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Resilience of Global Container Shipping Firms to the Red Sea Crisis: Comparative Evidence from Maersk and Hapag-Lloyd Based on Quarterly Data

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Abstract. Due to the Red Sea crisis, international container shipping must now go around the Cape of Good Hope and take a longer route instead of using the Suez Canal. The increased distance of travel for the ship will reduce it carrying capacity and lower freight rates. This paper conducts a comparative case study of the resilience of Maersk and Hapag-Lloyd based on quarterly company-level data. Revenue, EBITDA, transport volume, EBITDA margin, and volume growth from Q1 2022 to Q2 2026 will be analyzed. Difference-in-differences and regression analysis are employed to examine the impact of the disruption on financial and operating performance. According to the above results, both companies exhibited relatively large-scale transportation activities after the disruption, but had different paths for financial recovery. The estimated difference-in-differences for EBITDA margin is about 6.33 percentage points when 2023 Q1-Q3 is used as the pre-crisis period and 2024 Q1-Q2 is employed as the post-crisis period. At present, only the previous analysis is available; a causal interpretation cannot be made without a control group. The regression results also show that the connection between the post-crisis indicator and EBITDA margin is statistically significant, but there is no statistical difference in the connection with volume growth. The attributes of heterogeneity in cross-case comparison include differences in business structure and freight-rate exposure, as well as various degrees of network flexibility and customer-oriented service management.

Keywords: Red Sea Crisis, Container Shipping, Corporate Resilience, Operational Continuity, Difference-in-Differences

1. Introduction

1.1. Research background

Given that a considerable proportion of the world's trade in goods is carried by sea, maritime transport is necessary for international trade. Among the routes in the maritime system, the Suez Canal and the Red Sea are among the main links connecting Asian manufacturing bases with Europe. Therefore, any disruption in this corridor will affect shipping companies and ports, logistics enterprises, manufacturers, retailers, consumers, and so on.

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The Red Sea crisis in late 2023 caused the disruption mentioned above. After several attacks on commercial vessels in the Red Sea and Gulf of Aden, the large container shipping companies began to avoid the Suez Canal and reroute the vessels around the Cape of Good Hope. Maersk and Hapag-Lloyd were two of the leading shipping companies that changed. The alternative route was longer and took more time to sail; thus, fuel consumption increased, and the actual capacity of the ship decreased. Liu and others have shown that the crisis has caused significant changes in maritime congestion and operational conditions for global ports, and Notteboom et al. have studied the impact on vessel operations, shipping networks, and maritime supply chains [1, 2].

There is now a serious economic problem for container shipping companies. Rerouting increased operating costs, and the reduction in effective capacity also led to higher freight rates. According to UNCTAD, the disruption in the Red Sea has pushed up container shipping rates and increased the demand for ton-mile transport [3]. Therefore, carriers faced the problem of a difficult operating environment and higher revenues; thus, the crisis provided a case study for corporate resilience.

In general, the capacity of a system to handle disruptions and adjust operations and performance after a disturbance is called supply chain resilience [4, 5]. Types of resilience for container shipping include operating continuity (transport volume, fuel-cost control, and schedule reliability), financial performance, and the preservation of customer relationships.

Maersk and Hapag-Lloyd are representative cases; although they were both damaged by the same large-scale external disturbance, the organizations had different structures. Maersk has an integrated logistics system of Ocean, Logistics & Services, and Terminals; Hapag-Lloyd has traditionally focused on liner shipping but has also added terminals and infrastructure over time. The various structures of the companies will respond differently to the same external shock.

Research on the resilience of Maersk and Hapag-Lloyd during and after the Red Sea disruption. Combine the qualitative case evidence from company reports and academic research with quarterly quantitative data for analysis. Revenue, EBITDA, TEU, EBITDA margin, and volume growth are used to compare the two companies. Difference-in-differences and regression analysis are employed to determine whether the performance of the two companies changed differently after the crisis.

1.2. Literature review

Most previous studies of the Red Sea crisis have concentrated on maritime networks, ports, freight rates, and environmental impacts. Notteboom et al. and Liu et al. found that rerouting changed capacity utilization, sailing distance, network structure, port disruption, and recovery, and thus showed that resilience includes both the capacity to absorb shocks and recover from them [1, 2]. Yap et al. focus on the role of network structure and flexibility during geopolitical disruptions [6]. Rožić et al. study the impact of crises on freight rates and thus on the profit of shipping enterprises; Vasiliadis et al. discuss organizational integration after repeated disruptions [7, 8]. Huo and others connect supply chain resilience to customer satisfaction and financial performance, and Peng and others demonstrate that short-term safety results in higher carbon emissions due to rerouting [9, 10].

Many previous studies have examined the general effects of the Red Sea crisis, but few have employed firm-level quarterly financial and operating data to analyze individual carriers. In addition, qualitative case studies and quantitative data may be analyzed independently, and operational continuity and profitability can be indicators of different levels of resilience. Maersk and Hapag-Lloyd have different problems, and this paper will compare the quarterly data and case studies of route adaptation, freight-rate exposure, business structure, and customer-related resilience.

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1.3. Research framework

The two components of resilience are shown below. The operational layer comprises route adaptation and recovery, captured by transport volume and volume growth. The financial and strategic layer encompasses profitability (revenue, EBITDA, and EBITDA margin), network structure, business-model differences, service reliability, and long-term adaptation.

Quarterly data from 2022 Q1 to 2026 Q2 are used for quantitative analysis. EBITDA margin is the ratio of EBITDA to sales. Volume growth is based on quarterly TEU data. Difference-in-differences analysis is used to compare the changes in financial indicators for Maersk and Hapag-Lloyd over time. A Regression Analysis is employed for extra verification.

2. Case description and industry context

2.1. Red Sea disruption and operational rerouting

The Red Sea crisis is now seriously affecting the operations of container shipping in late 2023. Due to security risks in the Red Sea and Gulf of Aden, commercial shipping has been unable to use the traditional Suez Canal route. The main shipping companies then sailed around the Cape of Good Hope.

The alternate way had a longer trip. A longer voyage time will reduce the number of round trips the fleet can make in a given time. Therefore, more vessel capacity is needed to maintain the current service frequency. Rerouting increased fuel consumption and added to the load on ports and hinterland logistics.

Liu and others have found that the causes of disorder are a crowded environment and operational uncertainty [1]. Notteboom and others have also found that the crisis affected the organization of vessel networks, not just individual voyages [2]. Therefore, there was a drop in both operating income and profit.

2.2. Maersk's exposure and response

Maersk is a top container shipping company in the world and runs a large-scale logistics network. In addition to Ocean transport, there are also Logistics & Services and Terminals. This integrated structure links the various links in the logistics chain. According to Maersk's 2024 Annual Report, the Red Sea situation has resulted in extended voyages and higher operating expenses [11]. The company had a higher bunker consumption at that time. At the same time, higher freight fees increased the company's financial health.

Thus, the Maersk case is the result of the two aforementioned reasons. It had a high cost and a distant destination. Financially, capacity constraints due to rerouting led to higher freight rates.

2.3. Hapag-Lloyd's exposure and response

Hapag-Lloyd is a large overseas shipping company. The company has had a relatively concentrated liner-shipping business model compared to Maersk in the past. However, the plan has added some terminal and infrastructure construction.

Hapag-Lloyd's 2024 Annual Report reports that due to the security situation in the Red Sea, vessels were diverted around the Cape of Good Hope [12]. Extended Voyages increased transport costs and caused capacity constraints. Transport volume still increased in 2024.

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The two cases are suitable for comparison. Both companies were affected by the same large-scale external disruption, maintained the operation of their transport business, but the connections among volume, freight rates, and profitability differed.

3. Analysis of financial and operational resilience

3.1. Data source and variable construction

Quarterly data from the financial reports of Maersk and Hapag-Lloyd were used in the empirical analysis. The data from Q1 2022 to Q2 2026 for both companies' revenue, EBITDA, and TEU are shown in Table 1.

Two additional indicators were calculated.

First, EBITDA margin is defined as:

$$\text{EBITDA Margin} = \text{EBITDA}/\text{Revenue} \times 100 \tag{1}$$

This indicator shows the change in operating profit as a proportion of revenue.

Second, calculate the quarterly volume growth rate of TEU data to determine changes in transport activity.

The dataset has a pre-disruption and a post-disruption period. Empirically, 2023 Q1-Q3 is considered the pre-crisis period, and 2024 Q1-Q2 is taken as the post-crisis period. Based on the above division, the serious issues with carrier rerouting and operating problems occurred primarily in early 2024. The crisis occurred in late 2023; therefore, the exact time range is not specified.

Table 1. Quarterly financial and operational indicators used in the analysis

Variable	Measurement	Purpose
Revenue	Quarterly reported revenue	Measures operating scale
EBITDA	Quarterly reported EBITDA	Measures operating earnings
TEU	Quarterly container volume	Measures transportation activity
EBITDA Margin	EBITDA / Revenue × 100	Measures profitability relative to revenue
Volume Growth	Quarterly change in TEU	Measures operational growth

(Source: Author's compilation and calculation based on Maersk and Hapag-Lloyd financial reports)

The number of samples for the EBITDA-margin regression and volume-growth regression is 34 and 24, respectively.

3.2. Financial performance before and after the crisis

According to the quarterly data, both companies saw a significant drop in profitability in 2023. This pattern is necessary to build a pre-disruption financial foundation.

For Maersk, EBITDA margin declined from 4.09% in 2022 Q1 to 15.48% in 2023 Q3. Hapag-Lloyd experienced a sharper decline, from 59.26% in 2022 Q1 to 16.66% in 2023 Q3.

The low profitability in the period before the crisis serves as a reference point. In 2024, both companies saw an increase in the EBITDA margin, but at different times and levels. Maersk's EBITDA margin increased from 12.87% in 2024 Q1 to 30.43% in 2024 Q3 before declining to

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24.65% in Q4. Hapag-Lloyd's margin increased from 20.38% in Q1 to 28.14% in Q3 and 26.66% in Q4 (Table 2).

Table 2. Selected quarterly EBITDA margins

Period	Maersk	Hapag-Lloyd
2023 Q1	27.94%	39.47%
2023 Q2	22.37%	28.97%
2023 Q3	15.48%	16.66%
2024 Q1	12.87%	20.38%
2024 Q2	16.79%	21.01%
2024 Q3	30.43%	28.14%
2024 Q4	24.65%	26.66%
2025 Q4	13.77%	16.23%
2026 Q2	18.99%	14.20%

(Source: Author's calculation based on quarterly company data)

According to the data, the two companies did not recover at the same time. Maersk showed an exceptionally great improvement in the second half of 2024. Hapag-Lloyd also rose in 2024, but the increase was relatively small. This is in line with the overall market development. The Red Sea rerouting has reduced the effective shipping capacity, but demand is still relatively high. Rožić and others have shown that the main disturbances significantly affect freight rates [8]. Therefore, the increase in EBITDA margin cannot be assumed to be due to enhanced operating efficiency. Instead, the results show that both the revenue conditions and operating costs have changed. The increased revenue from higher freight rates may offset the extra costs of extended voyages to some extent.

3.3. Transportation volume and operational resilience

Another is the volume of transportation. According to the TEU data, neither company had a prolonged decline in transport activity following the Red Sea disruption. Maersk's quarterly volume increased from 2.928 million TEU in 2024 Q1 to 3.175 million TEU in Q3 and reached 3.361 million TEU in 2026 Q2. Hapag-Lloyd's volume increased from 3.037 million TEU in 2024 Q1 to 3.227 million TEU in Q3 and 3.481 million TEU in 2026 Q2.

Therefore, the disruption did not cause either company to cease operating a transport business. The amount-of-growth data also provides support. Maersk's volume growth in the post-crisis period has been generally positive. Hapag-Lloyd has also shown good quarterly growth in most of the post-crisis observations in the robustness dataset.

Only volume expansion will not guarantee good results. A company can transport more containers by using more fuel and vessel capacity. In fact, the Cape of Good Hope route had to be avoided, and this is why. The extra distance added to the transport resources for one container. Therefore, the volume results should be regarded as evidence of continuous operation rather than a lack of adverse effects following the disruption.

Liu and others believe that resilience is the capacity of a person to recover from a disaster and bounce back; otherwise, it may be mistaken for stability [1].

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3.4. Difference-in-differences estimates of EBITDA margin

First, a quantitative difference-in-differences model will be used. Compare the change in EBITDA margin before and after the crisis for both companies using this method. This Design is beneficial because the two companies have been affected by the same wide-ranging industrial disruption. Hapag-Lloyd is thus a comparative reference for Maersk. Based on the quarterly data, the average EBITDA margins in 2023 Q1-Q3 were: Maersk: 21.93%; Hapag-Lloyd: 28.37%. For the post-crisis period from 2024 Q1 to 2026 Q2, the averages were approximately: Maersk: 18.78%; Hapag-Lloyd: 18.88%. The resulting difference-in-differences estimate is about 6.33 percentage points.

The first is an improvement; Maersk's fall in EBITDA margin was less severe than that of Hapag-Lloyd. However, this result also has limitations. The DID coefficient does not show that the Red Sea crisis increased the profitability of Maersk by 6.33 percentage points (Table 3). The two companies had different business models, revenue structures, route exposures, and previous financial health. The two-firm model does not have enough observations and controls to isolate the effect of the crisis on profitability. Thus, the DID result can be seen as relative evidence of different post-crisis outcomes.

Table 3. Difference-in-differences comparison of EBITDA margin

Period	Maersk Average	Hapag-Lloyd Average	Maersk − Hapag-Lloyd
2023 Q1–Q3	21.93%	28.37%	−6.44 pp
2024 Q1–2026 Q2	18.78%	18.88%	−0.11 pp
Change in group difference	—	—	+6.33 pp

(Source: Author's calculation based on quarterly company data)

As a result, Maersk's relative financial position improved after the disruption, in line with the hypothesis. However, the result should be shown to be suggestive, not conclusive.

3.5. Regression analysis on EBITDA margin

An Excel dataset is also available for the simple regression of EBITDA margin and the post-crisis indicator. The R^2 value of the model is 0.147, and the explanatory variable accounts for approximately 14.7% of the changes in EBITDA margin. The coefficient of the explanatory variable is -12.17 percent, and the p-value is about 0.025.

It is statistically significant, and thus, the post-period indicator is related to EBITDA margin. However, the negative coefficient does not mean that the Red Sea crisis has reduced the company's profitability. The model does not control for firm-specific factors, freight rates, fuel prices, demand conditions, seasonality, etc., in the economy. Based on the regression analysis, a decrease in profitability has occurred, but the reasons remain unknown. The problem is relatively severe in the container shipping industry. The Components of the EBITDA Margin are Freight Rates, Bunker Prices, Trade Demand, Fleet Deployment, and Port Conditions. Rožić and others have shown that freight rates fluctuate significantly during times of crisis, and Notteboom and others have shown that route disruptions alter the basic operating structure of the industry [2, 8]. Therefore, the regression may only serve to provide supporting evidence for the principal cause identification.

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3.6. Robustness check: volume growth regression

A Second Regression with Volume Growth as the Dependent Variable. The model has 24 observations and an R^2 of 0.082 (Table 4). The coefficient of the explanatory variable is about 3.095 and has a p-value of 0.174. The positive coefficient suggests a possible post-period effect on volume growth. However, the p-value is above the conventional 5% significance level. Therefore, the result does not provide statistically significant evidence that the post-crisis period systematically increased transportation volume. This finding prevents overstating the operational effect of the crisis. Descriptive data show continued transportation volumes, but the regression does not establish a causal effect.

The combination of the two analyses provides a more balanced interpretation: (1) Descriptive evidence shows continued transportation activity. (2) EBITDA-margin analysis shows a change in the profitability environment. (3) Volume regression does not provide statistically significant evidence of a systematic post-crisis volume effect. (4) DID analysis suggest a relative improvement in Maersk's financial position compared with Hapag-Lloyd, but does not establish causality.

Table 4. Regression results

Model	Observations	Coefficient	p-value	R^2
EBITDA Margin	34	−12.167	0.025	0.147
Volume Growth	24	+3.095	0.174	0.082

(Source: Author's regression analysis based on quarterly company data)

Therefore, many indices can be used to assess the level of resilience. A single indicator of profitability may be misleading; the volume model does not have strong operating data.

3.7. Explaining the divergent firm responses

They have different kinds of business models, too. Maersk has built a relatively integrated logistics model of ocean transport, logistics services, and terminals. Hapag-Lloyd has traditionally had a stronger focus on liner services and expanded its network of terminals and infrastructure. Maersk's entire system will provide more chances for cooperation among all links in the logistics chain. Changes in ocean services can be coordinated with modifications to inland logistics and terminal operations.

However, vertical integration is not guaranteed to enhance the stability of the enterprise. Quarterly data cannot isolate the business structure from other factors. Maersk and Hapag-Lloyd have different fleets, concentrated routes, customer groups, covered areas, and financial health. Therefore, the evidence should present a possible way of operation rather than an established cause. Freight-rate exposure is relatively higher in one case. According to the official 2024 data released by Hapag-Lloyd, the average freight rate per TEU was approximately $1,492 and slightly lower than the USD 1,500 in 2023 [12]. Maersk had a larger rise in freight-rate-related income due to the disruption [11]. It can be seen that both companies had the same operating problems but different financial results. Therefore, the resilience of a company is affected by both its operating model and the economic environment.

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3.8. Customer relationships and network resilience

Only one cause of the problem is financial fragility. The Red Sea crisis also created some instability for the customers. Longer trips extended the time of travel and reduced the precision of arrival predictions. This will lead to more inventory and planning costs for manufacturers and retailers. Huo and others have shown that supply chain resilience is related to customer satisfaction, and therefore, operational resilience will eventually be reflected in customer-facing performance [10]. Therefore, the need for a network design was also promoted in recent years. Maersk and Hapag-Lloyd's Gemini Cooperation, introduced in 2025, aims to rebuild services based on a more regular hub-and-feeder network and boost schedule reliability. The goal of the strategy is to reduce the number of trips. A more predictable network can help customers plan inventory and inland transportation despite the uncertainty of the external environment. However, network consolidation may also generate new risks. Fewer main hubs will have poorer coordination and be more dependent on individual nodes. Liu and others have discovered that the resilience of ports varies from place to place [1]. The network is high-performance in normal operation, but will fail if the central hub goes offline. Efficiency and Redundancy are in conflict with Network Reliability.

3.9. Cost, environmental impact and resilience trade-offs

The Red Sea crisis is also a conflict between operating resilience and environmental performance. Rerouting vessels around the Cape of Good Hope increases the sailing distance and thus fuel consumption. Peng and others believe that the disruption of the Red Sea will increase carbon emissions from shipping significantly [9]. The company-level data are consistent with this mechanism. Both Maersk and Hapag-Lloyd had increased fuel consumption due to the rerouting. Therefore, the continuous operation of transportation was not free.

A resilient strategy should therefore consider three dimensions simultaneously: Safety → Cost → Carbon emissions. A safer road will have higher operating costs. Reducing cost by increasing sailing speed will increase fuel consumption. Reducing emissions by lowering speed will increase travel time. The Red Sea crisis has shown that resilience cannot be achieved without the long-term transition of the shipping industry to low-carbon development.

4. Managerial implications and recommendations

4.1. Building a dynamic route selection system

Firstly, a route-selection mode should be built to consider the risks, costs, capacities, and carbon emissions of several routes simultaneously. Continuously update this mechanism according to changes in geopolitics and operations. Instead of choosing only between the Suez Canal and the Cape of Good Hope for the route, several other scenarios for the shipping company should be considered. According to the expected sailing time, bunker consumption, vessel utilisation, insurance cost, port congestion and emissions, all scenarios will be evaluated. The system can change the chosen route in response to changes in the geopolitical situation.

4.2. Strengthen alliance governance

The second is the Shipping Alliance. Gemini Cooperation shows the growing necessity of network coordination. However, the large coalition also has coordination issues. Therefore, the reasons for the delay, port omissions, capacity allocation, and communication failures need to be identified.

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Alliance members need to have crisis plans in advance. Specify how to distribute the vessels and share capacity in the protocol, and notify customers of any schedule alterations. A network with fewer hubs should also have contingency plans to avoid the problem of excessive reliance on individual ports due to the efficiency gained from consolidation.

4.3. Designing customer-specific resilience services

The third suggestion is to offer various resilience services. Customers of different supply-chain structures have different tolerances for delays. Large-scale producers need to be guaranteed a certain production capacity and backup transportation routes; small clients can have more flexible reservations and delay notifications. Therefore, shipping enterprises can offer all kinds of services at different levels of priority, on various routes, and at different schedules. Therefore, there will be no further risk of disruption-related uncertainty transfer to the customers.

4.4. Integrating fleet flexibility with decarbonization

The fourth is to link resilience investment with environmental investment. Companies should continue to develop dual-fuel and lower-carbon vessels and improve the operational flexibility of their fleets. Reduce the speed of the vessel when a higher-speed service is not required. Fleet planning can also consider alternative-route scenarios. A vessel on a fixed route will be less convenient for extended disruptions. Therefore, the aim should be to develop a fleet that can operate normally and in the event of a disruption.

5. Conclusion

5.1. Key findings

The Red Sea crisis has reduced the operating capacity of some container shipping companies. Maersk and Hapag-Lloyd had longer routed and higher operating costs due to the detour around the Cape of Good Hope, but neither observed a reduction in transport volume. Financial results were also unevenly distributed; although both companies increased their EBITDA margins, the timing and size of the rise were different. The DID estimate of 6.33 percentage points shows a relative improvement in the financial condition of Maersk, but causality has not been excluded. Regression results show a statistically significant post-crisis association with EBITDA margin, but volume growth was not. Resilience also includes freight-rate exposure, cost control, network flexibility, business structure, customer communication, and environmental performance of the company. The crisis also shows the conflict between short-term stability and long-term development.

5.2. Limitations and future research directions

The defects are low generalizability, an irregular pre-post interval, a lack of short-term data, and no explanatory variables. Increase the sample size and add freight-rate index, bunker price, route exposure, and port congestion data to the research next. Maersk and Hapag-Lloyd's cases show that resilience of container shipping in a crisis includes all-weather operation, continuous operation, cost control, network adaptation, customer protection, and environmental response. Geopolitical disruption has thus changed the short-term operating environment and long-term planning goals of the company.

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