



# Measuring Maritime Disruptions

## A Route-Based Index of US Import Exposure

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### Summary:

We construct a monthly maritime pressure index that measures US import exposure to disruptions using public trade and vessel-traffic data. The index weights disruptions along shipping routes by the value of imports using those routes, showing which goods are exposed and where they enter the country. It peaked in January 2024, at about five times its 2022–23 average, as the Red Sea disruption coincided with drought restrictions at the Panama Canal. That episode exposed a broad range of nonenergy goods entering mainly through East Coast ports. The 2026 Hormuz disruption was narrower, concentrating pressure on energy imports and refining centers along the Gulf and West Coasts. Monthly updates allow policymakers to track where exposure is concentrated while a disruption unfolds.

### Key findings:

1. The Red Sea disruption produced the highest national readings and exposed a broad range of nonenergy goods entering mainly through East Coast ports.
2. The Hormuz disruption concentrated pressure on energy imports and refining centers along the Gulf and West Coasts.
3. Public trade and vessel-traffic data allow monthly monitoring of exposure across chokepoints, products, and US ports of entry.

**JEL classification:** C43, F14, R41

**Key words:** maritime shipping, chokepoints, supply-chain disruptions, imports

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## 1 Introduction

Disruptions at a handful of narrow waterways can interrupt the flow of US imports. Nearly half of the value of US goods imports, as well as most of their weight, arrives by sea, and three important waterways have been disrupted since 2023. Drought forced the Panama Canal to limit transits in 2023. Late that year, attacks on commercial ships in the Red Sea led many carriers to reroute around the Cape of Good Hope, lengthening voyages and raising freight rates. The war with Iran that began at the end of February 2026 then all but halted traffic through the Strait of Hormuz.

Disruptions like these raise the cost of delivering the goods that US firms and households buy from abroad, and they slow deliveries down. A manufacturer can be left waiting for components, or a retailer short of inventory, and the effects can reach firms that never import directly but rely on suppliers who do. How much a given disruption matters depends on which goods and routes it touches and on how much the United States spends on them.

In this article, we construct a monthly maritime pressure index that measures the exposure of US imports to these disruptions since January 2022. We start from Census data on imports by US port, partner country, and product; trace each import flow along its likely sea route to the United States; and use IMF PortWatch data to measure disruptions to vessel traffic at the chokepoints along those routes. The index weights these disruptions by the value of the imports that use each route. Because it is built up from individual flows, the index can be broken down by chokepoint, product, and US port of entry.

We measure disruptions by the value of the imports they affect following [Fuchs, Leibovici, and Wong \(2026\)](#), in which we show that the direct cost of a small shipping disruption is approximately the average proportional change in delivery costs, weighted by how much is spent on each import flow. A moderate shortfall on a route that carries a large share of US imports can therefore matter more than a severe shortfall on a route that carries little.

We have three main findings. First, the Red Sea disruption placed more pressure on US import routes than any other episode in our sample, including the Hormuz disruption (Figure 1.1). The index peaked at 38.9 points in January 2024, about five times its 2022–23 average, when the start of the Red Sea disruption coincided with drought restrictions at the Panama Canal, and it remained elevated through late 2025.

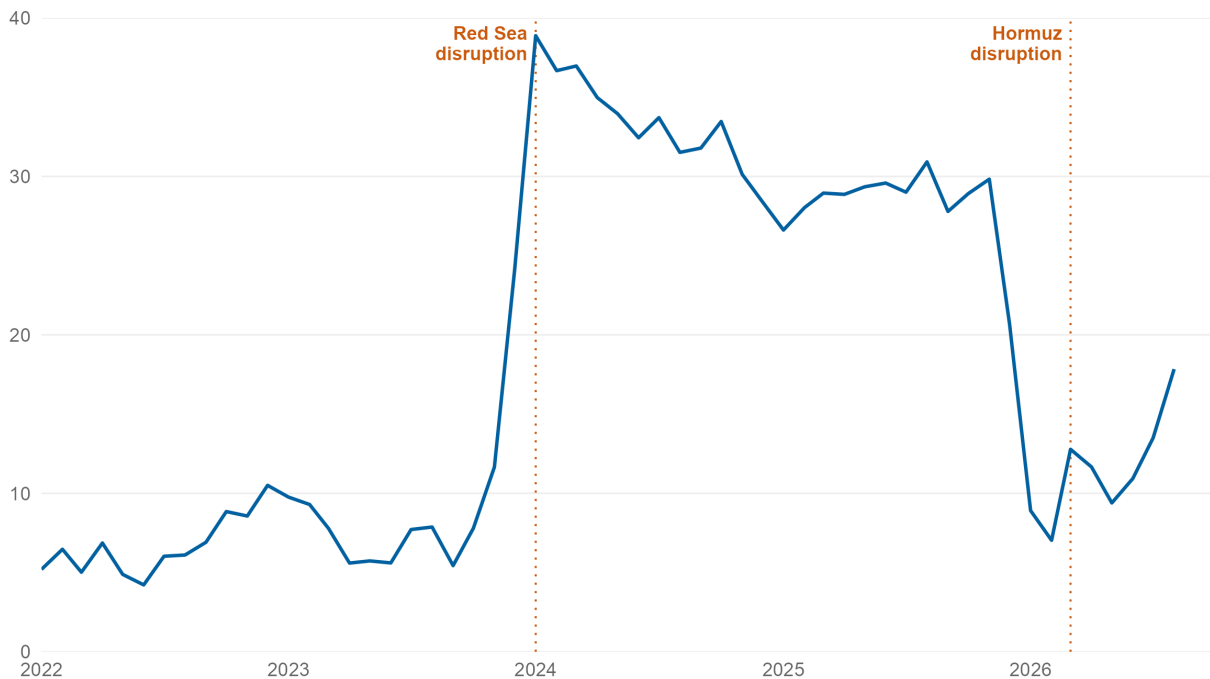
The sharp decline around the start of 2026 partly reflects a change in the traffic benchmark. We compare traffic with its typical level in the same month over the preceding three years. Once two of those years include the Red Sea disruption, that benchmark falls. The lower index reading therefore does not, by itself, show that traffic recovered to its pre-disruption level.

Second, the Red Sea disruption reached a broad range of nonenergy goods, whereas the Hormuz disruption was concentrated in energy imports. In January 2024, apparel and footwear contributed more to the index than machinery and electronics, even though they account for less than half as much maritime trade.

Third, the goods exposed to the Red Sea disruption entered the country mainly through East Coast

**National maritime pressure**

Vessel-import-weighted route shortfalls, in index points

**Figure 1.1. The national maritime pressure index**

January 2022–August 2026. Index points are 100 times the average log traffic shortfall along import routes, weighted by maritime import values in the preceding three calendar years. Dotted lines mark January 2024 and March 2026. Sources: US Census Bureau, SeaRoute, IMF PortWatch; authors’ calculations

ports, led by New York/New Jersey, Savannah, and the Port of Virginia. Los Angeles/Long Beach, which handles more maritime import value than any other US port, contributed little, because its imports cross the Pacific on routes that avoid the Red Sea. During the Hormuz disruption, pressure was concentrated on routes serving refining centers along the Gulf and West Coasts.

The index relies on public data that can be updated monthly, making it a monitoring tool. Its breakdowns identify which goods and ports are exposed while a disruption is under way, before the affected goods reach US ports. The same exposure measures can also be used to assess a hypothetical disruption at a chokepoint that has not yet been affected. The recent episodes also show that a disruption can move the national index only modestly, as the Hormuz disruption did, and still put severe pressure on particular goods and on the ports that receive them.

Section 2 presents the economic framework behind the index, Section 3 describes the data and how we build it, Sections 4 and 5 examine differences across goods and across ports, and Section 6 concludes. Appendix A provides the construction details.

## 2 Analytical Framework

One important way shipping disruptions affect the United States is by raising the cost of delivering the goods it imports. Measuring US exposure to these disruptions therefore requires a way to add

up disruptions across many goods, trading partners, and routes. This section lays out a simple framework for doing so, which guides how we build the index in Section 3.

The weighting follows the logic of price indexes. A 10 percent increase in a good’s price is more significant when that good accounts for a larger share of a household’s budget. Delivery costs work the same way. A disruption that raises the delivered price of an import flow by 1 percent matters more, the more is spent on that flow, so changes in delivery costs should be added up in proportion to spending on the affected imports.

In [Fuchs, Leibovici, and Wong \(2026\)](#), we formalize this idea in a model in which shipping services link producers to buyers. Write the delivered price of import flow  $i$  as the producer’s price times a delivery-cost factor  $\tau_i$ , and let  $s_i$  be the flow’s share of baseline import spending. For a small disruption that changes delivery costs by  $d \ln \tau_i$ , the direct delivery-cost effect on imported purchases, measured relative to import spending, is

$$\sum_i s_i d \ln \tau_i. \quad (2.1)$$

At an efficient baseline, where no one can benefit without making someone else worse off, adjustments such as rerouting or switching suppliers do not need to be counted separately. They shape how much delivery costs change, but once those changes are known, baseline spending is enough to value them.<sup>1</sup>

Our index applies this logic to what we can observe, using disruptions to vessel traffic along each import’s route in place of changes in delivery costs and Census import values in place of spending. If a given disruption to traffic raises delivery costs by the same proportion on every route, the index moves roughly in proportion to the direct cost in equation (2.1). The index captures only this delivery-cost channel. A disruption can also raise the prices that foreign producers charge, even for goods that never pass through the affected chokepoint. Oil is the leading example, since a disruption at Hormuz can raise US fuel prices through the world oil price even if the United States imports little oil through the strait.

## Related Measures and Research

The Global Supply Chain Pressure Index (GSCPI) of [Benigno et al. \(2022\)](#) combines freight costs and manufacturing surveys, adjusted for changes in demand, to summarize global supply-chain conditions. Our index links traffic shortfalls at particular chokepoints to the value of US imports using those routes, showing how exposure differs across products and ports of entry.

IMF PortWatch reports vessel activity at ports and chokepoints around the world ([International Monetary Fund and University of Oxford 2023](#)). Related models study how shipping supply and demand shape costs and aggregate activity ([Dunn and Leibovici 2024](#)), and how port bottlenecks and limited fleet capacity affect commodity prices and trade ([Brancaccio et al. 2026](#)).

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<sup>1</sup> This is the logic behind [Hulten’s \(1978\)](#) theorem and holds for small disruptions. For large ones, such as the prolonged closure of a major route, higher-order effects can matter ([Baqae and Farhi 2019](#)).

Closely related work by [Bai et al. \(2026\)](#) combines detailed vessel-tracking data with a model of US-bound shipping to explain how disruptions spread through the economy. Their analysis shows how shipping-capacity constraints and congestion, together with retailers' sourcing, sales, and entry decisions, can amplify the effects of a disruption. In their model, congestion and market power make reallocation matter for welfare at first order, so route spending weights alone do not measure the full welfare effect. We complement their analysis by using publicly available data to construct an index of exposure to maritime chokepoints across US ports and product categories.

An empirical literature documents why this exposure is costly, estimating that each additional day in transit is equivalent to an ad valorem tariff of 0.6 to 2.1 percent ([Hummels and Schaur 2013](#)), that higher shipping costs pass through to consumer prices ([Carrière-Swallow et al. 2023](#)), and that shortages and delivery delays are associated with higher retail prices ([Cavallo and Kryvtsov 2023](#); [Baslandze and Fuchs 2026](#)).

### 3 Data and Index Construction

Building the index requires three pieces of data, drawn from the sources listed in Table 3.1: the value of each import flow, the route it travels, and conditions along that route. The series covers January 2022–August 2026, the last complete month of PortWatch data available on October 1. To make the steps concrete, we follow a single flow through the construction of the index, cotton shirts from India that enter the United States through the Port of Savannah.

**Table 3.1. Data used to construct the index**

| Source        | Information                                    | Role                                  |
|---------------|------------------------------------------------|---------------------------------------|
| US Census     | Imports by US port, partner, product, and mode | Value of each import flow             |
| SeaRoute      | Sea routes between foreign and US ports        | Chokepoints along each route          |
| IMF PortWatch | Daily vessel traffic at ports and chokepoints  | Loading ports and traffic disruptions |

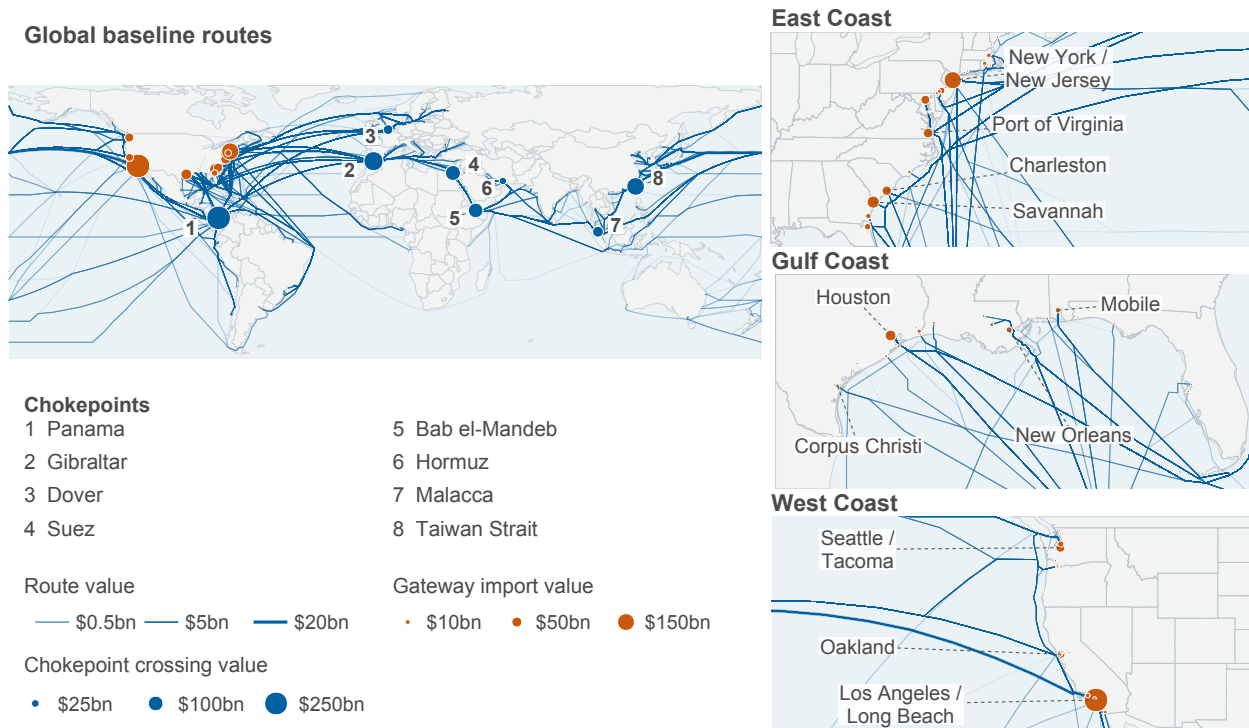
#### Import Exposure and Routes

Census import records report, for each US port, partner country, and six-digit Harmonized System (HS6) product, the customs value of imports and how they were shipped ([U.S. Census Bureau n.d.](#)). We keep goods that arrive by vessel, which accounted for 44.8 percent of the value of US imports in 2019. An observation is a trade flow that might bundle many shipments; our shirts are one such flow. Census also reports how much of each flow arrived in containers, as apparel typically does, and we treat the containerized part and the rest as separate flows.

Each flow counts in proportion to its average import value over the preceding three calendar years, which we update once a year. The index for 2024 uses average values for 2021–23, for example, and the index for 2026 uses 2023–25. Updating keeps the index in step with US sourcing, which has shifted considerably since 2019, and averaging over three years smooths out year-to-year noise. These values come from past years and are fixed within the year, so a disruption cannot immediately shrink its own importance in the index by cutting the flow of goods.

Census does not record the foreign port where goods are loaded. We therefore allocate each

partner's shipments to the United States across its ports in proportion to their 2019 export activity for the relevant vessel class, as measured by PortWatch. India's container trade, for instance, is spread across several Indian ports, including Nhava Sheva, near Mumbai. We then trace the route from each foreign port to the US port of entry using SeaRoute, an open-source tool from Eurostat that computes the shortest path by sea between two ports along a global network of shipping lanes (Eurostat 2026). The route tells us which chokepoints a shipment would cross on its way to the United States.<sup>2</sup> The path from Nhava Sheva to Savannah crosses three of the chokepoints we monitor: Bab el-Mandeb, Suez, and Gibraltar.



**Figure 3.1. Baseline routes locate US import exposure**

2019 baseline. Routes shown cover at least 90 percent of maritime import value for which a route can be assigned. The global map marks the 12 largest US ports of entry; coastal panels enlarge each coast and label selected ports. Line widths increase with import value. Orange circle areas show the value of imports with assigned routes into each port, on a common scale across panels; blue circle areas show import value crossing each chokepoint, on a separate scale. A flow can cross several chokepoints. Sources: US Census Bureau, SeaRoute, IMF PortWatch; authors' calculations.

Figure 3.1 maps the resulting network of likely routes, which actual voyages need not follow exactly. Line widths increase with the value of US imports carried on each route in 2019, and circles show the value of US imports crossing each chokepoint. US-bound trade is spread very unevenly across chokepoints. The Panama Canal carries the most, followed by Gibraltar, and Hormuz the least. A major corridor runs from Asia and the Middle East to the East Coast through Bab el-Mandeb, Suez, and Gibraltar. Much of the trade that crosses the Pacific to the West Coast

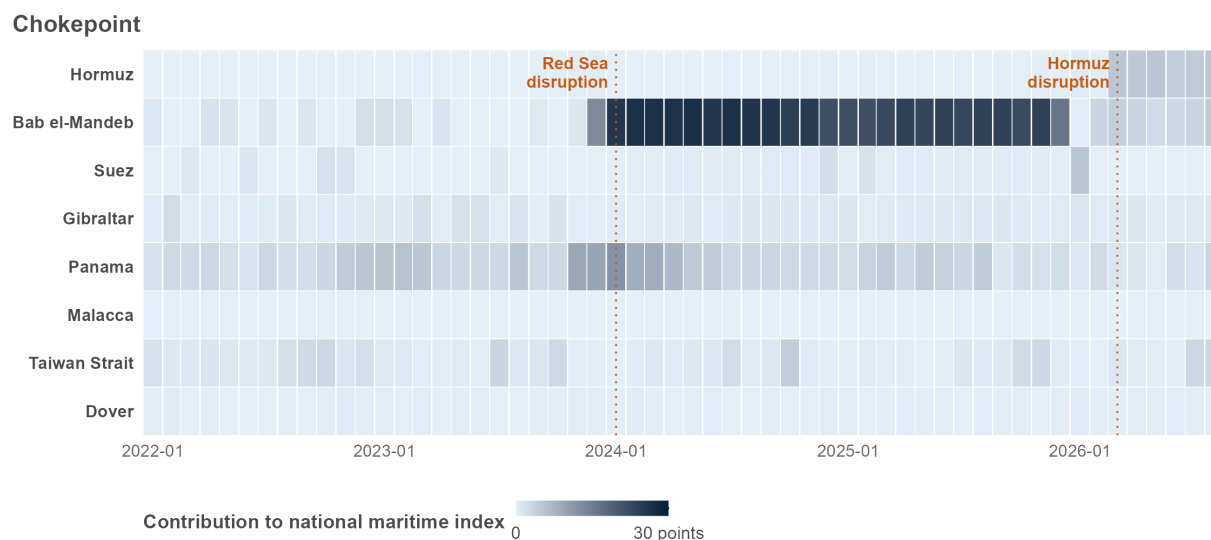
<sup>2</sup> We use SeaRoute's five-kilometer network and exclude Arctic passages.

passes no chokepoint at all, and in the 2019 baseline only about half of maritime import value was assigned to routes crossing at least one.

Unlike the import values, which we update every year, the routes do not change over time. They are the shortest sea paths between ports, with foreign ports assigned using 2019 data. If routes instead followed where ships actually sail, trade that avoided the Red Sea by going around the Cape of Good Hope would have been reassigned to a route that crosses no disrupted chokepoint, and the index would have registered little pressure just when the disruption was most severe. Holding routes fixed keeps that trade counted as exposed, which we think appropriate because rerouting is itself a costly response to the disruption.

## Measuring Disruptions

We monitor eight chokepoints: Bab el-Mandeb, Dover, Gibraltar, Hormuz, Malacca, Panama, Suez, and the Taiwan Strait. We measure traffic separately for container ships and other vessels and match each flow to its Census shipping class, so that a drop in noncontainer traffic does not register as pressure on containerized goods. Other vessels include tankers, dry-bulk carriers, general-cargo ships, and roll-on/roll-off vessels. At each chokepoint, we compare daily traffic with its normal level for that time of year, defined as the typical level in the same calendar month over the preceding three years. The daily shortfall is the log of normal traffic relative to actual traffic when traffic is below normal, and zero otherwise. The monthly shortfall is the average of these daily values. Appendix A explains the capacity measures and the cap used when traffic nearly stops.



**Figure 3.2. Chokepoint contributions to maritime pressure**

January 2022–August 2026. Shading shows each chokepoint’s monthly contribution to the national index, in points. A route’s pressure is attributed to its most disrupted chokepoint. Sources: US Census Bureau, SeaRoute, IMF PortWatch; authors’ calculations

A route’s pressure is the largest monthly shortfall among the chokepoints it crosses. We use the maximum rather than the sum because a single interruption often shows up at several

chokepoints on the same route. When ships avoid the Red Sea, for example, traffic falls at both Bab el-Mandeb and Suez, and adding the two would count the same interruption twice. For our shirts, which travel in containers, route pressure in a given month is the largest of the shortfalls in container traffic at Bab el-Mandeb, Suez, and Gibraltar.

Figure 3.2 breaks the index down by chokepoint, with chokepoints in rows and months in columns. The shading shows each chokepoint's contribution to the national index; each route is assigned to the chokepoint where its shortfall was largest that month. Bab el-Mandeb accounts for most of the pressure from January 2024 through late 2025. Panama, where drought restrictions limited transits at the time, accounts for most of the November 2023 reading and 30.8 percent of the January 2024 reading. The January peak thus reflects two disruptions at once. Hormuz accounts for 40.9 percent of the March 2026 reading. Because each route is assigned to a single chokepoint, the Suez row stays pale during the Red Sea episode even though traffic through Suez fell: on routes that cross both chokepoints, the shortfall at Bab el-Mandeb was larger.

### From Route Pressure to the Index

The last step aggregates over import flows, first averaging pressure across each flow's routes using its route shares and then averaging across flows using their shares of maritime import value. If  $P_{it}$  is the pressure assigned to flow  $i$  in month  $t$  and  $w_{i,y(t)}$  is its share of maritime import value over the preceding three calendar years for reporting year  $y(t)$ <sup>3</sup>, the index is

$$I_t = 100 \sum_i w_{i,y(t)} P_{it}. \quad (3.1)$$

The factor of 100 expresses the index in points, and equation (3.1) is the empirical counterpart of equation (2.1) in Section 2.

To see the scale, suppose routes like the one carrying our shirts account for 10 percent of maritime import value, and traffic at their most disrupted chokepoint runs at 90.5 percent of normal throughout the month. The log shortfall is then about 0.1, and these routes contribute  $100 \times 0.10 \times 0.1 = 1$  point to the index. If twice as much trade used those routes, their contribution would double even though conditions along them were the same.

This example gives the index its natural interpretation. The index combines the severity of a disruption with the importance of the affected routes in the US import basket. A given traffic shortfall contributes more when it affects routes carrying a larger share of US imports, and less when it affects routes carrying little trade. Because the same calculation can be performed separately by product and by port of entry, the index also traces which parts of the import basket account for the pressure generated by a disruption.

The index therefore measures exposure rather than realized import losses. Its import weights are determined from trade observed before the current year, while disruptions are recorded at

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<sup>3</sup> These shares use all maritime imports, including flows for which no route is assigned and routes that cross no monitored chokepoint.

chokepoints when they occur. As a result, the index can register pressure on the goods in the US import basket before those goods complete their voyages to the United States.

## 4 Differences across Goods

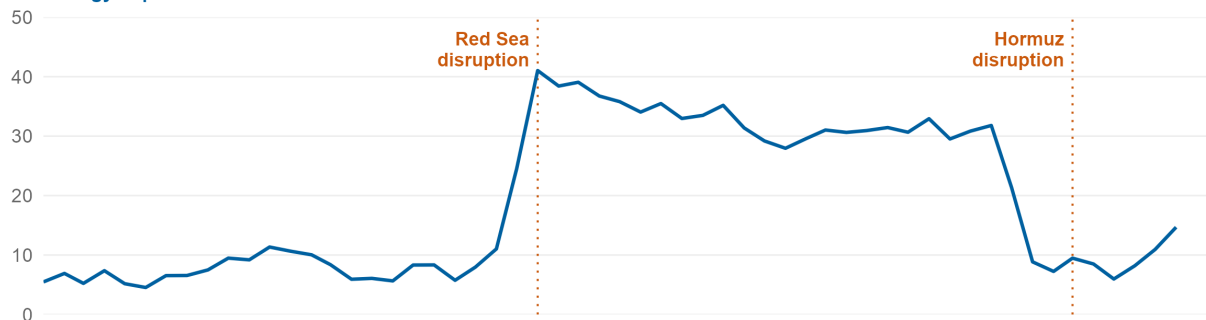
The location of a disruption determines which goods it affects, because different goods travel on different parts of the shipping network. Energy is the clearest case, since crude oil and refined products move on tankers, often along routes that container ships do not use.

Figure 4.1 compares the index for energy imports (chapter 27 of the Harmonized System product classification) with the index for all other imports. Each series is computed within the group’s own maritime imports and thus measures how severe conditions were for that group.

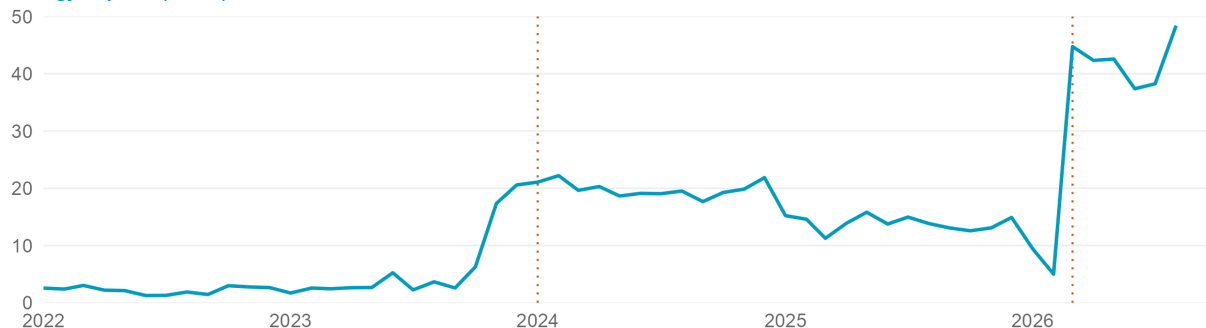
Maritime pressure on nonenergy imports rose more than fivefold between October 2023 and January 2024 and remained elevated through late 2025. Maritime pressure on energy imports also rose during the Red Sea episode, but its largest increase came in March 2026, when it rose about ninefold in a single month, and it has remained near that level since. By then, pressure on nonenergy imports had fallen to about a quarter of its January 2024 level, partly reflecting the lower traffic benchmark discussed in Section 1.

### National within-group maritime pressure index

#### Nonenergy imports



#### Energy imports (HS 27)



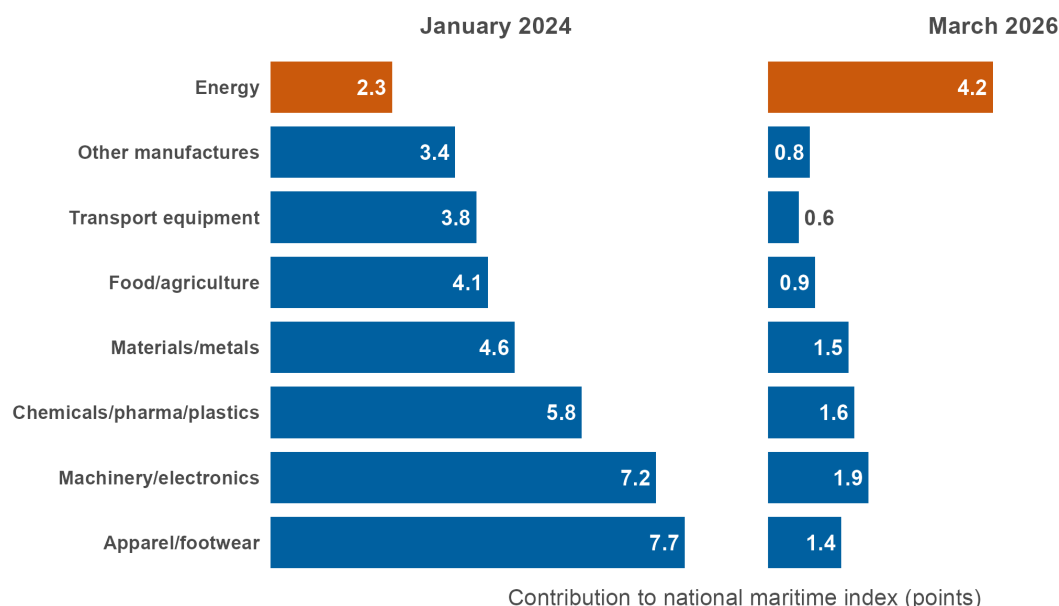
**Figure 4.1. Maritime pressure on energy and nonenergy imports**

January 2022–August 2026. Each series averages log traffic shortfalls along routes using its own group’s maritime import values over the preceding three calendar years as weights and expresses the result in index points. The panels share a scale. Dotted lines mark January 2024 and March 2026. Sources: US Census Bureau, SeaRoute, IMF PortWatch; authors’ calculations

Figure 4.1 shows how severe conditions were for energy and nonenergy imports, but how much a group of goods matters for the national index also depends on its share of maritime trade.

Figure 4.2 combines the two by breaking the national index into the contributions of eight product groups in January 2024 and March 2026, with each bar measured in points of the national index.

In January 2024, contributions were spread across many groups. Apparel and footwear contributed the most, 7.7 points, closely followed by machinery and electronics at 7.2 points. Machinery and electronics account for more than twice as much maritime trade in that year's basket, but route pressure on apparel and footwear was more than twice as severe. Chemicals, food, transport equipment, and materials also made substantial contributions.



**Figure 4.2. Product contributions to national maritime pressure, January 2024 and March 2026**

Each bar shows a product group's contribution in national index points, weighted by its share of maritime import value over the preceding three calendar years. Sources: US Census Bureau, SeaRoute, IMF PortWatch; authors' calculations

In March 2026, energy was by far the largest contributor, at 4.2 points, while no other group contributed more than 2 points. Energy accounted for 32.8 percent of the March reading, compared with 5.8 percent in January 2024, even though it makes up only 9.4 percent of the 2026 maritime import basket. The national reading was nonetheless much lower than in January 2024. Hormuz carries relatively little US-bound trade in the baseline network (Figure 3.1), so even severe pressure there adds relatively few points, and by March 2026 the contributions of Bab el-Mandeb and Panama had fallen well below their January 2024 levels (Figure 3.2). For Bab el-Mandeb, this comparison includes the decline in its traffic benchmark.

## 5 Differences across US Ports

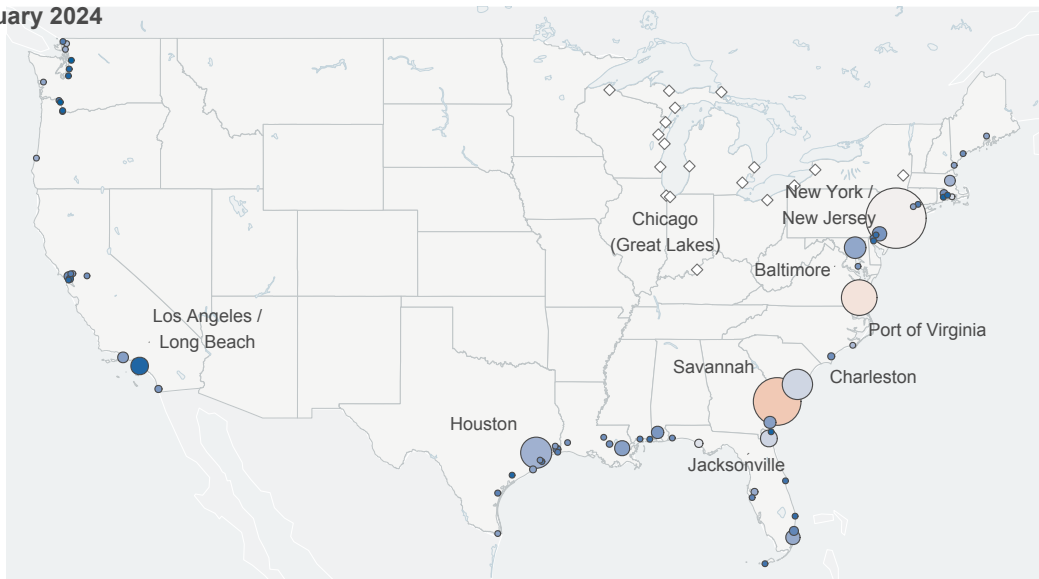
Exposure also differs across the US ports through which imports enter the country. Figure 5.1 groups maritime pressure by port of entry. Circular areas represent ports' contributions to the

national index; color represents average pressure on each port's assigned routes. A small port can face severe pressure and still contribute little, because few imports are exposed. These measures describe pressure on the routes into each port, not congestion at the port itself, and they do not show where the goods are ultimately used, since goods entering Savannah, for example, serve buyers well beyond Georgia.

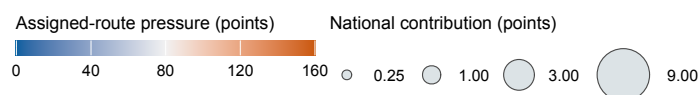
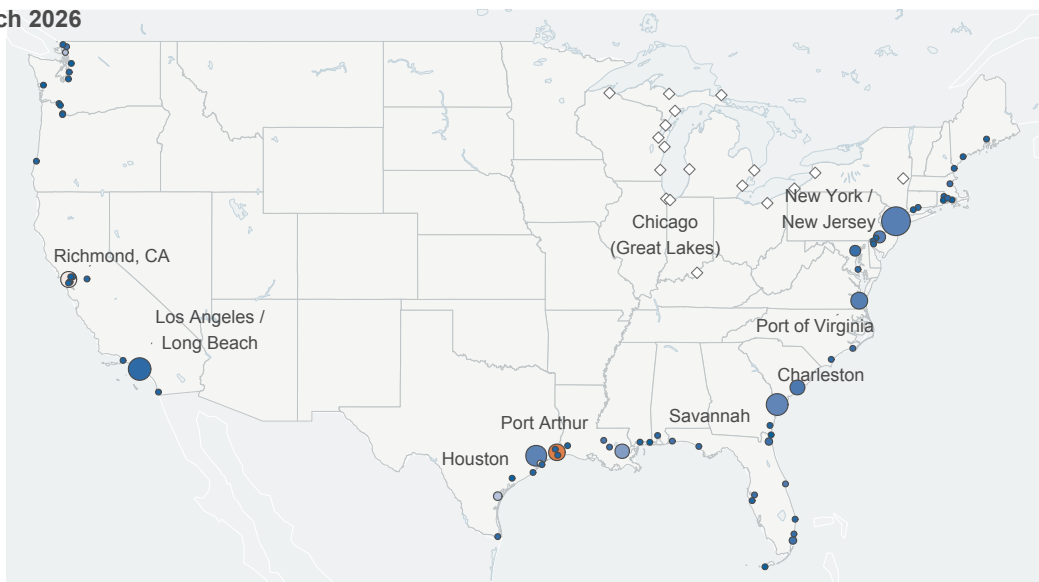
In January 2024, the largest contributions came from the East Coast. New York/New Jersey contributed the most, followed by Savannah and the Port of Virginia, each combining large import values with substantial pressure on routes through the Red Sea and the Panama Canal. Los Angeles/Long Beach—the largest US port of entry for maritime imports—contributed much less, because its imports arrive mostly across the Pacific on routes that avoid the chokepoints disrupted that month.

By March 2026, the East Coast circles had shrunk considerably. Maritime pressure was instead disproportionately high on routes serving refining centers along the Gulf and West Coasts, such as Port Arthur, Texas, and Richmond, California, consistent with the concentration of the Hormuz disruption in energy imports. These ports had some of the darkest markers, and their contributions were large relative to the imports they receive, although still smaller than those of New York/New Jersey and Los Angeles/Long Beach, which faced much less pressure but receive far more imports.

**A. January 2024**



**B. March 2026**



**Figure 5.1. Maritime pressure by US port of entry, January 2024 and March 2026**

Circular areas show contributions to the national index using maritime import values over the preceding three calendar years. Small positive contributions share a minimum circle size; gray crosses mark zero contributions. Color shows average pressure on the routes assigned to each port, in index points. Both months share area and color scales. Gray diamonds mark 18 Great Lakes and inland ports; eight noncontiguous ports lie outside the map. Sources: US Census Bureau, SeaRoute, IMF PortWatch; geography: Census and Natural Earth

## 6 Concluding Remarks

We have constructed a monthly index of the exposure of US imports to maritime disruptions. Built from public data, the index measures each disruption by the value of the imports it affects, and it can be broken down by chokepoint, product, and port of entry. These breakdowns show how different the two recent episodes were.

The Red Sea disruption, compounded in late 2023 and early 2024 by drought restrictions at the Panama Canal, produced the highest readings in our sample and affected many kinds of nonenergy goods, which entered mainly through East Coast ports. The Hormuz disruption of 2026 was narrower, falling disproportionately on energy imports and the refining centers that receive them.

Because the index relies only on public data, it can be updated every month to show, while a disruption is still unfolding, which US imports are exposed and where they enter the country. More broadly, the same approach can be applied to any country with similarly detailed import data, since the traffic data and shipping routes it relies on are global.

For policymakers, the index is best viewed as an early-warning and diagnostic tool. A rise in the national index indicates that an ongoing maritime disruption is affecting economically important US import routes; the product, port, and chokepoint decompositions then show where that pressure is concentrated. These breakdowns can be used to identify goods and gateways that warrant closer monitoring, distinguish broad disruptions from severe but narrowly concentrated ones, and assess which parts of the US import network would be most exposed to a potential disruption before it occurs. The index is therefore not a measure of imports lost or of welfare costs, but a way to translate real-time changes in maritime traffic into a systematic measure of where US supply-chain exposure is building.

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## A Construction Details

*Data.* The index covers January 2022–August 2026. Import weights come from monthly Census files of imports by US port, partner country, and HS6 product for 2019–25 ([U.S. Census Bureau n.d.](#)). Foreign loading ports are assigned using 2019 PortWatch export activity ([International Monetary Fund and University of Oxford 2023](#)), and routes are computed on SeaRoute’s 5-kilometer network, excluding Arctic passages ([Eurostat 2026](#)).

*Weights and routes.* A flow  $i$  is a US port, partner country, HS6 product, and vessel class (containerized or other). Its weight  $\bar{V}_{iy}$  is its average annual customs value over the three calendar years before reporting year  $y$ , counting years with no imports as zero. Route shares are fixed at their 2019 values and pooled across products within each US-port–partner–vessel-class group  $g$ , so products first imported after 2019 inherit their group’s route mix. We write  $\pi_{gr}^{2019}$  for the share of group  $g$ ’s total 2019 maritime import value assigned to routes crossing the set of chokepoints  $r$ . Incomplete or unavailable 2019 route assignments leave 4.5 to 5.6 percent of the basket unassigned, depending on the year. This trade stays in the denominator and contributes zero pressure.

*Index.* Let  $h_{bvt}$  be the monthly shortfall at chokepoint  $b$  for vessel class  $v$ , and let  $q_{rvt}$  be the largest  $h_{bvt}$  among the chokepoints in  $r$ , with  $q_{rvt} = 0$  for routes that cross no monitored chokepoint. With  $g(i)$  and  $v(i)$  denoting flow  $i$ ’s routing group and vessel class, and  $y(t)$  the reporting year of month  $t$ , the index is

$$I_t = 100 \frac{\sum_i \bar{V}_{i,y(t)} \sum_r \pi_{g(i)r}^{2019} q_{r,v(i),t}}{\sum_i \bar{V}_{i,y(t)}}. \quad (\text{A.1})$$

Chokepoint contributions assign each route’s pressure to the chokepoint with the largest shortfall; product and port contributions restrict the numerator to the relevant flows. Each decomposition keeps the national denominator, so its contributions sum to  $I_t$ . The energy and nonenergy series in Figure 4.1 instead divide by each group’s own maritime imports, and the colors in Figure 5.1 divide by the value of imports assigned to routes into each port.

*Shortfalls.* Traffic is PortWatch transit capacity for container ships and other vessels, with vessel counts used where capacity is missing. Normal traffic is the median of the preceding three years’ median daily traffic in the same calendar month. Below normal, the daily shortfall is the log of normal divided by actual traffic; otherwise it is zero. Traffic at or below 4 percent of normal receives the maximum shortfall,  $\ln 25 \approx 3.2$ . Monthly shortfalls average the daily values.

*Interpretation.* The weights in equation (2.1) are shares of spending at delivered prices. Census customs values exclude international freight and insurance, so they approximate these shares when freight and insurance are a similar fraction of value across flows. Relating the index to this delivery-cost effect requires a common conversion from traffic shortfalls to cost changes. We do not estimate that conversion, so the index is in traffic-shortfall units.