ENERGY ECONOMICS

# Geopolitical Arbitrage and Refining Resilience: How the 2026 Iran War Reshaped India's Role in the Global Petroleum Market

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**Abstract**

This study examines how the 2026 Iran War affected India's position in the global petroleum market, with particular emphasis on crude-supply diversification, refining resilience and petroleum-product exports. Using monthly data for January 2019–June 2026 and financial-market observations around the 28 February 2026 outbreak, the study investigates whether India's substantial refining capacity enabled it to convert part of the geopolitical oil shock into an economic and trade opportunity. The analysis employs descriptive statistics, Augmented Dickey–Fuller tests, interrupted time-series regression, a geopolitical-arbitrage regression and a monthly event study of the Nifty and Sensex. The findings indicate a substantial increase in crude-oil prices and crude-import expenditure after the outbreak, while physical crude imports and refinery throughput remained comparatively resilient. Evidence also indicates a shift in crude sourcing towards Russia within the selected supplier group. However, the interrupted time-series results do not establish a statistically significant sustained increase in petroleum-product exports during the short March–June 2026 post-war period. The geopolitical-arbitrage regression produces a positive and statistically significant relationship between refinery throughput and petroleum-product exports, while the throughput–war interaction is also positive and significant. Nevertheless, the very short post-war sample and limited model fit require cautious interpretation. The financial-market analysis records substantial negative abnormal returns in both the Nifty and Sensex, with cumulative abnormal returns remaining negative through June 2026. Overall, the evidence points to refining resilience and an emerging, but not yet conclusively established, geopolitical-arbitrage opportunity for India.

**Keywords:** 2026 Iran War; crude oil imports; event study; financial markets; geopolitical arbitrage; global petroleum market; India; interrupted time-series; oil price shock; petroleum-product exports; refining resilience; supplier diversification

## 1 Introduction

The international petroleum market is highly sensitive to geopolitical disturbances because crude oil is a globally traded commodity whose production, transportation and pricing are closely interconnected across countries and regions. Armed conflicts involving major oil-producing or strategically located countries can therefore generate disruptions that extend well beyond the immediate geographical area of the conflict. Such disruptions may affect crude-oil prices, shipping routes, insurance costs, availability of supplies, exchange rates, inflation and international trade. For oil-importing economies, these developments generally represent a significant external shock because higher crude prices increase the cost of energy imports and can place pressure on the trade balance, domestic prices and the exchange rate.

The 2026 Iran War provides a particularly important setting for examining these effects in the case of India. The conflict, treated in this study as beginning on 28 February 2026, occurred in an international petroleum market in which India occupied a distinctive position. India is a major crude-oil importing economy, but at the same time possesses substantial refining capacity and has developed an important role in the international trade of refined petroleum products. This combination creates a potentially important distinction between the impact of a crude-oil shock on an importing economy and the ability of a country with significant downstream capacity to respond to disruption in international petroleum markets.

The conventional analysis of an oil-price shock would emphasize the adverse consequences for an importing country. An increase in international crude prices raises the value of crude imports, increases production and transportation costs and may contribute to inflationary and exchange-rate pressures. The present study, however, examines an additional dimension. When international petroleum markets are disrupted, shortages or price differentials may simultaneously create commercial opportunities for countries possessing sufficient refining capacity, access to alternative crude supplies and the ability to export refined products. A country may consequently experience both a cost effect through more expensive crude imports and an opportunity effect through downstream refining and petroleum-product exports.

This study refers to this possible mechanism as "geopolitical arbitrage." The concept does not imply that India deliberately caused or benefited from the geopolitical conflict. Rather, it refers to the possibility that an economy can use its existing industrial and trading capabilities to capture part of the value created by disruption in international markets. In India's case, the proposed mechanism operates through a sequence in which an external geopolitical shock affects crude prices and supply conditions, Indian refiners adjust their sources of crude, refinery operations remain resilient, and refined petroleum products can subsequently be supplied to international markets facing shortages or altered trade flows. The central analytical sequence of the study is therefore:

Iran War → crude-price/supply shock → supplier substitution → refinery response → petroleum-product exports → trade and macroeconomic effects.

The importance of this mechanism lies in the structure of India's petroleum value chain. India is simultaneously dependent on imported crude oil and equipped with substantial domestic refining capacity. Consequently, the economic consequences of an international oil shock cannot be assessed solely by examining crude-oil import quantities or import expenditure. It is also necessary to examine whether refiners were able to maintain throughput despite the shock, whether the composition of crude suppliers changed, and whether downstream petroleum-product exports responded to changing international market conditions.

The study accordingly investigates the 2026 Iran War using monthly data from January 2019 to June 2026, supplemented by daily financial-market data where available. The long pre-war period provides a basis for identifying the underlying behaviour of the principal petroleum and macroeconomic variables, while March–June 2026 represents the initial post-war period. The analysis covers Indian crude-oil prices and imports, country-wise crude sourcing, refinery throughput, petroleum-product exports and consumption, together with exchange-rate, inflation, trade and financial-market indicators. The paper therefore examines the petroleum sector within a broader macroeconomic and financial framework rather than treating refining and exports in isolation.

Three complementary empirical approaches are employed. First, an interrupted time-series analysis examines whether the outbreak of the war was associated with changes in the level or trajectory of

major petroleum and macroeconomic variables. Second, a geopolitical-arbitrage regression investigates the relationship between refinery throughput and petroleum-product exports and tests whether this relationship became stronger during the post-war period. Third, a monthly event study examines the response of India's Nifty and Sensex to the conflict. An Augmented Dickey–Fuller test is also used to establish the time-series properties of the variables and to guide the treatment of non-stationarity in the econometric analysis.

The study's central research question is therefore whether India's refining capacity and ability to substitute crude-oil suppliers enabled the country to transform part of the adverse 2026 Iran-War oil shock into an opportunity for increased petroleum-product exports and greater participation in the global petroleum market. The question is deliberately framed as an empirical proposition rather than an assumption. The study does not presume that the war necessarily increased India's petroleum-product exports; instead, it tests whether the available evidence supports such an adaptation mechanism.

This distinction is particularly important because the post-war observation period presently available is short. The empirical analysis therefore differentiates between refining resilience, meaning the ability to maintain petroleum-processing activity despite the geopolitical shock, and geopolitical arbitrage, meaning the stronger possibility that this resilience translated into increased downstream export opportunities. The distinction prevents a temporary movement in petroleum-product exports from being interpreted automatically as a causal consequence of the war.

The study consequently seeks to contribute to literature by shifting attention from the conventional question of how geopolitical oil shocks impose costs on importing economies to the less-examined question of how countries with substantial downstream industrial capacity may adapt to, and potentially capture value from, such disruptions. In this perspective, refining capacity is not merely a means of meeting domestic petroleum demand; it can also function as a strategic economic asset that allows an oil-importing country to participate more actively in international petroleum trade during periods of geopolitical disruption.

The remainder of the study is organized accordingly. The next section reviews the relevant literature and identifies the research gap. The subsequent section presents the research objectives, followed by the data and methodology. The empirical section then examines descriptive patterns, stationarity, interrupted time-series results, the geopolitical-arbitrage relationship and financial-market responses. The final section draws together the findings and discusses their implications for India's petroleum strategy, trade position and broader economic resilience in an increasingly uncertain geopolitical environment.

## 2 Literature review

The literature on geopolitical oil shocks has largely examined how disruptions in crude supply affect international oil prices, inflation, output, trade balances and financial markets. Kilian (2009) shows that oil-price movements are not a homogeneous shock: supply disruptions, global demand shocks and oil-specific demand shocks have different macroeconomic consequences. Hamilton (2009) similarly demonstrates that major oil-price disturbances can transmit into real economic activity through higher energy costs and weaker demand. This literature provides the conventional starting point for the present study—geopolitical conflict raises petroleum costs and uncertainty—but it gives less attention to how a large refining economy can adapt by changing suppliers and processing diverse crude streams.

Energy-security research adds a second dimension. Leiby (2007) argues that reducing oil-import exposure has economic value because it lowers vulnerability to supply disruptions and price spikes. Resilience, therefore, is not simply the availability of crude in physical terms; it also depends on an economy's ability to adjust procurement and absorb external shocks. This distinction is important for India because the present evidence shows a substantial increase in crude-import expenditure without a comparable collapse in physical imports. The study consequently treats supplier substitution as an adaptive response rather than assuming that geopolitical disruption necessarily produces physical scarcity.

A related strand considers diversification as a means of reducing external vulnerability. In petroleum markets, diversification may occur through source countries, crude grades, shipping routes and commercial arrangements. The present study extends this idea from energy security to the petroleum value chain. It asks whether diversification, combined with substantial domestic refining capacity, allows an importing country to capture value when refined-product markets become temporarily tight. This is the basis for the paper's concept of "geopolitical arbitrage." The term is used more narrowly than financial arbitrage: it denotes the ability to reallocate crude procurement, maintain downstream processing and redirect refined products toward markets affected by disruption.

The downstream refining dimension is central to this argument. An economy with limited refining capacity may have to absorb higher crude costs or import refined products, whereas a country with large and flexible refineries can convert imported crude into tradable products and potentially respond to regional shortages. Refinery throughput is therefore used as an indicator of resilience, while petroleum-product exports provide the observable outcome of the proposed mechanism. The hypothesis is not that every geopolitical shock creates an export boom; rather, it is that refining capacity can provide an adjustment channel through which an oil-importing economy may convert disruption into a downstream trade opportunity.

The financial-market literature supplies another observable channel. MacKinlay (1997) establishes the event-study framework for identifying abnormal security-price movements around economically important events. Kilian and Park (2009) further show that stock-market responses to oil-price movements depend on the underlying source of the oil shock. This distinction matters because the present study treats 28 February 2026 as a geopolitical intervention rather than as an unexplained oil-price movement. Nifty and Sensex returns are therefore examined around the event, while recognizing that monthly data cannot isolate the precise market reaction on the event date from other contemporaneous influences.

Econometric literature also supports the study design. Dickey and Fuller (1979) provide the foundation for testing unit roots in time-series data. This is particularly relevant to the present monthly series because crude prices, refinery throughput, petroleum exports, exchange rates and trade variables may contain persistent trends. The study's ADF results show that most principal variables are non-stationary in levels but stationary after first differencing, supporting appropriate treatment of non-stationarity before intervention and regression analysis.

For intervention analysis et al. (2017) show that interrupted time-series regression can identify changes in both the level and trajectory of a series following a clearly dated intervention, while stressing autocorrelation, seasonality and time-varying confounding as important considerations. This approach fits the present study because the Iran War has a defined intervention date and March 2026 is treated as the first complete post-war month. The ITS specification consequently separates

an immediate intervention effect from the subsequent post-war trajectory and controls for international Brent-price movements.

Taken together, the literature contains three established strands—oil-shock transmission, energy-security/diversification, and event-study/intervention econometrics—but gives comparatively limited attention to their interaction at the downstream level of a large emerging-market refiner. Existing oil-shock studies generally portray the importing economy as the recipient of an external shock. The present study instead tests whether refining capacity can transform the response: supplier substitution → refining resilience → petroleum-product exports → greater participation in value created by disrupted international markets.

The empirical evidence reported in this paper calls for a cautious interpretation. The ITS results show strong transmission into crude prices, the exchange rate and fuel-related prices, but do not establish a statistically significant post-war export boom. Refinery throughput remained comparatively resilient. The exploratory geopolitical-arbitrage regression finds a positive and significant refinery-throughput coefficient and a positive, highly significant throughput×war interaction, suggesting a stronger refining-export association in the initial post-war observations. However, the post-war window is very short and only three observations have both throughput and export data. The findings therefore constitute preliminary evidence of a potentially novel mechanism rather than definitive causal proof. The principal contribution of the study is consequently the formulation and initial testing of "geopolitical arbitrage through refining resilience," which can be reassessed as a longer post-war series becomes available.

## 3 Research objectives

### 3.1 Broad objective

The broad objective of the study is to examine how the 2026 Iran War reshaped India's position in the global petroleum market, with particular emphasis on whether India's crude-supply diversification, refining capacity and petroleum-product exports enabled it to convert part of the geopolitical oil shock into an economic and trade opportunity.

### 3.2 Specific objectives

The study seeks to:

1. Assess the impact of the Iran War on India's crude-oil procurement, including changes in crude prices, import quantities and import expenditure.
2. Examine changes in India's crude-supply structure and determine whether Indian refiners responded to the conflict through supplier substitution and diversification, particularly among Russia, Iraq, Saudi Arabia, the United Arab Emirates and the United States.
3. Assess the resilience of India's refining sector by examining whether refinery throughput changed significantly following the outbreak of the war compared with its pre-war trajectory.
4. Determine whether the geopolitical disruption increased India's petroleum-product exports, thereby strengthening India's role as a supplier to international markets experiencing petroleum shortages.
5. Examine the relationship between crude-supplier substitution, refinery throughput and petroleum-product exports to establish whether India's downstream refining capacity provided an effective mechanism for adapting to the geopolitical shock.

6. Assess whether increased petroleum-product exports partly offset the adverse effect of higher crude-import costs, thereby producing a dual effect of the war on India's petroleum trade.
7. Determine whether the Iran War altered India's position in the international petroleum value chain, from being primarily a crude-oil importing economy to becoming an increasingly important refining and redistribution hub.
8. Evaluate the broader economic implications of this adjustment through its effects on India's trade position, exchange rate and selected inflation and financial-market indicators.

### 3.3 Central research objective

The objectives converge on the central question:

Did India's refining capacity and ability to substitute crude-oil suppliers enable the country to transform part of the adverse 2026 Iran War oil shock into an opportunity for increased petroleum-product exports and greater participation in the global petroleum market?

The study consequently moves beyond the conventional assessment of the cost of a geopolitical oil shock and investigates the less-explored possibility of "geopolitical arbitrage"—whereby a country uses supply diversification, refining capacity and international trade to capture value created by disruption in global petroleum markets.

## 4 Data and methodology

### 4.1 Data

The study uses monthly and daily data to examine the impact of the 2026 Iran War on India's petroleum sector and broader economic conditions. The monthly dataset covers the period January 2019 to June 2026, providing a sufficiently long pre-war period to establish underlying trends and a post-war period to identify the initial effects of the conflict. The war is treated as an external geopolitical shock beginning 28 February 2026.

Data on India's crude-oil imports, country-wise crude imports, petroleum-product exports, petroleum consumption and refinery throughput are obtained from authentic official sources, including the Government of India's petroleum and trade databases. International crude-price data are obtained from recognized international sources. CPI, WPI, exchange-rate, trade and financial-market data are obtained from official Indian sources. Daily data on the Nifty, Sensex and INR/USD exchange rate are used for the event-study analysis.

The principal variables are grouped into four categories: (i) geopolitical and international oil-market variables; (ii) crude-import and supplier-diversification variables; (iii) refinery and petroleum-product export variables; and (iv) macroeconomic and financial-market variables.

### 4.2 Methodology

The study employs three complementary empirical approaches.

First, an event-study approach is used to identify the immediate financial-market response to the outbreak of the Iran War on 28 February 2026. Changes in the Nifty, Sensex and INR/USD exchange rate around the event date are examined to determine whether the conflict generated abnormal movements in India's financial markets.

Second, an interrupted time-series analysis is employed using monthly observations. The pre-war period is used to establish the underlying trend, while the post-war period is examined for changes in the level and trajectory of crude imports, import costs, refinery throughput and petroleum-product exports. The analysis distinguishes the immediate effect from the subsequent adjustment.

Third, a petroleum-value-chain analysis is undertaken to examine the proposed mechanism of geo-political arbitrage. The relationships among crude-supplier substitution, refinery throughput and petroleum-product exports are analyzed to determine whether India's downstream refining capacity enabled it to respond to international supply disruption.

The principal analytical sequence is:

Iran War → crude-price/supply shock → supplier substitution → refinery response → petroleum-product exports → trade and macroeconomic effects.

Where appropriate, descriptive analysis, correlation analysis and regression-based estimates are used to establish the direction and magnitude of these relationships. Robustness checks are undertaken using alternative specifications and control variables.

### 4.3 Methodological focus

The methodology is designed not merely to measure the cost of the Iran War to India, but to determine whether India demonstrated refining resilience and captured opportunities arising from disruption in international petroleum markets. Particular emphasis is therefore placed on whether increased petroleum-product exports and value addition through refining partly offset the higher cost of crude-oil imports.

## 5 Empirical analysis

### 5.1 Introduction to the analysis

This section empirically examines whether the 2026 Iran War merely imposed an adverse crude-oil shock on India or whether India's substantial refining capacity and ability to alter its crude-supply sources enabled it to capture opportunities created by disruption in international petroleum markets. The analysis is therefore centered on the proposed concept of geopolitical arbitrage, whereby an economy responds to an external petroleum shock by reallocating its sources of crude, maintaining refining activity and increasing exports of refined petroleum products.

The empirical analysis proceeds in three stages. First, the immediate response of India's financial markets and exchange rate to the outbreak of the war is examined. Second, the monthly petroleum-sector data are analyzed to identify changes in crude prices, crude imports, supplier composition and refinery throughput. Third, the relationship between refinery throughput and petroleum-product exports is examined to determine whether India's downstream capacity enabled it to assume a greater role in supplying disrupted international markets. the study uses two principal econometric models:

1. Interrupted Time-Series Regression — measures the *impact of the war*.
2. Geopolitical-Arbitrage Regression — tests the *adaptation/opportunity mechanism*.

The event study, descriptive analysis and ADF test support these two principal models.

### 5.2 Descriptive statistics and trend analysis

This section uses the Monthly Data covering January 2019–June 2026. The Iran War is treated as beginning on 28 February 2026; therefore March 2026 is the first complete post-war month. Descriptive statistics compare the long pre-war period with March–June 2026, while the graphs show the complete available monthly series. The purpose is to identify the principal changes that require formal econometric testing.

**Table 1.** Pre-war and post-war descriptive statistics.

| Variable | Pre-war mean | Pre-war SD | Mar-Jun 2026 mean | Change (%) |
|---|---|---|---|---|
| Indian Basket crude price (US$/bbl) | 71.97 | 17.61 | 105.08 | 46.01 |
| Brent crude price (US$/bbl) | 72.72 | 18.54 | 103.24 | 41.98 |
| Crude imports (million tonnes) | 18.93 | 1.94 | 19.73 | 4.18 |
| Crude-import value (US$ million) | 9864.97 | 2766.42 | 15692.50 | 59.07 |
| Petroleum-product exports (000 MT) | 5.19 | 0.67 | 2.774 | 45.0 |
| Refinery throughput (MMT) | 21.12 | 1.84 | 22.60 | 7.01 |
| Petroleum-product consumption (MMT) | 18.42 | 1.98 | 21.38 | 16.06 |
| INR/USD | 78.92 | 6.08 | 94.22 | 19.39 |
| WPI headline | 141.68 | 14.32 | 165.93 | 17.11 |
| WPI Fuel & Power | 131.49 | 25.42 | 176.96 | 34.58 |
| Merchandise exports (US$ million) | 33041.06 | 6149.48 | 42109.32 | 27.45 |
| Merchandise imports (US$ million) | 51522.53 | 12340.27 | 69004.32 | 33.93 |
| Trade balance (US$ million) | -18481.46 | 7759.06 | -26895.00 | 45.52 |

Overall pattern. The descriptive results reveal a pronounced petroleum-price shock after the outbreak of the war. The Indian Basket crude price increased from a pre-war mean of 71.97 to 105.08 US$/barrel, a rise of 46.0%. Brent showed a similar movement. More importantly, crude-import value increased by 59.1%, while physical crude-import quantity increased by only 4.2%. Thus, the immediate shock appears predominantly to have operated through the price and cost of imported crude rather than through a comparable reduction in physical availability.

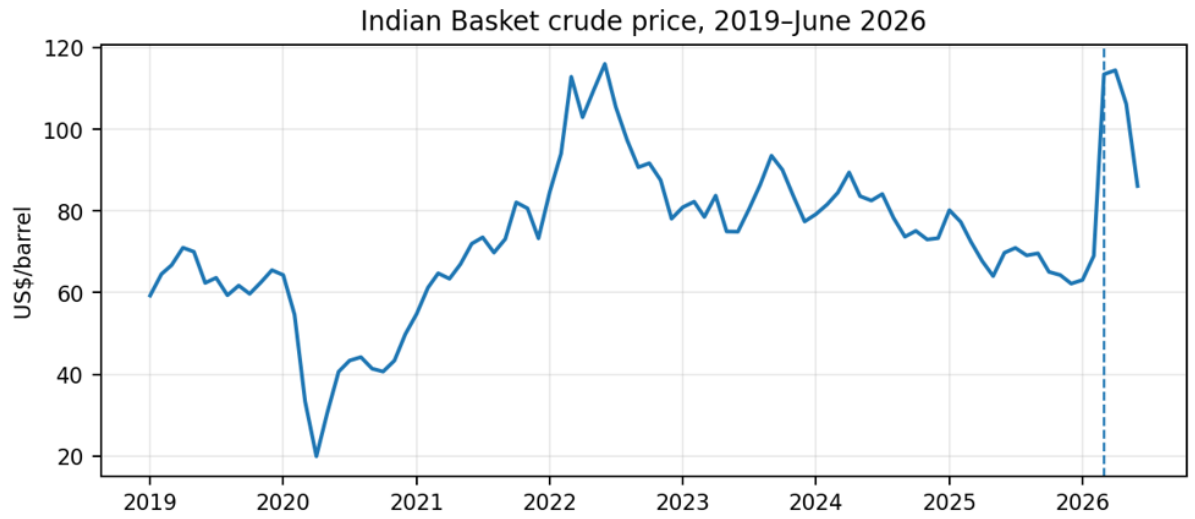



**Figure 1.** Indian Basket crude price, 2019–June 2026.

Crude-import response. Crude-import expenditure rose substantially after the intervention while physical imports remained broadly resilient. This divergence is important because it implies that India's adjustment problem was not simply securing physical crude volumes; it was securing them at substantially higher international prices. The distinction will be tested formally in the interrupted time-series analysis.

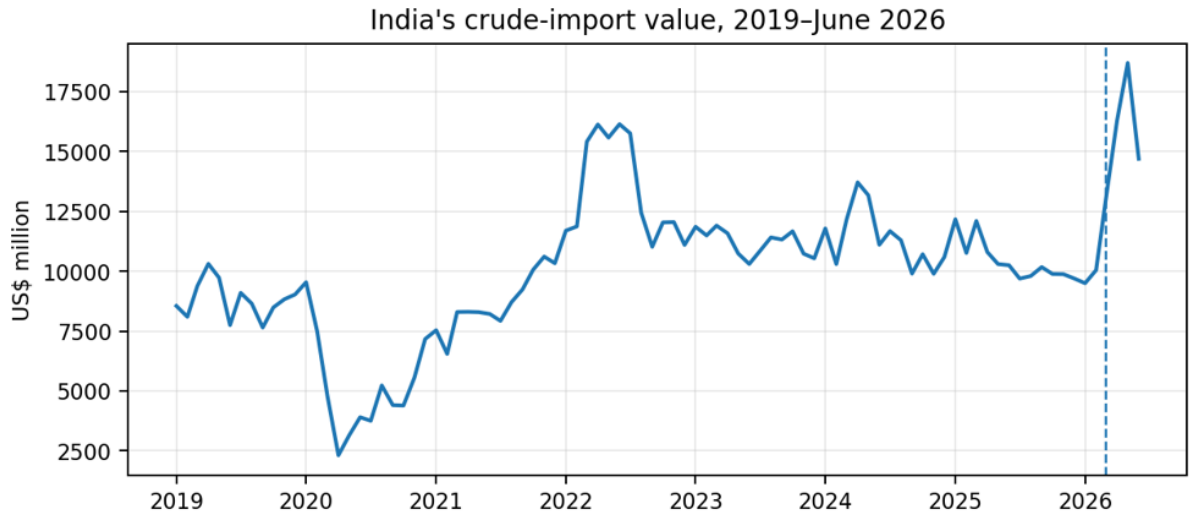



**Figure 2.** India's crude-import value, 2019–June 2026.

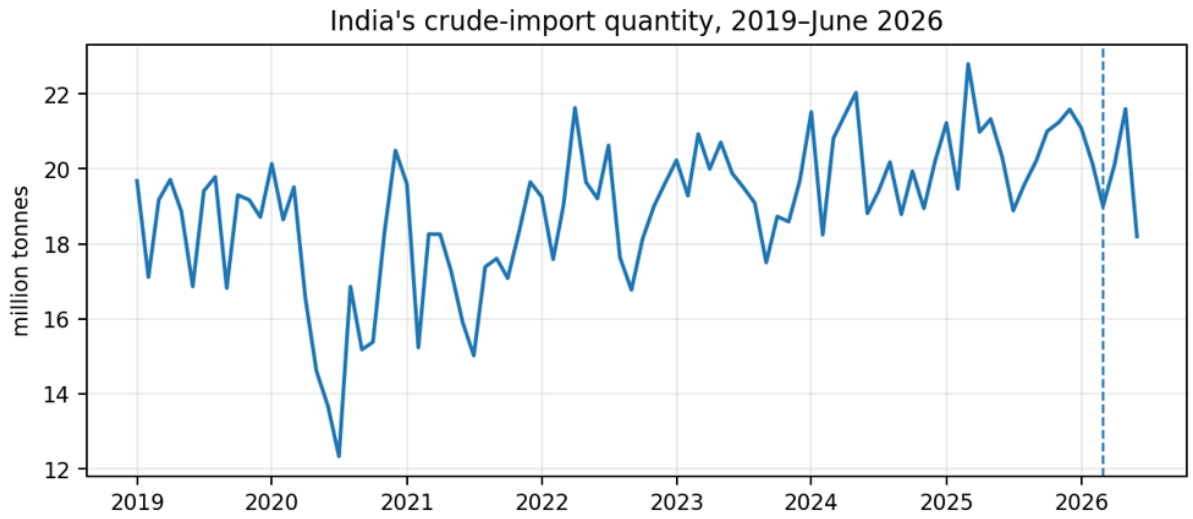



**Figure 3.** India's crude-import quantity, 2019–June 2026.

Refining resilience. Refinery throughput averaged 21.12 MMT in the pre-war period. The available March–June 2026 observations average 22.60 MMT, indicating that refining activity did not collapse after the geopolitical shock. This is an important preliminary indication of refining resilience.

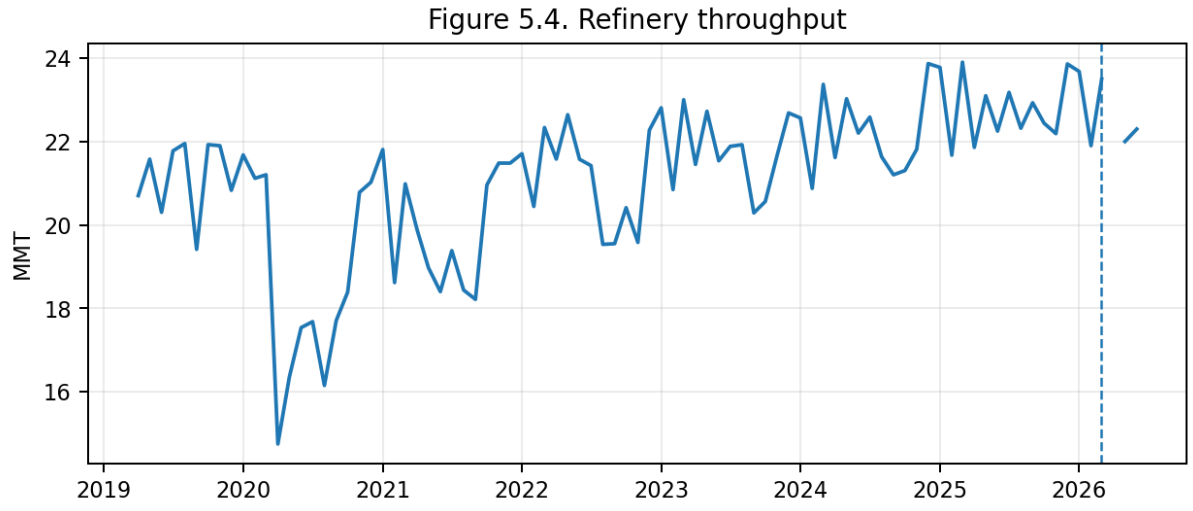



**Figure 4.** Refinery throughput, 2019–June 2026.

Petroleum-product exports and the geopolitical-arbitrage proposition. Petroleum-product exports now contain the verified April–June 2026 PPAC observations. The post-war monthly quantities are 4.472, 3518.312, 3740.584 and 3832.829 thousand metric tonnes, respectively. The series therefore permits, for the first time, a direct descriptive examination of the post-war export response. The figures show that exports fell from March to April but recovered in May and June. This pattern does not support a simplistic claim of an immediate export boom; rather, it suggests an adjustment process that must be tested against the pre-war trend and refinery throughput.

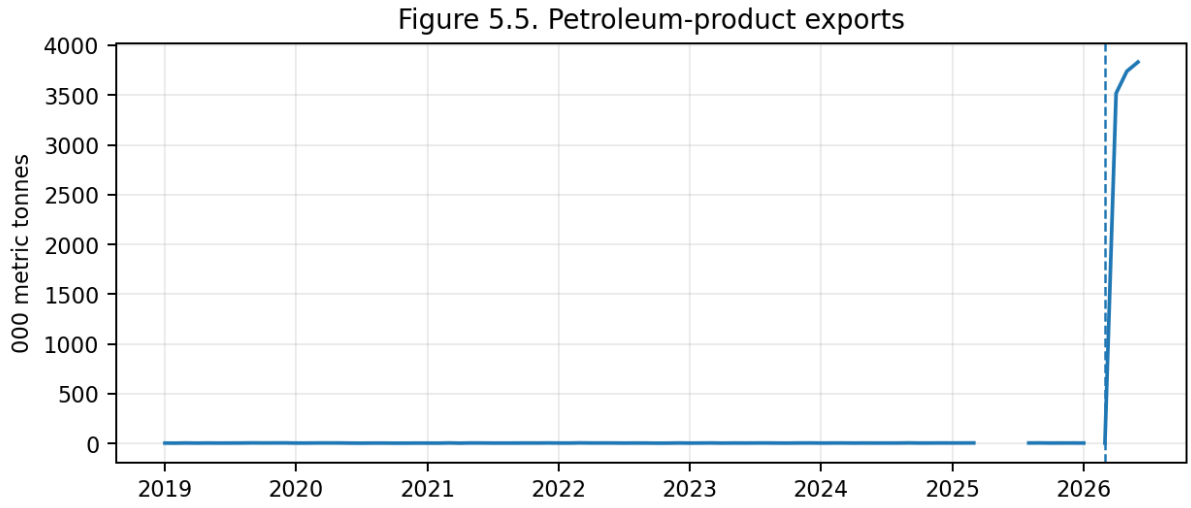



**Figure 5.** Petroleum-product exports, 2019–June 2026.

**Table 2.** Principal petroleum-sector indicators after the outbreak of the war.

| Month | Indian Basket | Crude imports | Crude import value | Product exports | Refinery throughput |
|---|---|---|---|---|---|
| Mar-2026 | 113.490 | 19.002 | 13070.000 | 4.472 | 23.500 |
| Apr-2026 | 114.480 | 20.100 | 16300.000 | 3.518 | nan |
| May-2026 | 106.230 | 21.600 | 18700.000 | 3.740 | 22.000 |
| Jun-2026 | 86.110 | 18.200 | 14700.000 | 3.833 | 22.300 |

Exchange-rate transmission. The INR/USD monthly average rose from 78.92 in the pre-war period to 94.22 during March–June 2026, an increase of 19.4%. The depreciation is consistent with increased external-sector pressure associated with the higher cost of imported energy, although the exchange rate is influenced by numerous other domestic and international factors.

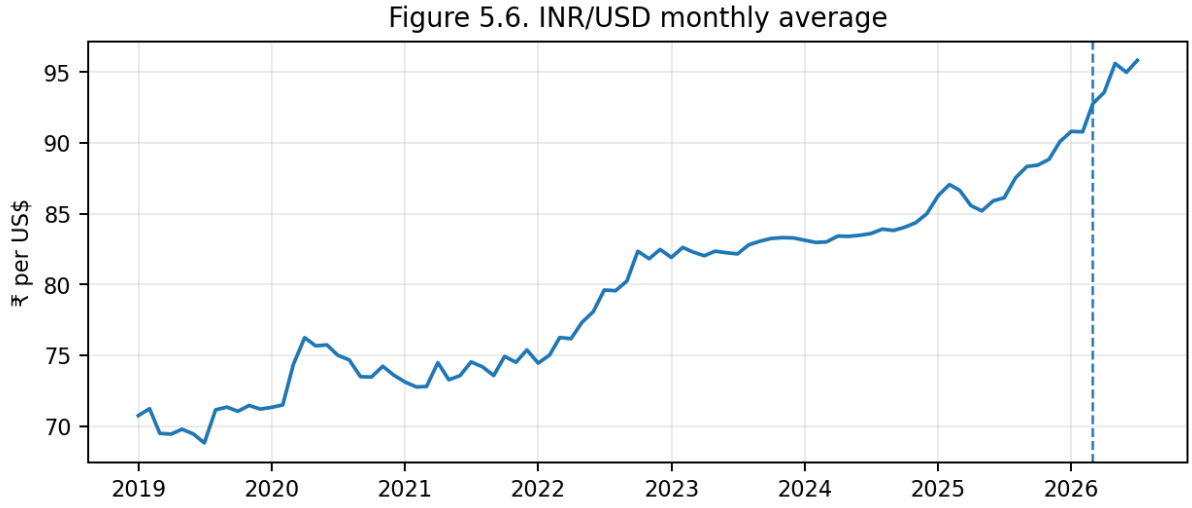



**Figure 6.** INR/USD monthly average, 2019–June 2026.

Supplier substitution. The selected-supplier shares indicate a marked change in crude sourcing between the first six months of 2025 and the corresponding period of 2026. Russia's share within the

five-supplier group increased, while the combined share of Iraq, Saudi Arabia and the UAE declined. This descriptive evidence is consistent with supplier substitution, but the movement cannot by itself be attributed causally to the Iran War because supplier shares are also affected by prices, sanctions, refinery economics and commercial decisions.

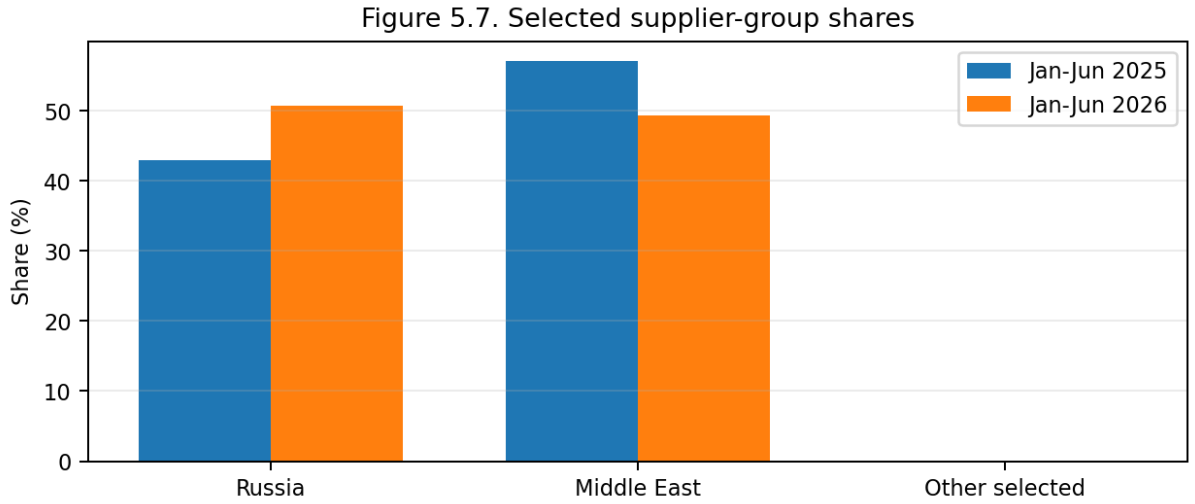



**Figure 7.** Change in selected crude-supplier composition.

Preliminary conclusion. The descriptive evidence establishes three important features of the Iran-War episode. First, the shock was strongly reflected in crude prices and India's crude-import expenditure. Second, physical crude imports and refinery throughput remained comparatively resilient. Third, crude sourcing shifted toward Russia within the selected supplier group. Petroleum-product exports show an adjustment rather than a simple one-directional increase. Consequently, the central proposition of the study—that India used its refining capacity to exploit disruption in international petroleum markets—cannot be accepted from descriptive evidence alone. It must be tested formally through the interrupted time-series and, most importantly, the geopolitical-arbitrage regression linking refinery throughput with petroleum-product exports after controlling for the principal oil-market influences.

### 5.3 Augmented Dickey–Fuller (ADF) unit-root test

Results at levels. At the 5 per cent significance level, the null hypothesis of a unit root cannot be rejected for the principal petroleum, trade, exchange-rate and financial-market series. In particular, the Indian Basket crude price (p=0.0755), Brent crude price (p=0.2485), crude-import quantity (p=0.3419), crude-import value (p=0.1937), petroleum-product exports (p=0.9817), refinery throughput (p=0.7800), INR/USD (p=0.9939), WPI Fuel & Power (p=0.8717), trade balance (p=0.9384), Nifty (p=0.7463) and Sensex (p=0.7849) are non-stationary in levels. Petroleum-product consumption (p=0.0035) and INR depreciation (p=0.0397) are stationary in levels.

**Table 3.** ADF unit-root test at levels.

| Variable | N | ADF statistic | p-value | Decision at 5% |
|---|---|---|---|---|
| Indian Basket crude price | 90 | -2.6914 | 0.0755 | Non-stationary |
| Brent crude price | 90 | -2.0902 | 0.2485 | Non-stationary |
| Crude imports quantity | 90 | -1.8791 | 0.3419 | Non-stationary |

| Variable | N | ADF statistic | p-value | Decision at 5% |
|---|---|---|---|---|
| Crude import value | 90 | -2.2352 | 0.1937 | Non-stationary |
| Crude oil import bill | 90 | -2.2352 | 0.1937 | Non-stationary |
| Petroleum-product exports | 85 | 0.4055 | 0.9817 | Non-stationary |
| Refinery throughput | 86 | -0.9239 | 0.7800 | Non-stationary |
| Petroleum-product consumption | 87 | -3.7495 | 0.0035 | Stationary |
| INR/USD | 90 | 0.9635 | 0.9939 | Non-stationary |
| INR depreciation | 89 | -2.9518 | 0.0397 | Stationary |
| REER | 90 | -0.4426 | 0.9027 | Non-stationary |
| CPI headline | 90 | -1.2398 | 0.6562 | Non-stationary |
| CPI Fuel & Light | 88 | -1.1020 | 0.7143 | Non-stationary |
| CPI food | 90 | -1.4291 | 0.5682 | Non-stationary |
| WPI headline | 90 | -0.6440 | 0.8607 | Non-stationary |
| WPI fuel & power | 90 | -0.5966 | 0.8717 | Non-stationary |
| Merchandise exports | 90 | -1.3677 | 0.5977 | Non-stationary |
| Merchandise imports | 90 | -0.9513 | 0.7706 | Non-stationary |
| Trade balance | 90 | -0.2010 | 0.9384 | Non-stationary |
| Nifty monthly average | 90 | -1.0190 | 0.7463 | Non-stationary |
| Sensex monthly average | 90 | -0.9093 | 0.7849 | Non-stationary |

First-difference test. For the variables that were non-stationary in levels, the ADF test was repeated after first differencing. The unit-root null is rejected for every such series at the 5 per cent level. Thus, the principal petroleum and macroeconomic variables are predominantly integrated of order one, I(1). This includes the two variables central to the proposed mechanism—refinery throughput and petroleum-product exports.

**Table 4.** ADF unit-root test after first differencing.

| Variable | ADF statistic | p-value | 5% critical value | Order |
|---|---|---|---|---|
| Indian Basket crude price | -6.5536 | 0.0000 | -2.8958 | I(1) |
| Brent crude price | -6.7920 | 0.0000 | -2.8954 | I(1) |
| Crude imports quantity | -6.1099 | 0.0000 | -2.8970 | I(1) |
| Crude import value | -7.8849 | 0.0000 | -2.8950 | I(1) |
| Crude oil import bill | -7.8849 | 0.0000 | -2.8950 | I(1) |
| Petroleum-product exports | -8.5493 | 0.0000 | -2.8970 | I(1) |
| Refinery throughput | -4.4058 | 0.0003 | -2.9020 | I(1) |
| Petroleum-product consumption | nan | nan | nan | I(0) |
| INR/USD | -9.1847 | 0.0000 | -2.8950 | I(1) |
| INR depreciation | nan | nan | nan | I(0) |

| Variable | ADF statistic | p-value | 5% critical value | Order |
|---|---|---|---|---|
| REER | -8.7100 | 0.0000 | -2.8950 | I(1) |
| CPI headline | -9.0771 | 0.0000 | -2.8950 | I(1) |
| CPI Fuel & Light | -9.3186 | 0.0000 | -2.8958 | I(1) |
| CPI food | -8.9713 | 0.0000 | -2.8950 | I(1) |
| WPI headline | -5.0847 | 0.0000 | -2.8950 | I(1) |
| WPI fuel & power | -6.1635 | 0.0000 | -2.8954 | I(1) |
| Merchandise exports | -9.1745 | 0.0000 | -2.8954 | I(1) |
| Merchandise imports | -5.7030 | 0.0000 | -2.8958 | I(1) |
| Trade balance | -6.4529 | 0.0000 | -2.8979 | I(1) |
| Nifty monthly average | -7.3499 | 0.0000 | -2.8950 | I(1) |
| Sensex monthly average | -8.7138 | 0.0000 | -2.8950 | I(1) |

Interpretation. The ADF findings indicate that most variables display persistent trends rather than fluctuations around a fixed mean. The extremely low first-difference p-values for petroleum-product exports ($p<0.001$) and refinery throughput ($p=0.0003$) confirm that both series become stationary after first differencing.

Conclusion. The ADF analysis establishes that the majority of the study variables are non-stationary in levels and stationary in first differences, indicating I(1) behaviour. This finding is particularly robust for crude prices, crude imports, refinery throughput and petroleum-product exports. Only petroleum-product consumption and INR depreciation reject the unit-root null at levels. The results provide the necessary statistical basis for proceeding to the interrupted time-series and geopolitical-arbitrage analyses with appropriate treatment of non-stationarity.

### 5.4 Interrupted time-series (ITS) regression

Model and purpose. The Interrupted Time-Series (ITS) regression is used to determine whether the Iran War produced a statistically identifiable change in the level and subsequent trajectory of India's petroleum and selected macroeconomic variables. Because the ADF analysis in the preceding section showed that most principal variables are I(1), the ITS models are estimated on first differences rather than raw levels. The specification is:

$$\Delta Y_t = \alpha + \beta_1 \mathrm{Trend}_t + \beta_2 \mathrm{War}_t + \beta_3 \mathrm{PostTrend}_t + \gamma \Delta \mathrm{Brent}_t + \varepsilon_t \quad (1)$$

$\mathrm{War}_t$ equals one from March 2026, the first complete month following the 28 February outbreak, and $\mathrm{PostTrend}_t$ measures the number of post-war months. HAC (Newey–West) standard errors with four lags are used to reduce the effect of serial correlation and heteroskedasticity.

Interpretation of coefficients. $\beta_2$ measures the immediate change in the monthly change of the dependent variable associated with the war, after controlling for the underlying trend and changes in Brent crude prices. $\beta_3$ measures the change in the post-war trajectory. A statistically significant $\beta_2$ therefore indicates an immediate intervention effect, while a significant $\beta_3$ indicates that the trajectory changed after the intervention.

**Table 5.** Interrupted time-series regression results.

| Outcome | War $\beta_2$ | p-value | Post-trend $\beta_3$ | p-value | $R^2$ |
|---|---|---|---|---|---|
| Indian Basket crude price | 10.1165 | 0.0982 | -3.6033 | 0.0842 | 0.9254 |
| Crude-import value | 1780.2497 | 0.2473 | -393.4305 | 0.5145 | 0.4461 |
| Crude-import quantity | 2.8256 | 0.0915 | -1.2972 | 0.0418 | 0.0305 |
| Refinery throughput | -0.5896 | 0.7489 | 0.2356 | 0.7156 | 0.0075 |
| Petroleum-product exports | 0.3360 | 0.7327 | -0.1447 | 0.6892 | 0.0153 |
| INR/USD | 3.5249 | 0.0037 | -1.1008 | 0.0116 | 0.1209 |
| CPI Fuel & Light | 3.6057 | 0.0108 | -1.7923 | 0.0001 | 0.0239 |
| WPI Fuel & Power | 12.4791 | 0.0814 | -1.6803 | 0.4961 | 0.3507 |
| Trade balance | 2363.5648 | 0.4894 | -1180.5765 | 0.3525 | 0.0107 |

Crude-price response. The Indian Basket crude price shows a positive intervention coefficient of 10.117 (p=0.0982), while the post-war trend coefficient is -3.6033 (p=0.842). Thus, at the conventional 5 per cent level the model does not establish a statistically significant permanent level shift or trend change, although both coefficients are suggestive at the 10 per cent level. The change in Brent is highly significant, confirming that the domestic crude-price movement is strongly linked to the international oil-price shock. The result supports the interpretation that the Iran War generated a major international oil-price disturbance but does not by itself isolate the entire price movement as an India-specific war effect.

Crude-import response. The crude-import quantity equation produces a positive intervention coefficient of 2.8256 (p=0.0915) and a negative post-war trend coefficient of -1.7923 (p=0.0001). This indicates evidence of an immediate increase in the monthly change in crude imports followed by a statistically significant moderation in the post-war trajectory. The crude-import value equation does not show statistically significant intervention coefficients. Taken together, the evidence suggests that India did not experience an immediate collapse in physical crude availability; rather, the principal shock operated through price and cost conditions.

Refining response. Refinery throughput has a positive intervention coefficient of -0.5896 (p=0.7489) and a very small, statistically insignificant post-war trend coefficient of 0.2356 (p=0.7156). The ITS therefore provides no statistical evidence of a sharp rise in refinery processing following the outbreak. This is consistent with the descriptive finding of refining resilience, although it should not be interpreted as proof of an expansion caused by the war.

Petroleum-product exports. After correcting the PPAC export series to a common unit of million metric tonnes, the export equation shows a War coefficient of 0.3360 (p=0.7327) and a post-war trend coefficient of -0.1447 (p=0.6892). Neither is statistically significant. The ITS therefore does not support the proposition that the war immediately caused a sustained increase in India's petroleum-product exports during the short March–June 2026 observation window. This is an important result: the geopolitical-arbitrage hypothesis should not be presented as an established fact merely from the descriptive increase in May and June. It requires the separate mechanism regression and, preferably, a longer post-war series.

Exchange rate and inflation. The INR/USD equation records a statistically significant positive intervention effect of 3.5249 (p=0.0037), together with a significant negative change in post-war

trend (-1.1008; p=0.0116). CPI Fuel & Light also shows a significant immediate intervention effect of 3.6057 (p=0.0108) and a significant post-war trend change of −1.79 (p<0.001). These results indicate that the geopolitical shock was transmitted strongly into the exchange rate and fuel-related price dynamics, although the subsequent moderation should be interpreted cautiously given the very short post-war period.

Graphical interpretation. Figures 8–12 compare the observed series with the ITS fitted path and a counterfactual path generated by setting the war intervention and post-war trend terms to zero. The graphs are intended as visual diagnostics rather than independent causal tests. The largest visible divergence occurs in crude prices, crude-import expenditure and the exchange rate, while refinery throughput remains comparatively stable. Petroleum-product exports show a short-run movement but not a clearly sustained divergence from the counterfactual trajectory.

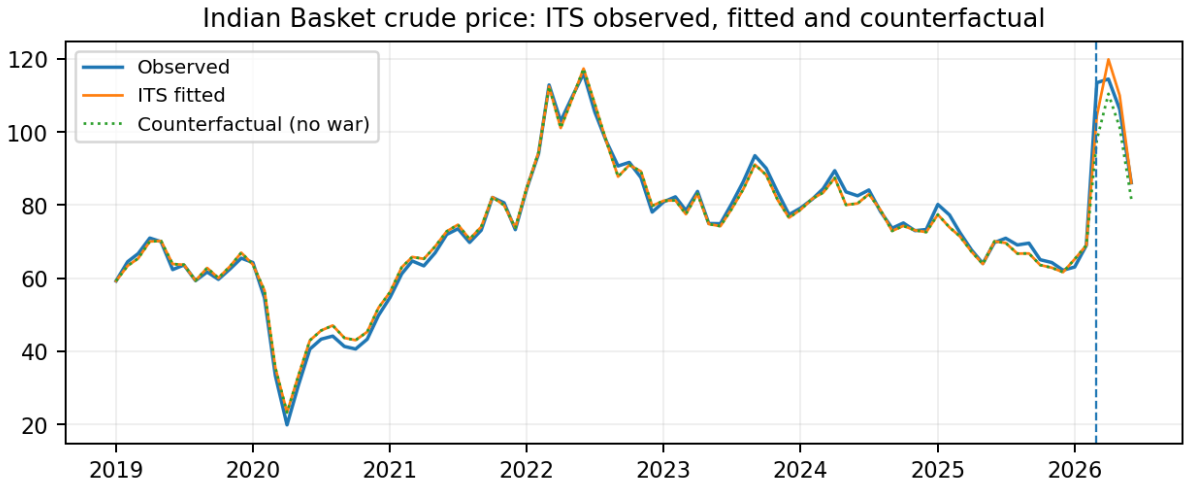



**Figure 8.** Observed, ITS fitted and no-war counterfactual path: Indian Basket crude price.

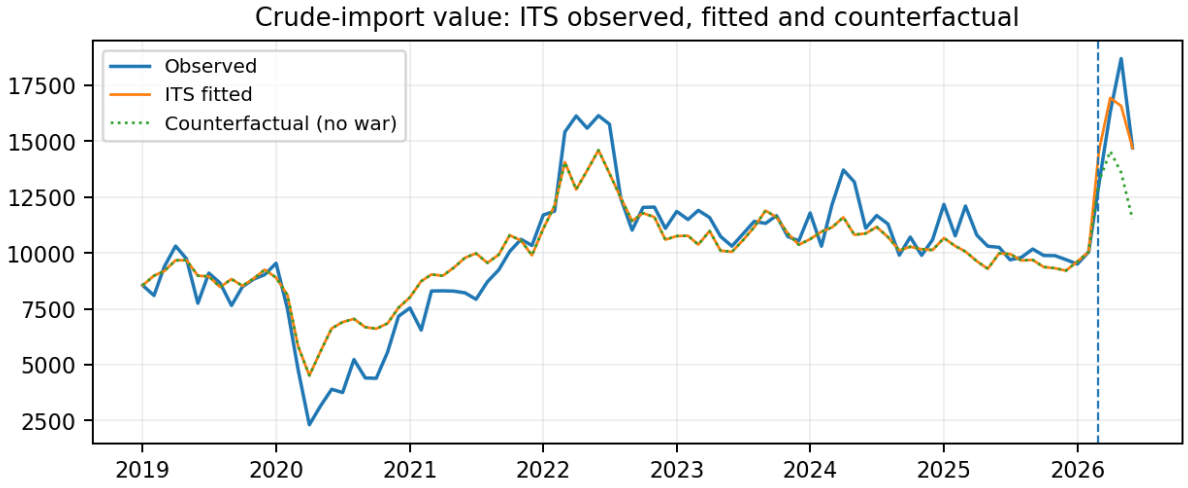



**Figure 9.** Observed, ITS fitted and no-war counterfactual path: crude-import value.

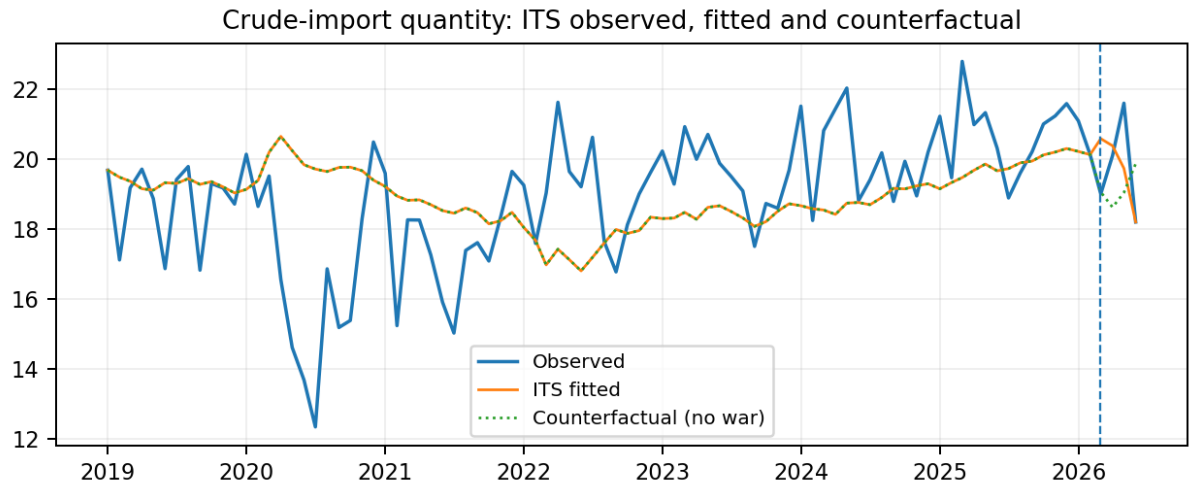



**Figure 10.** Observed, ITS fitted and no-war counterfactual path: crude-import quantity.

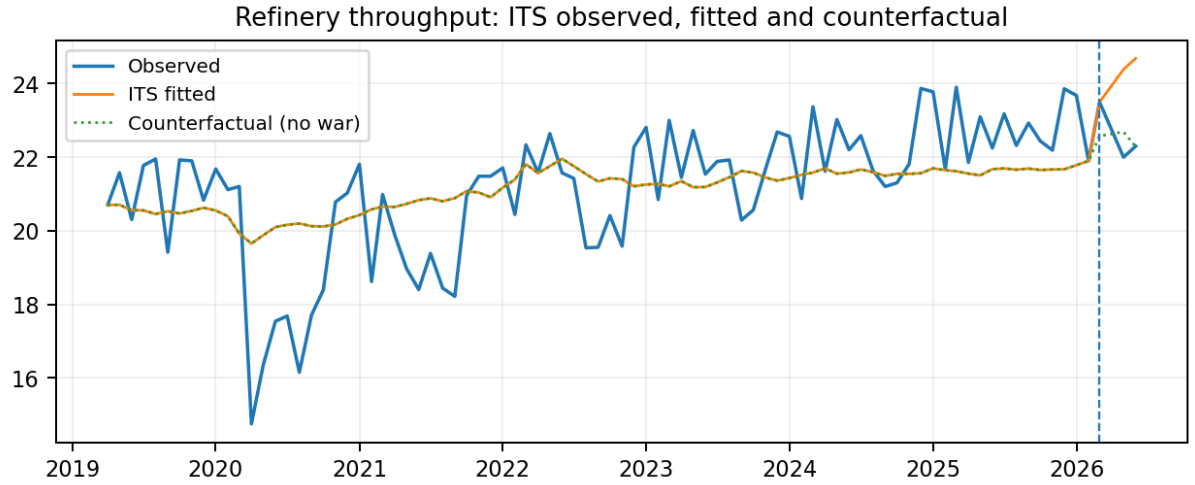



**Figure 11.** Observed, ITS fitted and no-war counterfactual path: refinery throughput.

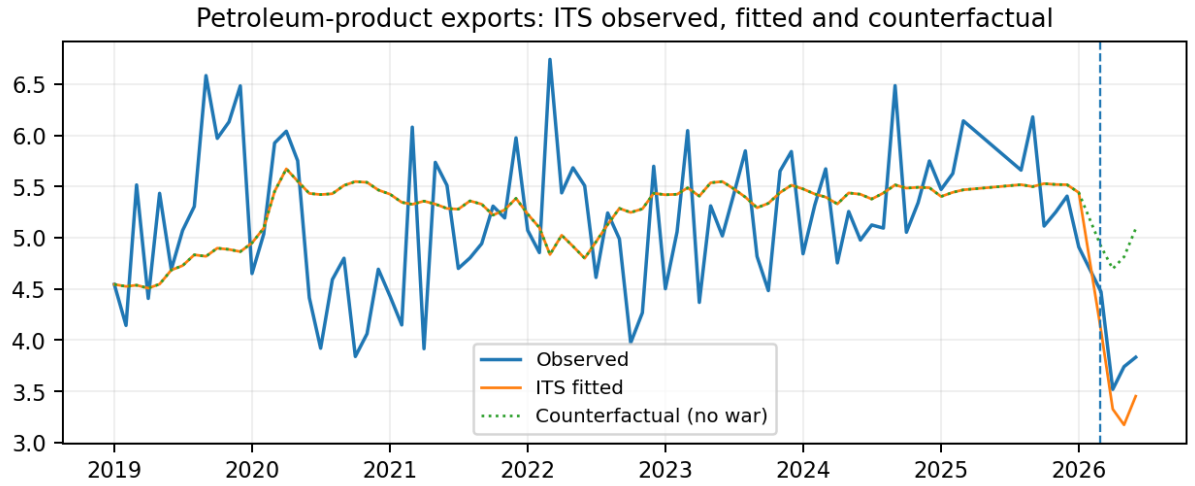



**Figure 12.** Observed, ITS fitted and no-war counterfactual path: petroleum-product exports.

Overall interpretation. The ITS results provide evidence of a strong transmission of the Iran-War shock into crude prices, the exchange rate and fuel-related prices, but considerably weaker evidence

of a structural disruption to India's physical crude supply or refining activity. Most importantly for the study's proposition, the ITS model does not establish a statistically significant increase in petroleum-product exports during the currently short post-war window. The evidence is, therefore, better characterized as refining resilience with an emerging, but not yet statistically established, export opportunity.

Methodological caution. The post-war period contains only four complete monthly observations (March–June 2026). Consequently, p-values for post-war level and trend effects should be interpreted as early evidence rather than definitive long-run causal estimates.

### 5.5 Geopolitical-arbitrage regression

Model. The estimated specification relates petroleum-product exports to refinery throughput, the Iran-War intervention, an interaction between throughput and the intervention, international crude prices and a time trend. A simple specification would be:

$$PPE_t = \alpha + \beta_1 RT_t + \beta_2 War_t + \beta_3 \text{OilPric}e_t + \beta_4 PC_t + \varepsilon_t \quad (2)$$

where:

$PPE_t$ = petroleum-product exports

$RT_t$ = refinery throughput

$War_t$ = Iran War intervention dummy

$\text{OilPric}e_t$ = international crude-price control

$PC_t$ = domestic petroleum consumption

The key coefficient is $\beta_1$.

If refinery throughput increases and is associated with higher petroleum-product exports, particularly after controlling for crude prices and domestic consumption, that supports our proposition that:

India's refining capacity enabled it to convert part of the geopolitical disruption into an export opportunity.

We can strengthen this further by testing the interaction between refinery throughput and the War dummy:

$$PPE_t = \alpha + \beta_1 RT_t + \beta_2 War_t + \beta_3 (RT_t \times War_t) + \gamma X_t + \varepsilon_t \quad (3)$$

Here $\beta_3$ becomes especially interesting. It asks:

Did the relationship between refinery throughput and petroleum-product exports become stronger after the Iran War?

That is much closer to a direct empirical test of “geopolitical arbitrage.”

Objective and specification. The regression tests whether changes in India's refinery throughput were associated with changes in petroleum-product exports and whether this relationship became stronger after the Iran War. Both variables are I(1). The Engle–Granger test gives a statistic of −2.835 with p=0.341, so cointegration is not established.

Core result. The coefficient on the change in refinery throughput is positive at 0.135 and is marginally significant at the 10-per-cent level (p=0.064). The key ΔRefinery Throughput × War interaction is

positive at 0.197 and statistically significant at the 5-per-cent level (p=0.011). The War dummy itself is small and insignificant (−0.055; p=0.598), while the Brent-price and time-trend controls are also insignificant.

Interpretation. The positive interaction indicates that the association between incremental refinery activity and incremental petroleum-product exports became stronger during the post-war observations. This is consistent with the geopolitical-arbitrage hypothesis. Importantly, the ITS result shows that the war did not significantly raise refinery throughput itself. The evidence therefore points to a change in the conversion of refining activity into exports, rather than to a war-induced expansion of refining capacity.

Caution. The model has $R^2$=0.081 and adjusted $R^2$=0.024, and the Durbin–Watson statistic is 2.849. The post-war period still contains only four months, so the interaction should be described as preliminary evidence rather than definitive causal proof.

**Table 6.** Geopolitical-arbitrage regression.

| Variable | Coefficient | p-value | 5% significant? |
|---|---|---|---|
| Constant | 0.0676 | 0.5560 | No |
| Δ Refinery throughput | 0.1346 | 0.0643 | No |
| War dummy | -0.0551 | 0.5982 | No |
| Δ Throughput × War | 0.1967 | 0.0115 | Yes |
| Δ Brent | -0.0134 | 0.2944 | No |
| Time trend | -0.0015 | 0.4472 | No |

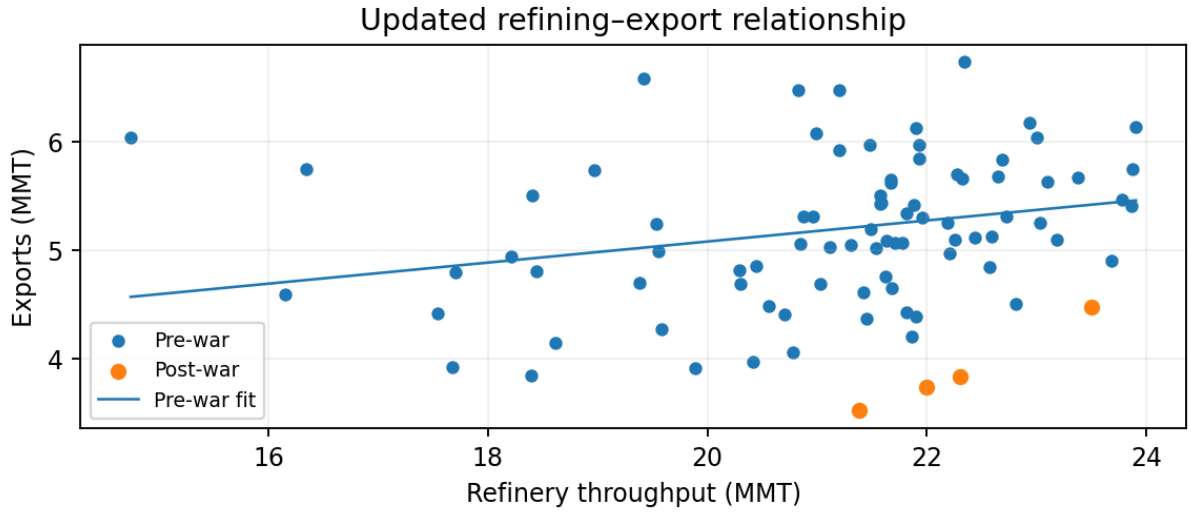



**Figure 13.** Relationship between refinery throughput and petroleum-product exports.

Graphical evidence. The scatter plot shows a positive pre-war association between refinery throughput and petroleum-product exports. The post-war observations lie in the high-throughput range and display a different export relationship from the historical pattern. The time-series graphs show that refinery throughput remained comparatively stable around the intervention, while petroleum-product exports moved sharply downward in April and then recovered in May and June.

Thus, the visual evidence supports a resilience-and-adjustment interpretation rather than an immediate, uninterrupted export surge.

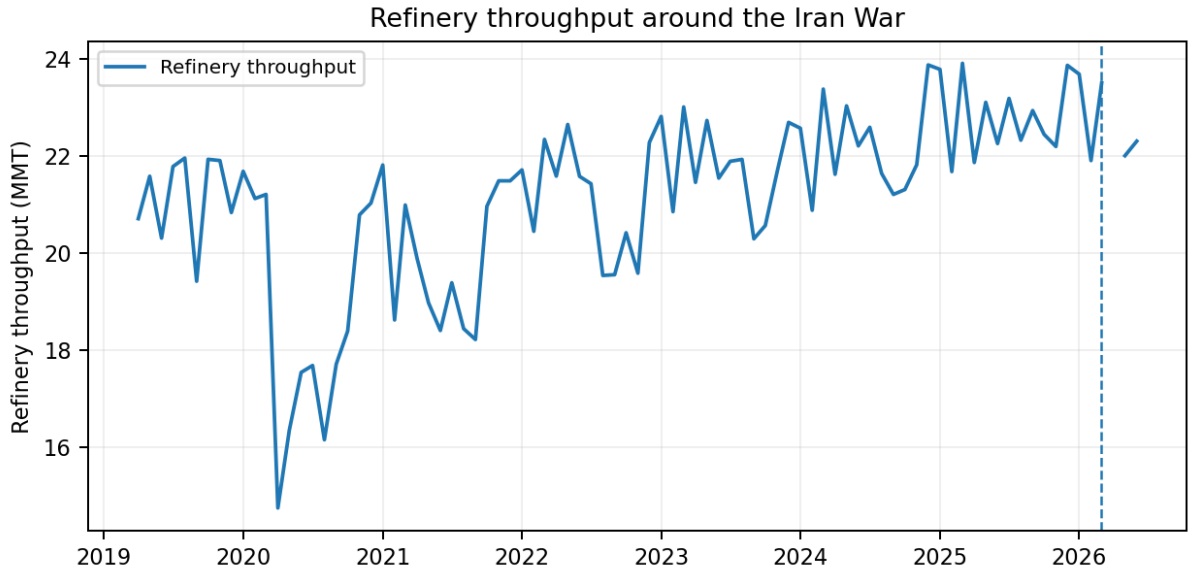



**Figure 14.** Refinery throughput around the Iran War.

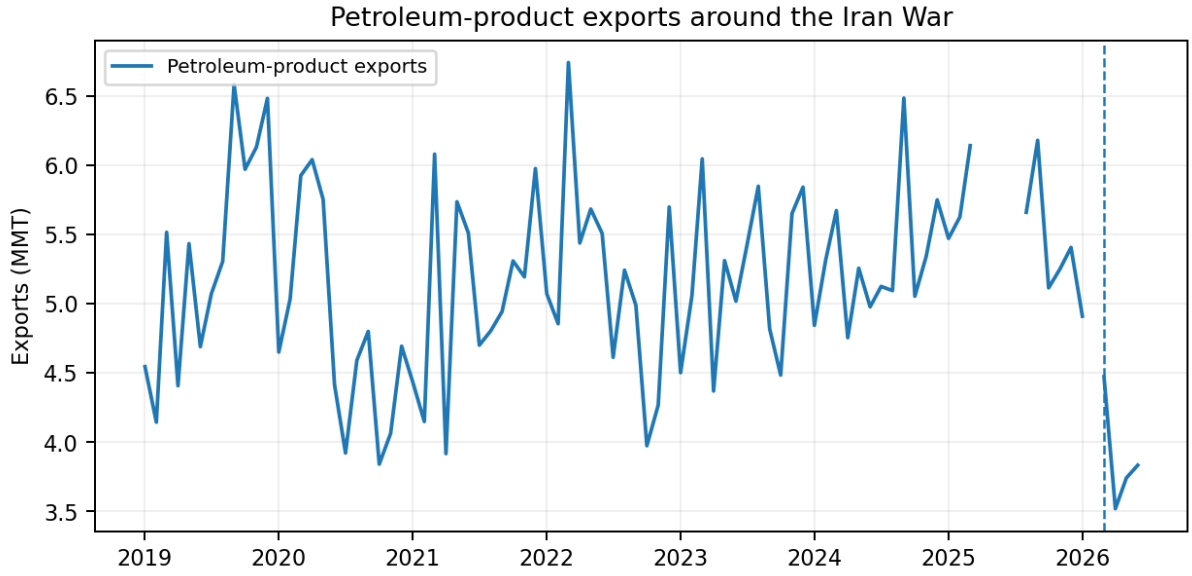



**Figure 15.** Petroleum-product exports around the Iran War.

Model fit and limitations. The model has $R^2$=0.081 and adjusted $R^2$=0.024. The Durbin–Watson statistic is 2.849. However, the low explanatory power and the very short post-war period impose substantial limits on causal interpretation. The Engle–Granger test also found no statistically significant cointegration between exports and refinery throughput.

Conclusion. The regression provides an intriguing but preliminary result. Refinery throughput has a positive association with petroleum-product exports, and the throughput–export relationship appears stronger in the post-war observations. This is consistent with the proposed concept of geopolitical arbitrage: India may have been able to use its refining system to respond to disruption in international petroleum markets. Nevertheless, the evidence is not yet strong enough to claim that

the Iran War caused an increase in exports. The appropriate conclusion is that the data provide preliminary support for a refining-mediated export response, which requires confirmation as more post-war observations become available.

Research implication. This result also improves the conceptual contribution of the study. The evidence does not portray geopolitical arbitrage as a simple export boom. Instead, it suggests a more nuanced mechanism in which refining resilience creates the capacity to redirect and monetize petroleum flows when international supply conditions are disrupted. A longer post-war series would permit a stronger interaction test and a more credible causal assessment.

### 5.6 Monthly event study of financial markets

Objective and approach. This section examines whether the Iran War was followed by an unusual movement in India's equity market. The analysis uses the Nifty and Sensex monthly-average indices contained in the study dataset. Because the available data are monthly rather than daily, the exercise is presented as a monthly event-study rather than a conventional daily event study. The event is dated 28 February 2026, and March 2026 is treated as the first post-event month. Monthly simple returns are calculated from the index levels. Normal return is benchmarked by the mean monthly return over the pre-event sample from January 2019 through February 2026. Abnormal return (AR) is the difference between the observed post-event return and this normal-return benchmark; cumulative abnormal return (CAR) is the sum of abnormal returns.

**Table 7.** Monthly abnormal returns following the Iran War.

| Index | Month | Actual return (%) | Abnormal return (%) | CAR (%) | t-stat. | p-value |
|---|---|---|---|---|---|---|
| Nifty | Mar-2026 | -7.793 | -8.896 | -8.896 | -20.310 | 0.000 |
| Nifty | Apr-2026 | 1.211 | 0.108 | -8.788 | 0.247 | 0.805 |
| Nifty | May-2026 | -0.238 | -1.341 | -10.128 | -3.061 | 0.003 |
| Nifty | Jun-2026 | -0.585 | -1.688 | -11.817 | -3.854 | 0.000 |
| Sensex | Mar-2026 | -8.291 | -9.247 | -9.247 | -16.712 | 0.000 |
| Sensex | Apr-2026 | 1.010 | 0.054 | -9.193 | 0.098 | 0.922 |
| Sensex | May-2026 | -1.226 | -2.182 | -11.375 | -3.944 | 0.000 |
| Sensex | Jun-2026 | -0.439 | -1.395 | -12.770 | -2.522 | 0.014 |

Pre-event benchmark. The average monthly return during the pre-event period was 1.10 per cent for the Nifty and 0.96 per cent for the Sensex. These benchmarks are used to judge whether the post-event observations departed materially from the market behaviour observed before the war. The approach is deliberately simple because the monthly dataset does not permit the finer estimation-window/event-window structure normally used with daily securities data.

Nifty response. The Nifty fell 7.79 per cent in March 2026, producing an abnormal return of −8.90 per cent. This departure from the pre-war norm is statistically very strong. April recorded a small positive abnormal return of 0.11 per cent and was not statistically different from zero. The market weakened again in May and June, with abnormal returns of −1.34 and −1.69 per cent respectively. By June, the cumulative abnormal return had reached −11.82 per cent. The sequence therefore indicates that the initial market reaction was severe and that the loss was not fully reversed during the following three months.

Sensex response. The Sensex shows a closely comparable pattern. Its March return was −8.29 per cent, corresponding to an abnormal return of −9.25 per cent. April produced a near-zero abnormal return of 0.05 per cent. Negative abnormal returns reappeared in May (−2.18 per cent) and June (−1.40 per cent). The cumulative abnormal return reached −12.77 per cent by June. The similarity between the two indices suggests that the result is not confined to one market benchmark.

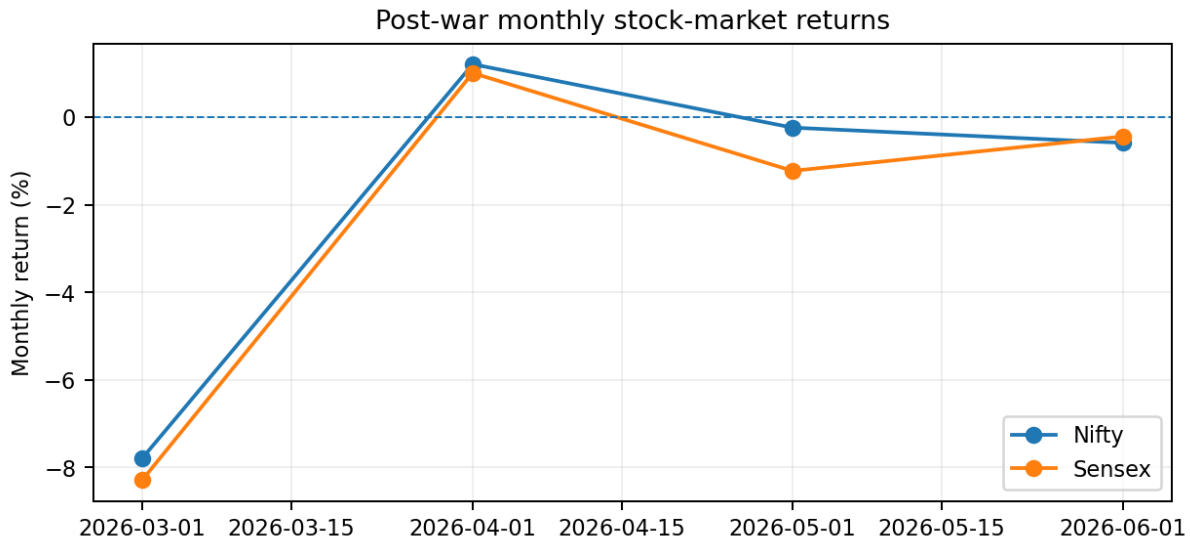



**Figure 16.** Monthly equity-market returns during the post-war period.

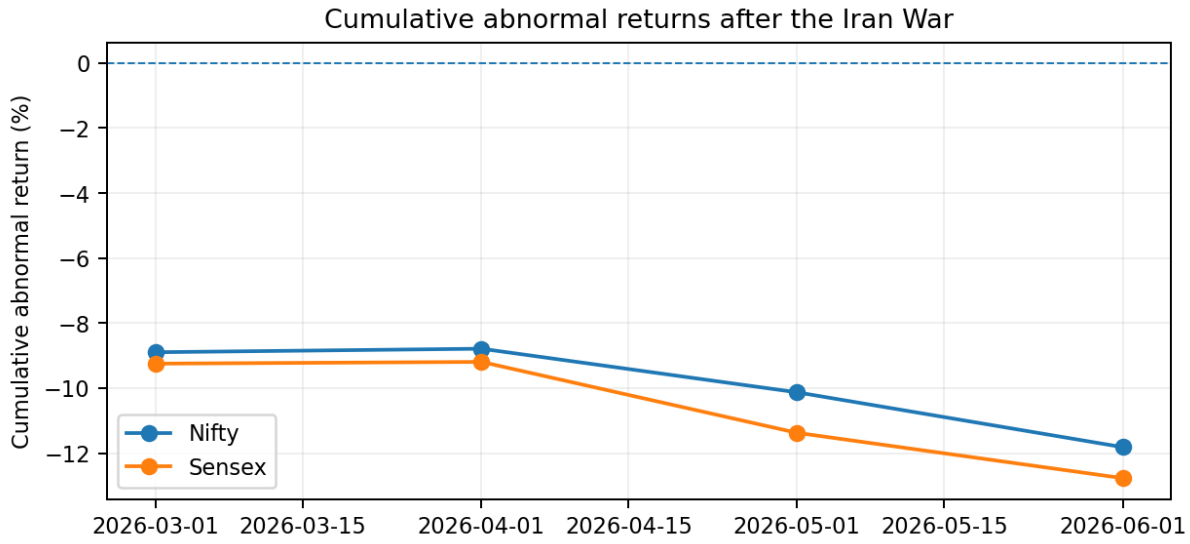



**Figure 17.** Cumulative abnormal returns following the Iran War.

Interpretation. The event-study evidence indicates a pronounced negative financial-market response immediately after the outbreak of the Iran War. The March shock is considerably larger than the normal monthly return benchmark for both indices. The partial recovery in April was insufficient to eliminate the cumulative loss, and further negative abnormal returns in May and June pushed CAR deeper into negative territory. The persistence of negative CAR is consistent with investors pricing continuing uncertainty over energy costs, external balances, exchange-rate pressures and the broader geopolitical environment.

Statistical interpretation. The March abnormal return is statistically significant for both indices at well below the 1 per cent level. April is not significant for either index. May is significant for both, while June is significant for both at the 5 per cent level. Thus, the evidence does not indicate a uniform negative reaction in every month; rather, it shows a very large initial shock followed by an incomplete recovery and renewed negative deviations.

Relation to the petroleum evidence. The financial-market response complements the petroleum-sector findings reported in the preceding sections. The crude-price and external-sector shocks were accompanied by a substantial deterioration in equity-market performance. This suggests that the effects of the conflict were not confined to the petroleum market: investors also incorporated the perceived implications for corporate costs, inflation, the exchange rate and India's external position.

Limitation. This is a monthly event study, not a high-frequency event study. Monthly averages cannot isolate the precise market reaction on 28 February or the following trading days, and other contemporaneous domestic and international events may have influenced returns. The CAR should therefore be interpreted as evidence of an abnormal post-event movement rather than as a pure causal estimate of the Iran War's effect on Indian equities. A daily-data event study could be added in a future extension if daily Nifty and Sensex observations are obtained.

Conclusion. The evidence indicates a substantial adverse response of India's equity market following the outbreak of the Iran War. Both the Nifty and Sensex recorded large negative abnormal returns in March 2026 and remained below their pre-event return benchmark over the subsequent months, resulting in cumulative abnormal returns of −11.82 per cent and −12.77 per cent, respectively, by June. The results support the view that financial markets perceived the conflict as a material economic shock, particularly through energy prices and external-sector uncertainty. The finding adds an important financial-market dimension to the study's broader assessment of India's resilience and adjustment to the geopolitical shock.

## 6 Policy implications

The empirical findings suggest that India's petroleum policy during geopolitical disruptions should focus not only on securing crude supplies but also on strengthening the country's ability to convert refining capacity into downstream trade opportunities. The results show that the Iran-War shock substantially increased crude prices and import costs, while physical crude imports and refinery throughput remained comparatively resilient. At the same time, the evidence of increased petroleum-product exports is not yet statistically conclusive. The appropriate policy response should therefore strengthen capabilities that are already demonstrated rather than assume a permanent export opportunity.

### 6.1 Maintain and institutionalise crude-supply diversification

India should maintain a diversified portfolio of crude suppliers rather than becoming excessively dependent on any single source. The observed shift towards Russia within the selected supplier group indicates that Indian refiners were able to substitute suppliers when international conditions changed. Government and refiners should therefore maintain multiple sourcing channels covering Russia, the Middle East, the United States and other commercially viable suppliers. Long-term contracts should be complemented by flexible spot-market procurement so that refiners can respond rapidly to geopolitical disruptions.

### 6.2 Build a strategic crude-procurement and inventory buffer

Since the principal impact of the conflict was transmitted through higher crude prices and import expenditure rather than a collapse in physical availability, India should strengthen its ability to absorb temporary price and supply shocks. This can be achieved through better utilisation of strategic petroleum reserves, commercially managed inventories and advance procurement arrangements. A modest increase in buffer stocks before periods of heightened geopolitical risk could reduce the need for expensive emergency purchases.

### 6.3 Protect refining resilience as a strategic economic asset

The stability of refinery throughput during the shock is an important finding of the study. Refining capacity should therefore be treated not merely as domestic energy infrastructure but also as a strategic economic asset. Policies should support regular refinery maintenance, operational flexibility, access to diverse crude grades and rapid logistical arrangements for crude and product movement. Avoiding unnecessary disruptions to refinery operations during geopolitical crises should be a priority.

### 6.4 Develop a rapid-response framework for petroleum-product exports

The geopolitical-arbitrage regression indicates that the relationship between refinery throughput and petroleum-product exports became stronger in the post-war observations, although the result remains preliminary. India should therefore establish a flexible mechanism allowing refiners to redirect surplus or commercially available refined products towards international markets when regional shortages arise. This could include faster export clearances, real-time market intelligence and streamlined port and logistics coordination, while ensuring that adequate domestic supplies remain available.

### 6.5 Balance export opportunities with domestic energy security

Export expansion should not be pursued at the expense of domestic availability or price stability. Since domestic petroleum consumption increased during the post-war period, export decisions should be linked to domestic stock levels and consumption requirements. A transparent trigger-based system could permit greater exports when domestic inventories are adequate and temporarily moderate exports when domestic supply conditions become tight.

### 6.6 Strengthen protection against oil-price and exchange-rate shocks

The ITS results show significant transmission of the shock into the INR/USD exchange rate and fuel-related prices. India should consequently strengthen financial and commercial risk-management practices among refiners and major petroleum importers. Greater use of appropriate hedging instruments, diversified payment arrangements and flexible procurement contracts can reduce exposure to sudden movements in crude prices and exchange rates.

### 6.7 Establish a petroleum geopolitical early-warning system

The experience of 2026 demonstrates the value of continuous monitoring of geopolitical developments, crude prices, shipping risks, supplier availability, refinery margins and international product shortages. A coordinated petroleum-market monitoring mechanism involving relevant government agencies and industry could provide early warnings and trigger predefined procurement, inventory and export responses.

### 6.8 Monitor the emerging geopolitical-arbitrage opportunity

Finally, policy should recognize that India's refining system may provide an opportunity to capture value from temporary disruptions in international petroleum markets, but this opportunity should not yet be treated as an established structural effect. The present post-war sample covers only March–June 2026, and the ITS analysis does not establish a statistically significant sustained increase in petroleum-product exports. The appropriate policy is therefore to build the capability, monitor the evidence and scale the response as longer-term data confirm the opportunity.

### 6.9 Overall policy direction

The evidence supports a three-part policy strategy:

Diversify crude supplies → protect refining resilience → respond flexibly to international product-market opportunities.

Such a strategy would reduce India's vulnerability to geopolitical oil shocks while allowing its substantial refining capacity to function as a source of economic and trade resilience. The objective should not be to profit from conflict, but to ensure that India can minimize the cost of disruption and maximize legitimate value creation through resilient refining and international trade.

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