a given capacity for carrying both imports and exports. Thus, a vessel fully utilizes its capacity in transporting exports from economy with large trade surplus, but could return with unutilized capacity in

[4] The freight rates from Rotterdam to Shanghai increased from USD 450 in December 2023 to about USD 1000 in January.

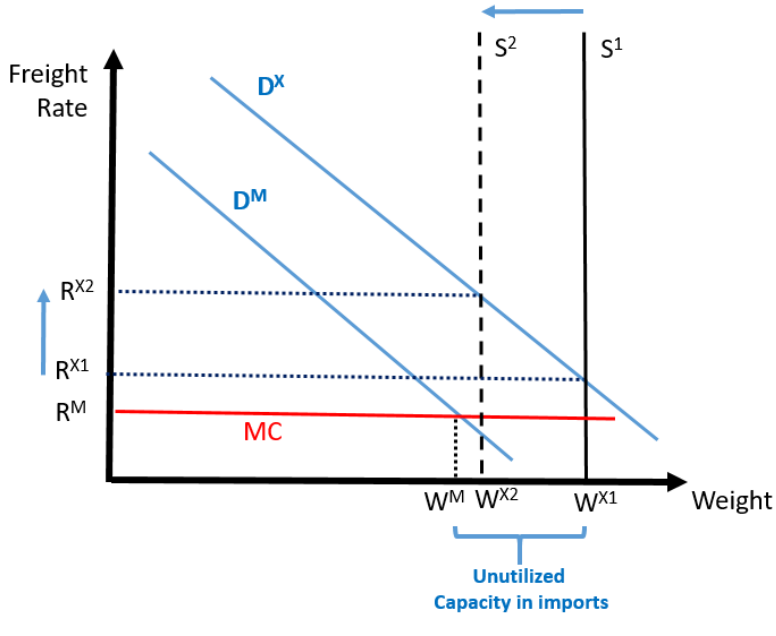
[5] Asymmetric freight rates are not unique to lines arriving and departing from Shanghai. For instance, the freight rate from NY to Rotterdam in January 2023 was about USD 1,300 but the return rate was above USD 6,000 (Chart A3)

transporting imports. Hence, the market for freight services is cleared by quantities and prices, rather than only by prices.

The market sets freight rates and quantities for exports and imports (Chart 4). We represent the specialization of the economy in exports by a higher demand for transporting exports (D^X) than the demand for transporting imports (D^M). The supply is represented by a vertical line (S^1) representing equal capacity for transporting imports and exports. The shipping firm has marginal cost for transporting each container including the loading and unloading the goods, additional fuel expenses etc. (MC). Thus, the minimal freight rate is set by the MC curve. In equilibrium the freight capacity is fully utilized in exports but not fully utilized in imports due to lower demand for transporting imports. As a result, freight rates for transporting exports are higher than the rates for transporting imports ($R^{X1} > R^M$) and the vessel arrives to the economy with unutilized transport capacity ($W^{X1} > W^M$).

An adverse supply shock (a shift to the left from S^1 to S^2), say because of a need to use the vessel in longer routes, reduces the quantity of export ($W^{X2} < W^{X1}$) increases the freight rates for exports ($R^{X2} > R^{X1}$), but does not affect freight rates and quantity of imports (R^M, W^M) as long as the adverse supply shock is smaller than the original unutilized capacity of imports.

Chart 4: The market for freight services for an economy specializing in heavy exports



This simplistic model explains how an adverse supply shock in the freight market can reduce the quantity and raise freight rates of exports without affecting quantity and freight rates of imports in an economy with a trade surplus. The reason for the asymmetric impact is the unutilized capacity in transporting imports, which shrinks with the adverse supply shock without affecting freight rates and quantities of imports. Notably, the impact on economies whose have trade deficit would be the opposite: a contraction

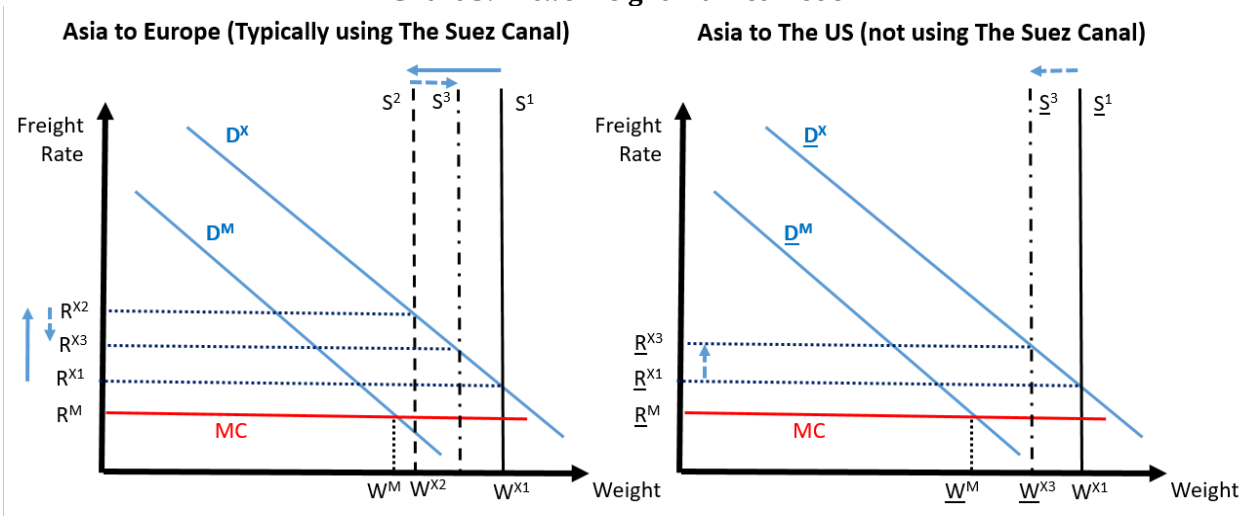
of the transportation supply increases the freight rates for importing goods and reduces the quantities of imports, while freight rates and quantities of exports are unchanged.

To apply this theoretical framework to the evaluation of the impact of the Houthi attacks on global trade we consider two freight markets: 1) The freight market between "Asia and Europe", where vessel *typically used The Red Sea* and were diverted around Africa to avoid the attacks in the Red Sea; 2) The freight market between "Asia and the US", where vessels typically do not cross The Red Sea, and are not directly threatened by attacks.

The diversion of the "Asia–Europe" route around Africa is akin to a negative supply shock as the same transport capacity (vessels and containers) can transport fewer goods via the longer and more time consuming route in a given time period (movement from period 1 to period 2 in Chart 5). The immediate impact of the adverse supply shock (movement from the solid line S^1 to the dashed line S^2) is an increase of freight rates in period 2 ($R^{X2} > R^{X1}$) and a decline in period 2 in exports in routes that typically cross the Red Sea ($W^{X2} < W^{X1}$).

At the period 3, shipping companies shift the supply of transport capacity from the "Asia-US" route to the "Asia-Europe" route and thus alleviating the adverse supply shock in the "Asia-Europe" market, while reducing supply in the "Asia-US" market (dashed-dotted lines S^3 in both markets). As a result, "Asia-Europe" freight rates in period 3 decline yet are still above the initial level ($R^{X2} > R^{X3} > R^{X1}$) and the quantities of "Asia to Europe" exports partly recover in period 3 ($W^{X2} < W^{X3} < W^{X1}$). Simultaneously, freight rates in "Asia-US" route in period 3 soar ($\underline{R}^{X3} > \underline{R}^{X1}$), and quantities of exports decline in period 3 ($\underline{W}^{X3} < \underline{W}^{X1}$).

Chart 5: A two freight market model



This analysis suggests that freight rates of "Asia to Europe" exports should initially increase and in the second stage they recede when freight rates of "Asia to US" exports increase. Overall both freight rates of exports increase. High frequency data may reveal the stages of the above freight rate dynamics. Freight

rates of imports may be unaffected as long as the unutilized transport capacity is not consumed by the reduction in the transport supply.

Comparison of the trade suggests that in the movement from the general equilibrium in stage 1 to the general equilibrium in state 3, exports in both markets should decline.[6] The magnitude of the decline depends on the elasticities od demand and supply for goods (not transport) in both markets. The imports to countries specializing in exports are in both markets are not likely to decline as long as the unused transport capacity isn't offset by a decrease in transport supply. However, the switch to a longer route and the resulted prolonged transport time in the Asia-Europe market, is expected to delay the arrival of imports to their destination. Hence, imports, but not exports, in the Asia-Europe market may have transitive decline.

The following sections present the data and the empirical strategies as well as the analysis of the impact of the Houthi attacks in the Red Sea on freight rates and trade.

4. Data and empirical strategies

The empirical strategy compares freight rates and trade between countries whose maritime trade *typically transported via The Red Sea* and is thus exposed to Houthi attacks to trade between countries whose maritime trade routes typically do not transported via The Red Sea. The analysis of the freight rates is based on time series analysis while the analysis of the trade data is using panel analysis.

4.1 Freight Rate data and analysis

The paper uses weekly quotes of freight rates and data on trade in goods. The data on freight rates are on the cost of shipping a 40 ft container from Shanghai to a few ports in the US and Europe (LA, NY, Rotterdam and Genoa), and back to Shanghai (only from LA and Rotterdam). We use the series for 2011-2024. These rates series are compiled by Drewry and reflect spot rates but exclude prices agreed in long run contracts, which are typically confidential. We use these series to both demonstrate the interaction of freight rates in various lines during the current episode of disruptions in the Red Sea as well as for estimating the long-run and short-run relation between these series in 2011-24 with co-integrations and error correction models.

4.2 Trade data and analysis

The paper uses trade data from Comtrade UN, a data depository service that collects trade data from national statistical offices, processes the data, and facilitates access to the data. Some statistical offices also report the data by means of transportation (sea, air, land, etc.), which is useful for identifying the impact of Houthi attacks on maritime trade, while air or land transportation of goods was not *directly* affected by the Houthies.

[6] We do not refer to trade in stage 2 as we do not have high frequency (weekly), but rather monthly trade data.

We use data on both imports and exports and note a few differences between them. First, import data include the country of origin, while export data do not identify the final destination of re-exported goods. This can create discrepancies between imports and exports between countries when trade is done via a third country. Second, the CIF value of imports includes insurance and transportation costs, while the FOB value represents the value at the exporting port without freight and insurance. Therefore, the relative decline in import value due to longer routes is likely to be attenuated by higher freight costs for affected routes. Third, exports are recorded at the departure date from the port, while imports are recorded at the arrival or clearance date at the importer's customs. Thus, longer sailing routes including rerouted Red Sea trade to the Cape of Good Hope increase the time gap between export and import registration of the same shipment.

We analyze data of total imports or exports of all countries reporting monthly trade in early 2024 to identify the global impact of the Houthi attacks. Our global sample includes all countries that reported monthly trade in 2022, 2023, and early 2024 and a subsample of countries that reported imports by origin and means of transportation in this period. The full sample includes 81 countries, which imported 77% of the value of global trade in goods in 2022. The sub-sample includes 28 countries, which imported 27% of the value of global trade in goods in 2022. Naturally, the smaller sub-sample is self-selected and does not represent global trade, yet it indicates whether the attacks affected the main maritime trade. We drop from the sample landlocked countries as we focus in this paper on maritime trade. We dropped landlocked countries from the econometric analysis as this paper focuses on maritime trade.

To capture the possible adverse effect of Houthi attacks on trade, we have to identify pairs of countries whose maritime trade route passes the Red Sea.[7] We use data from the CERDI-Sea Distance database, which contains bilateral maritime distances between 227 countries and territories. The relevant port(s) for countries with access to the sea is defined as the coastal region of a country which contains the highest number of shipping lines.

We compare imports between pairs of countries *which typically crosses The Red Sea* for trading between them with imports between other pairs month by month during 2022-24 with regression analysis similar to Dif-in-Dif estimations. Trade typically transported via The Red Sea is marked with a dummy variable, and we report the results of the interaction of this dummy variable with time dummy variables. Formally, we regress the log of imports or exports from country i to country j at time t, on a set of dummy variables for each pair of exporter and importer ($\theta_{i,j}$), dummy variables for each period ($\mu_t \bullet d_t$) and the interaction between period dummy variables and a dummy variable for pairs that typically crossing The Red Sea ($\beta_t \bullet d_t \bullet d_{i,j}^{Red\ Sez}$).

[7] The trade between a pair of countries is classified as passing via the Red Sea if the distance from country A (say Italy) to Country B (say India) is shorter than the sum of distances between country A (Italy) to Egypt, between Egypt and Sudan, and between Sudan and country B (India) minus 700 Km (to compensate for reaching and returning from ports in Egypt and Sudan.

$$(*) \quad ln(trade_{i,t}) = \theta_{i,j} + \mu_t \cdot d_t + \beta_t \cdot d_t \cdot d_{i,j}^{Red\ Sea} + \varepsilon_{i,t}$$

The variable of interest is β_t the coefficient of the change in trade typically crossing The Red Sea relative to the base period (November 2023). The direct impact of the Houthi attacks on trade is reflected in the changes in β_t for December 2023 and for the beginning of t.

In some specifications, when the imports is the dependent variable, we control for the parallel exports. In these specifications the meaning of a transitive decline of imports with the diversion of trade is that the longer sailing time in the new route temporarily reduced the arrival of goods, even when we control for the departure of the goods.

5. Empirical Results

This section provides evidence consistent with the theoretical framework documenting: 1. freight rates from China to Europe hiked following the Houthi attacks, and subsequently affected freight rates from China to the US as these series have long run and short run statistical relations; 2. Trade between pairs of countries *typically crossing The Red Sea* dropped following the attacks and recovered thereafter relative to other trade.

The impact of the Houthi attacks on freight rates

This section examines the interaction of freight rates of lines from Shanghai to destinations in Europe and the US (Rotterdam, Genoa, NY and LA). Notably, while the lines to Rotterdam and Genoa typically crossed The Red Sea and had to reroute around Africa due to the Houthi attacks, the lines to LA and NY were not directly affected by the attacks.[8] Yet, as noted in section 2 the hike in freight rates from Shanghai to Europe was followed by an increase in freight rates from Shanghai to LA and NY.

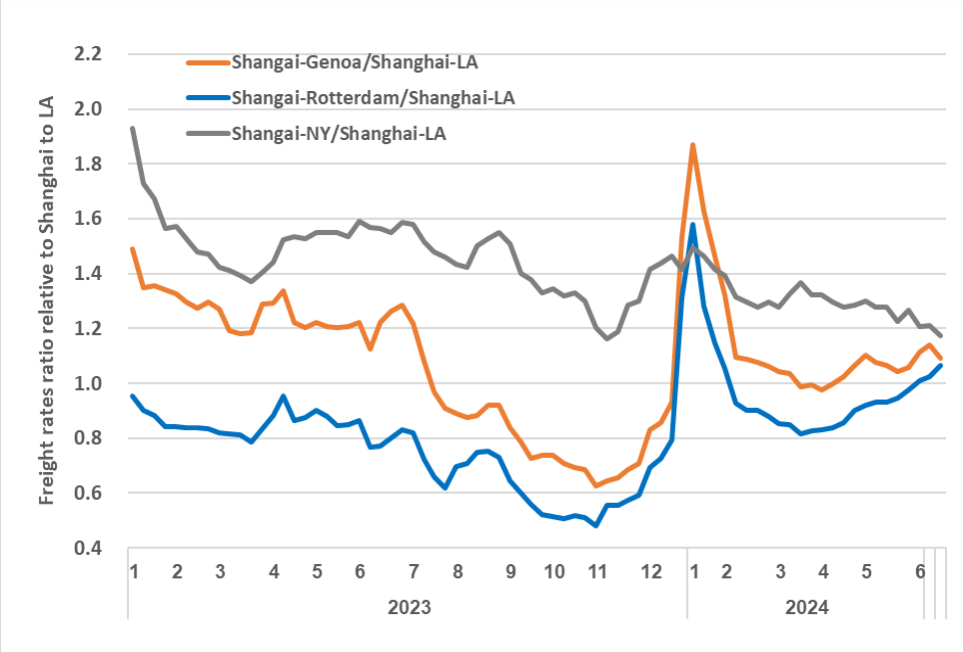
The interaction between the freight rates to various destinations from Shanghai is better revealed in Chart 7 presenting the ratio of freight rates to Genoa, Rotterdam (The Netherlands) and NY relative to the rate from Shanghai to LA. We use the freight rate to LA as this route is remote from the Red Sea and not threatened by the Houthis. Initially, in December 2023 and January 2024 freight rates from Shanghai to Genoa and Rotterdam hiked relative to the rates to LA and even overtook the rates to further away NY. These relative rates to Genoa and Rotterdam declined in February-March and stabilized at a level higher than before the war plausibly reflecting the longer route around Africa.

This reaction of the freight rates from Shanghai to the US to changes in freight rates from Shanghai to Europe is not new, but rather persisted in previous years. Estimations of long and short run relations (Co-integration and Error Correction Model, respectively) between freight rates from China to Europe and to the US in 2011-24 indicate that changes in the freight rates to Europe affected freight rates to the US long

[8] The short route from Shanghai to NY crosses the Panama Canal and thus changes in the rates on this line provide some indication whether the adverse impact of the draught in Central America had significant on international trade.

before the attacks in the Red Sea. Indeed, the co-movement of freight rate from China to Europe and to the US was particularly noticeable during the COVID crisis (Chart A2). Notably, the impact of freight rates to Europe on rates to Los Angeles are larger than the impact on rates to NY both in the long run and in the short run (Table 2 and Chart A2). At any rate, we surmised that these statistical relations reflect the shipping companies' decisions to allocate transport capacity (vessels and containers) available in China to the lines to Europe or to the US based on the rates for each line.

Chart 6: Freight rates for 40 ft container from Shanghai to Rotterdam, NY and Genoa relative to Shanghai to L.A rate, 2023- 24



Source: Authors' calculations & Bloomberg

These patterns as consistent with the argument that initially the attacks disrupted the trade via Red Sea and reduced the effective supply of maritime transportation from China to Europe. At a second, stage more transport capacity was moved from China-US routes to the China-Europe/Mediterranean routes shifting supply of transportation services from the China-US lines to the Asia-Europe lines.

In contrast, long run and short run relations between the freight rates in the opposite directions, from LA to Shanghai and from Rotterdam to Shanghai (column iii in Table 1 and dashed lines in Chart A2), are weak. The R^2 of the co-integration regression is low, we cannot reject the hypothesis that the residuals of the co-integration are non-stationary (low ADF statistic), and the ECM estimation indicates that the error of the co-integration model hardly affects the subsequent change in freight rated from LA to Rotterdam. The contrast between these weak statistical relations of the freight rates from the US and Europe to Shanghai and the stronger relations of freight rates from Shanghai to the US and Europe indicate that shipping companies shift transport capacity to satisfy the high demand to ship goods from China, while the weaker demand to ship goods back play a limited role on the allocation of transport capacity.

Table 1: Long run (co-integration) and short run (ECM) relations of freight rates of containers from China to US and from China to Europe, weekly data, 2011-2024

	(i)	(ii)	(iii)
	Long run relations (co-integration)		
Dependent variable	**Ln (Shanghai to NY)**	**Ln (Shanghai to LA)**	**Ln (LA to Shanghai)**
Ln (Shanghai to Rotterdam)	0.59 (0.01)***	0.72 (0.01)***	
Ln (Rotterdam to Shanghai)			0.36 (0.04)***
Constant	3.58 (0.09)***	2.17 (0.10)***	4.05 (0.10)***
N	680	680	680
R^2	0.80	0.83	0.12
ADF test of residuals	-5.89***	-6.10***	-1.96
	Short run relations (ECM)		
Dependent variable	**Δ Ln (Shanghai to NY)**	**Δ Ln (Shanghai to LA)**	**Δ Ln (LA to Shanghai)**
Δ Ln (Shanghai to Rotterdam)	0.12 (0.01)***	0.19 (0.02)***	
Δ Ln (Rotterdam to Shanghai)			0.14 (0.03)***
Error correction	-0.04 (0.01)***	-0.05 (0.01)***	-0.01 (0.005)**
Constant	0.001 (0.002)	0.001 (0.002)	0.0001 (0.002)
N	679	679	679
R^2	0.13	0.17	0.03

The transitive impact of the Houthi attacks on imports

The analysis of the impact of the Houthi attacks on global trade compares trade between countries whose shortest maritime route passes via The Red Sea (e.g., UK and India) and thus exposed to Houthi attacks to trade between countries whose shortest maritime route *does not* pass via The Red Sea (e.g., UK and the USA). When data are available, we compare maritime trade between these routes as the Houthi attacks did not directly affect airborne or land-transported.

The following regression analysis, based on equation * (p. 12), examines the average change of trade in percentage for each pair of countries before and following the Houthi attacks in the Red Sea. Chart 7 presents the coefficient for the interaction of *typically crossing The Red Sea* and time dummies (β_t) in a regression on the log of imports and of exports. The interpretation of β_t is the change in imports in percentage of trade *typically crossing The Red Sea* relative to the changes in other trade. The base period is September-October 2023, before the Houthi attacks on vessels began. Chart 7 also presents the confidence intervals for 5% significance, and the standard errors were clustered for each pair of trade partners.

Evidently, the difference in average imports and exports between pairs that *typically crossing The Red Sea* and other pairs before the Houthi attacks (November 2023) were similar and statistically insignificant

at 5%. In contrast, following the attacks imports between pairs *typically crossing The Red Sea* declined relative to other trade. The decline of imports in the regression analysis is larger (about 20% in January 2024) and more persistent that the decline in Chart 2 as the regressions depict average change in trade, and the chart decline in total trade.

In contrast to the decline in imports, exports did not decline. This difference suggests that the diversion to a longer route and the resulted longer sailing time is the mechanism for the transitive decline of arrival of imports even though exports continued to departure. We corroborate this interpretation by controlling for exports from *j* to *i*, in a regression on the imports from *j* to *i* (Chart 8). The results of the new estimation are similar to the estimations of imports without control for exports but with smaller SE. Indeed, while exports continued to departure from exporting countries the arrival of imports plausibly diverted from the Red Sea to the Cape of Good Hope was delayed and recovered after a few months.

Chart 7: Regression coefficients for the difference between trade typically crossing the Red Sea and other trade (β_t), dependent variable ln(imports / exports), 2022-24

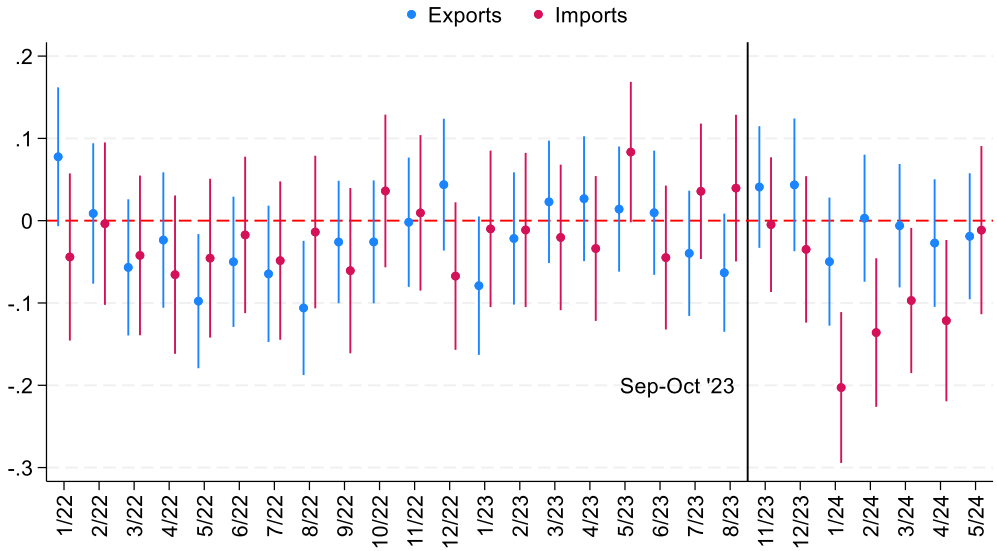


Chart 9 present the results of similar regressions when the dependent variables are ln maritime imports and ln non-maritime imports using a subsample of countries reporting trade by means of transport. The relative drop of maritime trade typically crossing The Red Sea following the attacks was significant already in December 2023 and reach a level of 36% in January 2024, but gradually recovered thereafter. There are no indications that country pairs typically crossing The Red Sea used in January-March 2024 non-maritime means of transport to compensate for the drop in maritime trade between them. Chart 9, like Chart A1, corroborate the assertion that the Houthi attacks on maritime trade *typically crossing the Red Sea* is the reason for the transitive decline in total trade.

Chart 8: Regression coefficients for the difference between imports typically crossing the Red Sea and other trade (β_t) controlling for mirror exports, dependent variable ln(imports), 2022-24

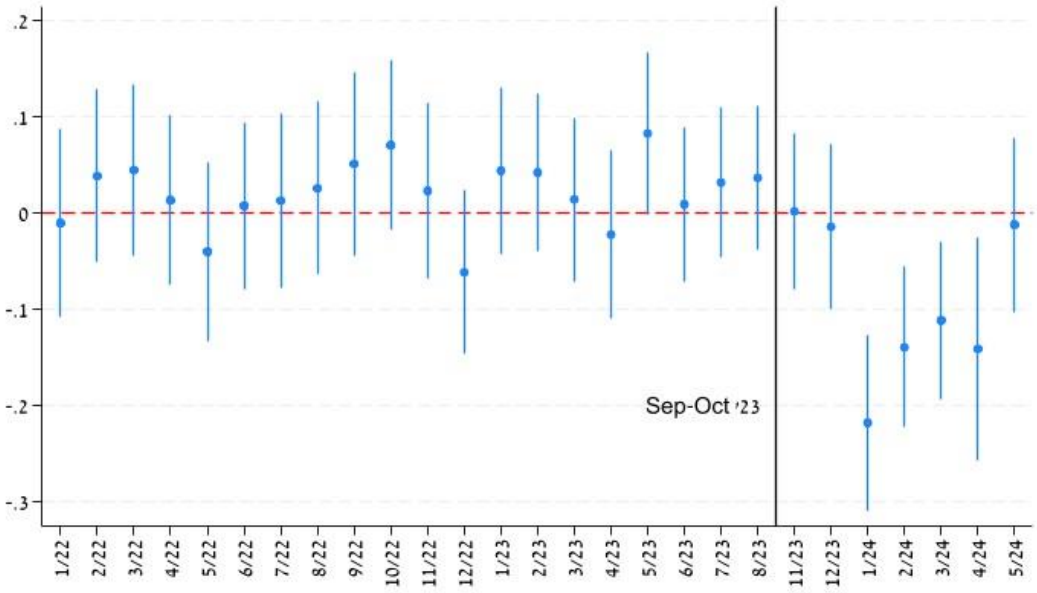
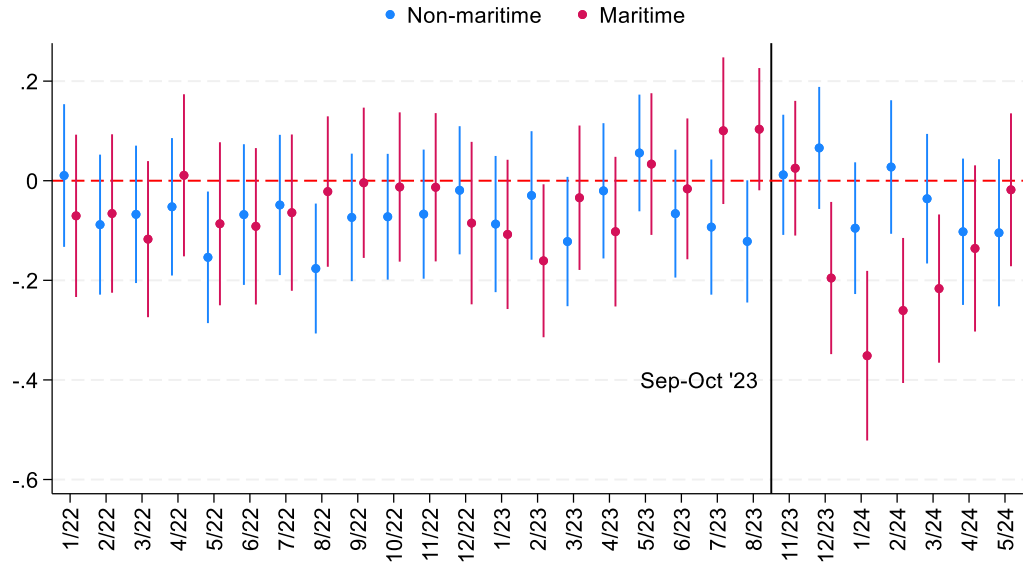


Chart 9: Regression coefficients for the difference between imports typically crossing the Red Sea and other trade (β_t) *by means of transport*, dependent variable ln(imports), 2022-24



Concluding remarks

Houthi attacks in the Red Sea disrupted the global supply chains by diverting cargo vessels from the shortest Red Sea route between Asia and Europe to the longer Cape of Good Hope route. This is a good case-study for testing the impact of distance on trade. Traditional trade models assume exogenous and often symmetric trade costs, including transportation costs, approximated by distance. Indeed, Feyrer

(2021) showed that closing (1967) and opening (1975) the Suez Canal had large impact for at least 6 years on trade that *typically used The Red Sea*.

In contrast, this paper documents that trade *typically crossing The Red Sea* dropped by about 10-13% in December 2023-January 2024 but recovered a few months later. Specifically, analysis of a subset of countries reporting trade by means of transport, indicate that maritime trade dropped by 20-27% before gradually recovering and some countries used other means of transport to compensate for this drop in trade.

In addition, we document that the hike in refight rates from Asia to Europe due to the longer route, heralded the increase in freight rates from Asia to the US for these transport markets affect each other as evident in the time-series analysis. The freight rate increase from China to the US indicate that transport capacity was rebalanced between the China-Europe and the China-US transport markets and presumably facilitating the recovery of the trade *typically crossing The Red Sea*. Indeed, this paper fits the emerging literature on endogenous trade costs, that analyzes transport markets and trade jointly (Brancaccio, 2020; Friedt, and Wilson, 2020; Wong, 2022).

Why did the closing of the Suez Canal in 1967 lead to a lasting decline in trade *typically crossing The Red Sea* while the Houthi attacks had a transitive decline of trade *typically crossing The Red Sea* in 2024? We surmise that changes in the maritime transport markets in the last 5 decades including – wider use of containers and large cargo vessels, fast and large data on location of vessels and cargo, and the emergence of global shipping alliances – help integrating transport markets across the globe. Indeed, globalization and cross border value chains created the demand for thicker transport markets. This paper provides evidence that these thinker and integrated transport market, specifically the transport markets from China to Europe and to the US helped restoring global trade patterns despite the disruption in the Red Sea, one of the main maritime transport route in the globe.

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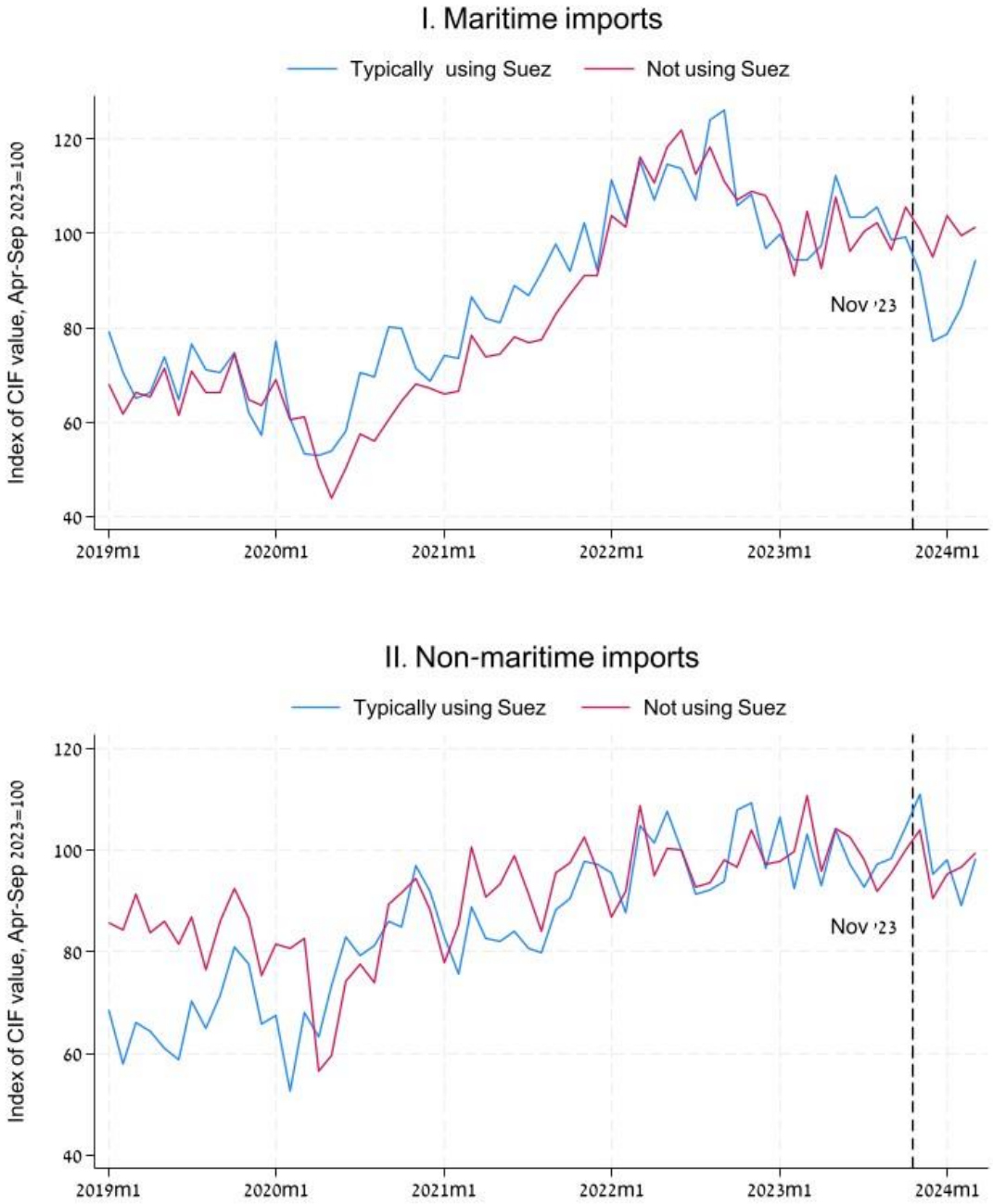
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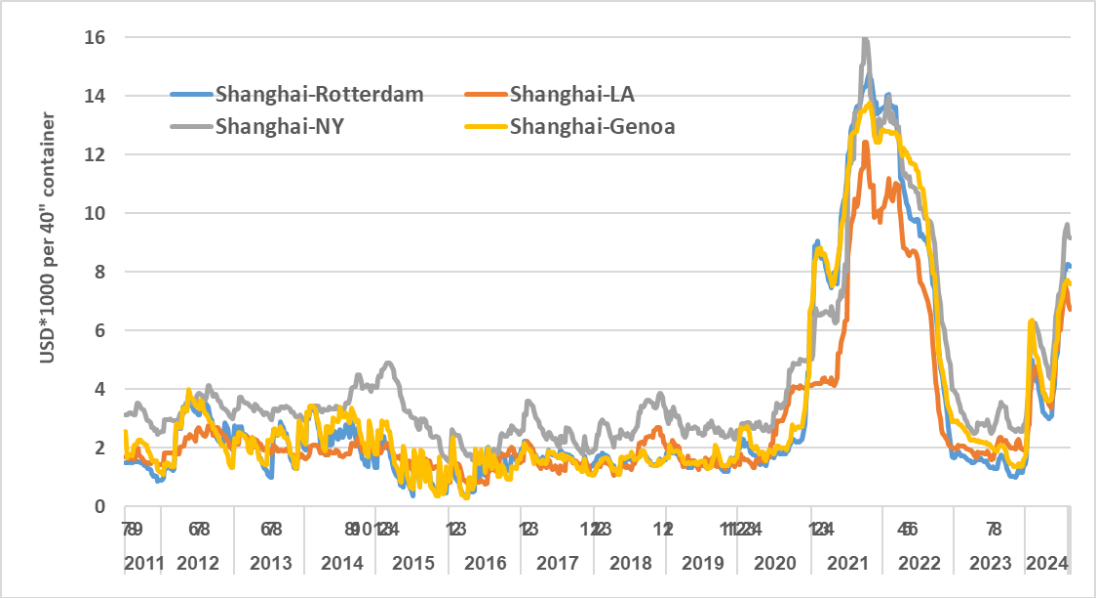
Appendices

Chart A1: Index of CIF value of imports in route typically passing The Red Sea and other routes, Index=100 in average Apr-Sep 2023, 2019-24



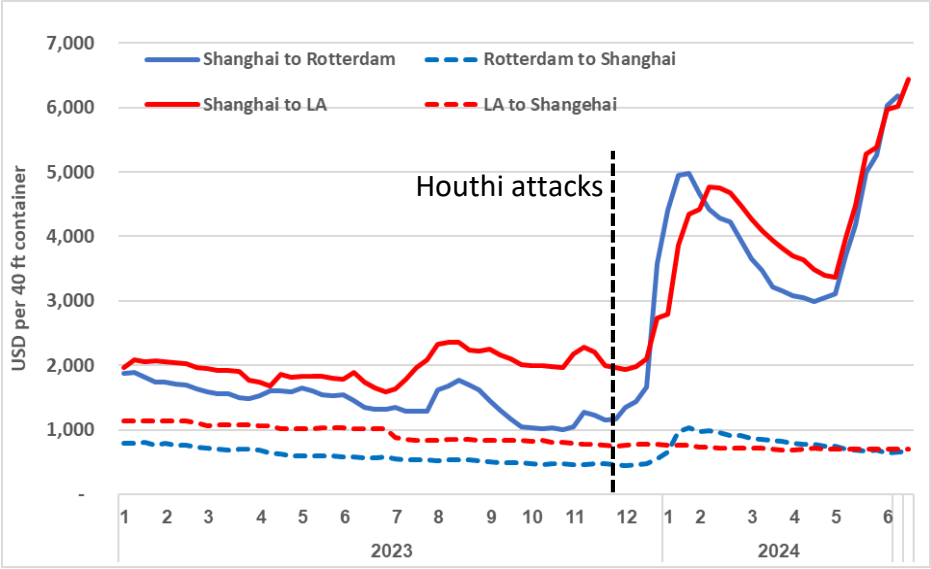
Note: The sample includes 28 countries reporting maritime trade in March 2023. These countries reported 26% of global imports in 2022.

A2: Freight Rates from Shanghai to Rotterdam, LA, NY and Genoa per 40 ft container, 2011-24



Source: Bloomberg

Chart A3: Freight Rates between Shanghai, Rotterdam and LA per 40 ft container, 2023-24



Source: Bloomberg