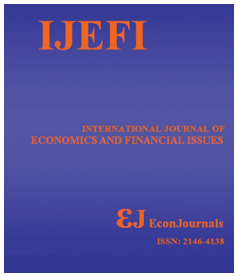


International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2025, 15(6), 306-318.

A Statistical Analysis to Assess the Impact of India's Export Potential in Petroleum Products and Real Effective Exchange Rate on GCC Countries

Haris Noor[1], Ahmad Raza[2], Md Imran Khan[3], Abdulrahman Alomair[4]*, Muhammad Azhar[1]

[1]Department of West Asian and North African Studies, Aligarh Muslim University, Aligarh, Uttar Pradesh, India, [2]Department of Economics, Jamia Millia Islamia, New Delhi, India, [3]New Delhi Institute of Management, New Delhi, India, [4]Department of Accounting, Business School, King Faisal University, Al-Ahsa, Saudi Arabia. *Email: aamalomair@kfu.edu.sa

Received: 04 May 2025 **Accepted:** 18 September 2025 **DOI:** https://doi.org/10.32479/ijefi.20627

ABSTRACT

This study explores how the economic growth of the gulf cooperation council (GCC) countries is affected by India's petroleum product exports and the real effective exchange rate (REER). Annual time series data from 1995 to 2025 are used for empirical support, and the panel autoregressive distributed lag model is used with gross domestic product (GDP) as a dependent variable, serving as a proxy for the economic growth of the GCC. For explanatory variables, the highest exported petroleum product from India to GCC countries and India's real effective exchange rate are used to determine the short and long-run relationship with the GDP of GCC countries. The findings reveal that petroleum product exports to the GCC countries and the real effective exchange rate significantly impact the GCC countries' GDP in both the short and long run. Lastly, the Breusch-Pagan test provides evidence of no heteroscedasticity issues, and the Pesaran LM test shows no cross-sectional dependence. In addition, the RESET test confirms the overall model stability in the regression analysis without any misspecification or errors. Unidirectional causality is confirmed through the Granger test, where petroleum product exports and the real effective exchange rate affect the GDP of the GCC countries.

Keywords: Gulf Cooperation Council, Real Effective Exchange Rate, Gross Domestic Product, Petroleum Products, Panel ARDL
JEL Classifications: F14, F31, O53, Q43

1. INTRODUCTION

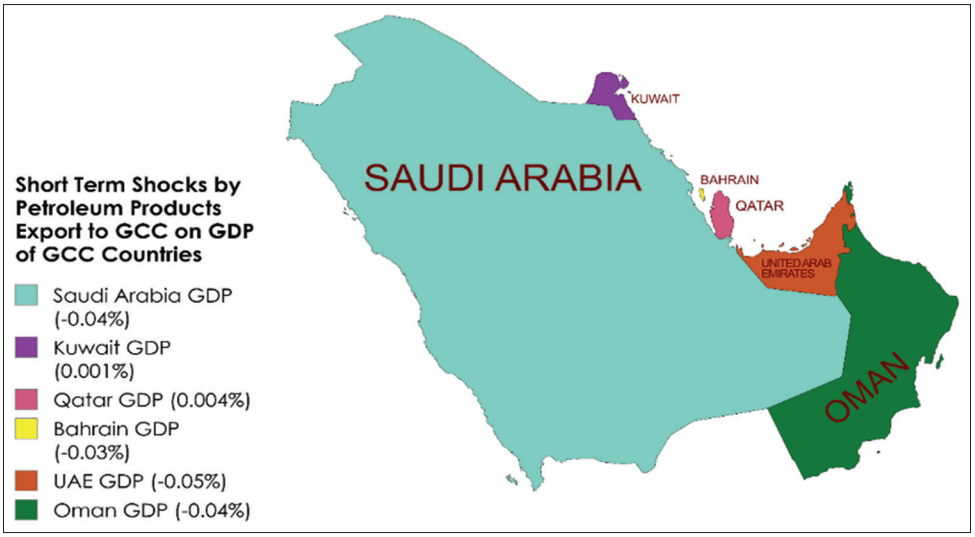
The worldwide oil demand has risen, and after reforming its petroleum industry, India has experienced growth in exports of petroleum products. India imports crude oil from different countries and new sources. This increases the refining capacity and export from India, which affects the economic growth of the importing countries, such as the Gulf Cooperation Council (GCC) countries, where India's exports of petroleum products are in large volumes. The petroleum industry in India demonstrates both innovative strength and adaptability by continuing to evolve to meet international and national energy requirements. Technology and new policy initiatives are the main drivers of the significant transformations experienced by India's petroleum industry (Azhar, 2021). Economic liberalization in the 1990s enabled private sector development and increased foreign investments in the GCC and India (Noor and Noor, 2024). India's exploration and refining activities depend heavily on the contribution of public sector undertakings, including the Oil and Natural Gas Corporation (ONGC) and the Indian Oil Corporation (IOC). The Jamnagar refinery in Gujarat represents one of India's state-of-the-art refineries, strengthening its refining capabilities and turning the country into a leading Asian refining centre. The National Exploration Licensing Policy (NELP), launched by the government, serves as an incentive to boost exploration operations nationwide. The Ministry of Statistics and Programme Implementation reports

that the gross value addition (GVA) for coke and refined petroleum products manufacturing rose from Rs.1.56 lakh Crore in 2012-2013 to Rs.2.12 lakh Crore in 2022-2023 (first revised estimates), leading to an increase in GDP from Rs.99.44 lakh Crore to Rs.269.49 lakh crore at current through exploration refining distribution and retail activities. This industry employs millions directly and indirectly. The value chain works with supporting industries, including petrochemicals, logistics, and manufacturing. The sector strengthens economic and social stability by developing skills and offering various professional possibilities. Global data places India among the world's leading refining countries because of its strong infrastructure and advantageous geographical position. Refined petroleum products comprise the seventh-largest category in the global export market. The industry demonstrates sustainability and innovation commitment through bio-refinery projects and compressed bio-gas (CBG) development. India's petroleum product exports to the Persian Gulf, especially in the GCC region, have risen due to the increasing demand for oil products for daily consumption, affecting the GCC's economies as well. Furthermore, the economic growth (GDP) of the importing region, GCC, is affected by the rise in India's real effective exchange rate. In the long run, the GCC countries' GDP is positively affected by the increase in India's real effective exchange rate. The exchange rate affects different nations and their GDP (AbuDalu et al., 2014). The Indian rupee achieves enhanced potency during increases in the real effective exchange rate (REER) value. Changes across industries have their economic movements controlled by the REER. Rupee appreciation damages India's export trade and diminishes work opportunities and foreign money transfer. Export performance increases when the Indian rupee weakens, as it drives job creation and higher foreign income receipts sent through remittances. Indian and Gulf policymakers must obtain information on economic changes to select choices that maximize national advantages (Singh and Kumar, 2022). Most of the time, the rise in India's real effective exchange rate will impact foreign countries and their GDP.

These exports from India will affect GCC countries' economic growth (GDP). The GDP of GCC countries is affected by many factors, such as natural gas imports and carbon dioxide CO_2 emissions, globalization, human capital, and innovation (Abdalla and Abdelbaki, 2014). In this study, petroleum product exports from India and the real effective exchange rate also affect macroeconomic factors in the GCC region, such as inflation and real GDP growth, which are shown in Figures 1A and 2A in the appendix with a global shock over the time span 1995-2025. The panel cross-sectional approach was used by Ahmed (2020) to determine stock market reactions to domestic areas during the study. Few studies on petroleum exports from India have been empirically tested, and on how importing economies are affected by these exports. The short and long-run asymmetric impacts of oil prices, oil revenues, and gas revenues on the real GDP of Qatar found that the energy sector played a crucial role in Qatar's economic diversification and growth (Charfeddine and Barkat, 2020). The objective of the paper is to analyse the more sophisticated association between the short and long-run impacts of petroleum product exports and the real effective exchange rate on the economic size (GDP) of the GCC countries. Previous studies have not discussed the impact of petroleum product exports from India and how India's real effective exchange rate will affect oil-exporting countries such as the GCC. Prior studies on India's oil and petroleum product exports are primarily theoretical (Ahmed and Nazir, 2016). No study has discussed how both increasing India's export of petroleum products and the real effective exchange rate of India affect the GCC countries in the short and long run, which are major oil-exporting economies.

Figure 1 shows the short-run effect of petroleum product exports to GCC countries. Meanwhile, in the long run, the impact of petroleum product exports to the GCC countries is positive and significant. Table 1 shows the negative short-run coefficients and the long-run positive coefficient of the GDP of the GCC countries. Due to the short-run effect of petroleum product exports, the GDPs of the United Arab Emirates, Saudi Arabia, and Oman were affected in the short period the most, while Kuwait and Qatar were not affected, as shown by the negative coefficient signs in Figure 1 and Table 1.

Figure 1: Short-term shocks on the economies of gulf cooperation council countries from India's petroleum products export to GCC countries



Source: Authors

In Figure 2, the real effective exchange rate of India affects Kuwait's GDP; as a unit percent increase in the real effective exchange rate of India, the GDP of Kuwait decreases by −1.34. Saudi Arabia and Oman are highly affected by India's real effective exchange rate. A unit increase in India's real effective exchange rate causes Saudi Arabia's and Oman's GDP to decrease by −1.17. Bahrain's GDP declines by −0.55% with a unit percentage increase in the exchange rate, and the UAE's GDP falls by −0.91%. A prior study uses a time series approach and finds that the real effective exchange rate is a determining factor for trade, productivity, and economic growth in the UAE (Kahsay and Patena, 2020), while the exchange rate of misalignment causes a negative and significant effect in Arab countries, as found by Elsherif (2024). Oil prices affect the exchange rate and growth in OPEC members, as mentioned in prior studies (Baek, 2021). The panel ARDL technique is used to determine the effect of REER on the association of southeast asian nations (ASEAN-5) countries' economic growth. In the short run, it has an adverse effect, while in the long run, it has a positive effect. This study also found a negative impact of the real effective exchange rate on the GDP of the GCC countries in the short term, and in the long run, it has a positive effect, as shown in Figure 2 and with negative impact signs and in Table 1. The remainder of this paper is organized as follows. Section 2 reviews the literature on previous studies. Section 3 presents the data and methodology. Section 4 presents the results of the study. Finally, Section 5 concludes the study.

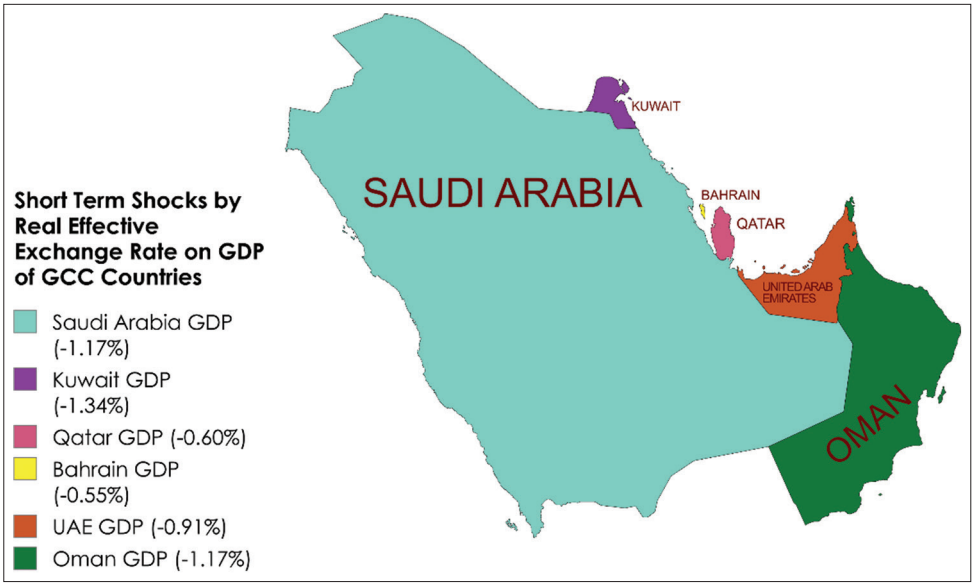
Table 1: Short and long-run effects on GDP of GCC countries

GDP of GCC	Variable	Coefficients	Standard error	t-value	P-value
UAE	COINTEQ01	−0.66	0.01	−36.96	0.00***
	D (LNPETEX)	−0.05	0.00	92.88	0.00***
	D (LNREER)	−0.91	0.18	−4.85	0.016**
Oman	COINTEQ01	−0.58	0.01	−34.87	0.00***
	D (LNPETEX)	−0.04	0.00	−69.97	0.00***
	D (LNREER)	−1.17	0.26	−4.85	0.020**
Qatar	COINTEQ01	−0.21	0.00	−38.04	0.00***
	D (LNPETEX)	−0.004	0.00	3.41	0.042**
	D (LNREER)	−0.60	0.00	−1.99	0.00***
Bahrain	COINTEQ01	−0.50	0.01	−47.50	0.00***
	D (LNPETEX)	−0.03	0.00	−126.81	0.00***
	D (LNREER)	−0.55	0.10	−5.13	0.014**
Kuwait	COINTEQ01	−0.45	0.02	−17.57	0.00***
	D (LNPETEX)	0.001	0.00	2.82	0.00***
	D (LNREER)	−1.34	0.00	−4.85	0.00***
Saudi Arabia	COINTEQ01	−0.50	0.01	−35.17	0.00***
	D (LNPETEX)	−0.04	0.00	−66.83	0.00***
	D (LNREER)	−1.17	0.25	−4.54	0.019**
GCC	LNPETEX	0.18	0.01	16.59	0.00***
	LNREER	1.47	0.22	6.68	0.00**

P-value* 10% level, P-value ** 5% level and P-value *** 1% level
Source: Authors

The methodology and the focus on India-GCC trade dynamics are the two primary ways in which this paper adds to the literature. The study has structural reliability in methodological contribution, including the use of the panel autoregressive distributed lag (ARDL) model to investigate the short-run and long-run dynamics among the India-GCC exports of petroleum products, India real effective exchange rate (REER), and the GDP of six GCC countries and robustness checks involving the stationarity tests, the analysis of the cointegration, and the diagnostic checks of heteroscedasticity, cross-sectional dependence, multicollinearity, and the misspecification. These confirm that there is no spuriousness between the relationships estimated. In addition, the Granger model incorporates unidirectional causality of the Indian export of petroleum and the REER to the GDP of the GCC, hence, complementing the meaning of directional economic relationships. Prior research on India's petroleum exports to GCC countries was largely theoretical, or focused only on oil price shocks and GCC's own exports. This study adds empirical depth by modelling how India's export potential and REER directly influence GCC economies, an aspect neglected in earlier works. Focusing on the commerce between India and the GCC, this paper is unique in

Figure 2: Short-term shocks on the economies of the gulf cooperation council countries by REER



Source: Authors

that it examines the importing end (GCC economies) of Indian petroleum exports and how the growth of the GCC reacts to the refining and exporting capacity of India. The role of GCC as an oil exporter is the most common subject of the literature, and this one turns the discussion around. It shows that the exports of petroleum in India first have a negative short-run effect on GCC GDP (because of adjustment costs and importation pressures), but also a positive long-run effect as the cheaper imported refined products replace the domestic refining expenses, whereby GCC growth is increased. This paper demonstrates that fluctuations in the REER of India in spill-over effects negatively influence GCC economies in the short run (through the impacts on trade competitiveness) but positively in the long run (through the import dependence effects on GCC growth). The findings indicate the role of trade agreements (e.g., CEPA), tariff changes, and exchange rate management in improving Indo-GCC trade. It emphasizes that India's ability to refine is a direct contribution to the diversification of the economy of the GCC. This paper builds on the existing empirical data on the relationship between the refining-export capacity of India and its exchange rate performance and the macroeconomic path of GCC countries by using a stringent econometric framework to apply to the underexplored trade flows. It fills a research gap between energy trade research (typically export-focused on GCC) and the exchange rate-growth literature; the India-GCC petroleum trade is a two-way driver of growth in global trade. The choice of the time horizon starting point of 1995 is indicative of the impact of the 1991 economic liberalization of India and subsequent changes in the petroleum sector, such as the National Exploration Licensing Policy (NELP) and expansion of the private refinery, such as the Jamnagar refinery operated by Reliance. This is the start of the transition of India into a petroleum product-exporting nation. Full information regarding the petroleum product exports of India, real effective exchange rate (REER), and GCC GDP is regularly available since the mid-1990s, which can be robustly estimated using the panel method. The horizon till 2025 is considered to include the predicted and recent data, which will allow this study to reflect the current trends and structural changes in India-GCC trade relations, rather than limit the analysis to shocks of the past. The dataset contains significant world shocks: The Asian crisis (1998), the global financial crisis (2008), the oil price crash (2014), and the COVID-19 pandemic (2020). These events add up to make sure that the model is able to capture both long-term adjustments and short-term disruptions in the trade flows and GDP response. The era reflects the growth of India into one of the largest refining centres in the world (e.g., the Jamnagar complex was commissioned in 1999, and thereafter further expansion happened during the 2000s and 2010s). The horizon cuts across three decades indicating early capacity-building stages and the full-fledged export-oriented stage of the Indian petroleum industry. It is reasonable to use the horizon (1995-2025) as its focus covers both the main periods of refinery-based exports growth in India, incorporates significant oil price shocks, and captures the initial phases of GCC diversification efforts, even though future researchers might need to go beyond 2025 to comprehensively evaluate efforts such as Vision 2030.

When the REER increases (appreciation of the rupee in real terms), it increases the price of Indian exports in terms of foreign currency. Reduces the overall competitiveness of India's exports because the buyers in foreign countries have increased costs. Usually, this would cause the volume of exports to reduce. The reduction in REER (weakening of the rupee in real terms) will make Indian goods (including petroleum products) cheaper to foreign consumers. Enhances export competitiveness, which induces more demand in an overseas country. This is especially powerful in price-sensitive markets. Structural and strategic factors influence the demand for GCC on Indian petroleum products, and this can make it less sensitive to changes in the REER than the rest of the world. GCC economies are strategic and necessity imports even though they are crude exporters of petroleum products. They bring in refined petroleum products (e.g., diesel, aviation turbine fuel) due to their cheaper and quicker production than the construction of domestic refining capacity to meet all the requirements. This implies that demand is not as price elastic as with normal exports to manufacturing. The geographic location of India to the GCC also lowers the transport costs and deliveries compared to competitors (Europe, the US, and East Asia). With a stronger price increase in India, the GCC states can still choose to use Indian refined products because of the logistics, reliability, and the already existing contracts. Although most GCC countries are exporters of crude, not all of them have the downstream refining capacity to meet the domestic mix demand. India, as an example, has ultra-modern refineries (e.g., Jamnagar) that manufacture high-value petroleum products, which GCC continues to import. This structural dependence reduces GCC price sensitivity. GCC countries are diversifying, yet in the short to medium term, their economies continue to be overdependent on imports of refined fuels to supply industrial and consumer needs. This means that REER changes can have less or more dissimilar effects than those in countries where petroleum imports are entirely price-driven. In India and GCC, the trading relations are withstanding (e.g., Comprehensive Economic Partnership Agreements). Such contracts will neutralize the impact of REER adjustments, as tariffs, quotas, or long-term supply contracts provide more or less constant flows. Higher REER is weakening export competitiveness, lower REER is strengthening it, and in the case of GCC, the reaction is less elastic and more unequal since imports are determined by logistics, refining complementarities, and strategic energy requirements, as compared to pure price competition. Therefore, GCC import behaviour may diverge from world averages: India's petroleum exports to GCC can remain resilient even during REER appreciation, while global demand may fall more sharply.

2. REVIEW OF LITERATURE

In this study, prior literature based on exchange rate, export, import, inflation, and other variables that affect the economic size of the GCC and other countries is examined, and how econometric methods are used in previous literature are critically analyzed. The real effective exchange rate is characterized by a positive asymmetric effect on Saudi non-oil exports that deteriorate rapidly above the threshold of 136.08. Positive shocks to the REER lead to a severe reduction in non-oil exports, while the latter do not generate any significant effects. Other factors, such as foreign income, domestic capacity, and openness, have a positive impact on non-oil exports. In contrast, government expenditure hurts them

in the long run. The findings may be specific to Saudi Arabia and may not be generalized to other countries with different economic structures and conditions (Ashour, 2023). The GCC countries depend on oil and gas (their principal exports), and consequently, they are exposed to price variations in the international market. Oil shock responses in each GCC country are widely different, implying that there are diversified transmission mechanisms. The structural vector autoregression (SVAR) framework was used in this study to analyse the effects of oil shocks and policy implications. Overall, oil price shocks greatly impact the GCC nations economic growth, price stability, and trade balance. The study uses historical data and may not represent the dynamics of recent markets or the current geopolitical changes in the context of oil prices and GCC economies. The SVAR framework may limit the comprehensiveness of accounting for the complexities of oil shocks and their effects on various GCC nations. The focus on oil shocks may ignore other major determinants that drive the economies of GCC states, such as diversification efforts and external economic factors (Nasir et al., 2019). The study by Barkat et al. (2024) examines how the nominal effective exchange rate (NEER) affects the trade balance in the GCC countries between 2000 and 2017, whereby the J-curve effect holds, that is, currency depreciation fails to improve the trade position during the early period favourably, but in the longer term, it improves. The reaction of the trade balance to increases in NEER (depreciation) is higher than the response to decreases in NEER (appreciation), showing a greater market response to the depreciation. In the short term, the results confirm the J-curve hypothesis, where immediate degradation of the trade balance occurs because of rapid adjustments in import prices. The analysis considers the cross-sectional dependence across the GCC countries, implying a long-run relationship among the variables under study. However, a study has insignificant variables for individual countries (p-values of the exchange rate and GDP of Bahrain, Oman, and Kuwait), which can result in biased results. One study examines the market size of ASEAN member countries, which produces positive benefits for India's petroleum export levels. The analysis reveals that higher population income levels significantly decline petroleum exports in India. The literature states that higher tariff rates strengthen India's petroleum export performance, but population reductions decrease the demand for petroleum products. The model estimates within the study lack an analysis of price variations that might affect India's petroleum market exports. The study omits an essential analysis of how domestic and overseas prices affect petroleum product exports, despite their vital nature in private refinery choices (Alam et al., 2025). Some research has been conducted to determine the impact of COVID-19 on Indian oil and petroleum products during import and export operations. This research demonstrates that import-export operations generate economies of scale and industrial development, specifically within the oil and gas industry. This study examined petroleum product and crude oil manufacturing patterns, consumption rates, and market exchange rates before and after the COVID-19 outbreak. The study investigates the relationship between COVID-19 and petroleum products and crude oil trading in India, but does not consider other economic effects. Limited analysis of import-export petroleum product dynamics emerges from this research's exclusion of key variables (Kulkarni et al., 2023). Many studies have been conducted on the effect of the GDP of GCC countries, analysing the connection between real GDP, CO_2 emissions, and energy usage patterns in six GCC countries from 1960 to 2013. Data analysis reve1als strong evidence that the data contain unit roots, suggesting non-stationarity. The study shows that Oman has a long-term connection between its variables. However, Kuwait and Qatar, together with Oman, demonstrate that energy use impacts GDP according to the "growth hypothesis." The research shows that Bahrain follows a "conservation hypothesis" because GDP controls energy use patterns. The study indicates that unified energy policies lack effectiveness in GCC countries because of the differing causal relationships between variables. The research data for Kuwait between 1992 and 1994 remains incomplete, leading to potential consequences for the analysis and results of this particular country. These research findings only apply to the six GCC countries and are irrelevant to other areas or nations implementing different economic systems and energy policies (Magazzino, 2016).

Some studies, such as Baydoun and Aga (2021) evaluated the impact of energy utilization and economic expansion, financial development, and globalization on CO_2 emissions within Gulf countries from 1995 to 2018 by implementing a cross-sectional autoregressive distributed lag model. The research revealed that economic growth and energy use are detrimental to environmental sustainability, whereas globalization supports ecological sustainability. The factors studied in this study have permanent associations with CO_2 emission levels. The results demonstrated that countries produce pollution mainly through their energy systems and consumption practices, as well as experiencing the dual effects of economic expansion and CO_2 emissions. The period from 1995 to 2018 in the dataset used might not show current emissions trends and their factors in the GCC nations. These results only apply to GCC countries, whereas other regional and national contexts with different economic and environmental factors may present limitations for broad generalization. The analysis fails to include every variable affecting CO_2 emissions, which produces incomplete results regarding the examined relationships. This study critically analysed the studies of panel ARDL, which do not account for both short and long-term impacts on the GDP of countries by the exchange rate and other macroeconomic drivers of growth, and also, the studies are not diversified (AbouElseoud and Alkhaldi, 2023). All the previous literature works critically examined in this study rarely used empirical estimation to answer the short and long-run effects on the GDP of the GCC countries (Hidthiir et al., 2024) and (Okunade et al., 2018). This study deeply analyses the short and long-run impact on the GDP of the GCC countries from petroleum product exports to the GCC countries and the rise in India's real effective exchange rate. The shortfalls of previous literature and this research gap need to be addressed. This study uses the best empirical estimates through panel ARDL, which affirms the impact of selected macroeconomic regressors over the short and long run on the countries of the GCC.

3. ECONOMETRIC METHODOLOGY

In this study, the panel ARDL method is used to determine the impact of petroleum product exports to the GCC and India's real

effective exchange rate on the GDP of the GCC countries in the short and long run. The dependent variable is the GDP of six selected GCC countries: the UAE, Saudi Arabia, Qatar, Kuwait, Bahrain, and Oman. There were two independent variables. First, petroleum product exports function as the entire category of petroleum products exported to GCC countries, and the real effective exchange rate of India is the second independent variable in this analysis. Annual time series data from 1995 to 2025 are used for the empirical study in the panel ARDL. To fulfil the prerequisites for panel ARDL, the stationarity of the variables and cointegration were examined. After affirming the stationarity and cointegration, the panel ARDL was executed to determine the short- and long-run effects of petroleum product exports and the real effective exchange rate. The short-run effects of petroleum product exports and the real effective exchange rate on GCC countries are shown in Figures 1 and 2. Furthermore, the long-run impact on the GCC countries is shown in Figures 3 and 4. The panel ARDL model in this study used automatic lag selection, as shown in Figure 5. A statistical evaluation of the data variables produced essential information about the average measurement points from the study period. The statistical results of the variable characteristics and data sources are presented in Tables 2 and 3. In Table 3, the mean and median scores exhibit positive results for all measured variables while maintaining moderate assessment levels across all variables. Most of the distribution points of the variables showed normal distribution behaviour based on the Jarque-Bera test probabilities. Limited deviations from the normality patterns existed within the collected data variables. The correlation matrix of the variables is presented in Table 3. The research variables did not encounter multicollinearity because all correlation values remained below 0.7. Exporting petroleum products to GCC countries has demonstrated a substantial, continuous increase based on data analysis across extended ranges and higher variations in export quantity.

3.1. Test for Stationarity

Before executing the Panel ARDL estimates, the stationarity of all the variables needs to be tested, whether they are stationary over time or not (Lau et al., 2019). Table 4 reports the stationarity of the variables on the first difference I (1) for all the variables, which suggests that the variables LNGDPGCC, LNPETEX, and LNREER are stable over time. The Levin, Lin, and Chu test, LM Pesaran and Shin W-stat, ADF- Fisher Chi-square test, and PP – Fisher Chi-square test are mentioned in Table 4 with symbols I (0) and I (1). As all the test statistics are significant at the first difference I (1) and the P-value of all the tests is <0.05, this means each variable time series does not have a unit root and is stationary. As the variables are stationary now, the next step is to run the panel co-integration to check the long-run existence of the variables.

3.2. Test for Cointegration

To test the cointegration to affirm the long-run association between the dependent variable, GDP of GCC countries, and the independent variables, petroleum product exports and real effective exchange rate, a panel cointegration test is applied as suggested by Pedroni (2004) and Kao (1999). Table 5 reports the panel cointegration results based on both Pedroni and Kao. All seven tests under Pedroni cointegration estimates are statistically

Figure 3: Long-run impact of petroleum product exports on the GDP of the GCC

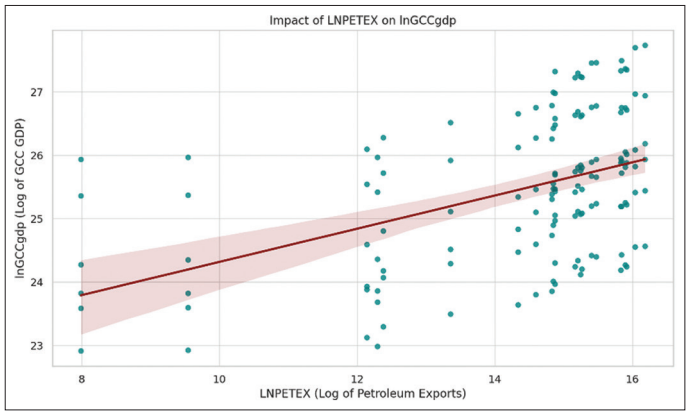


Figure 4: Long-run impact of REER on GDP of GCC

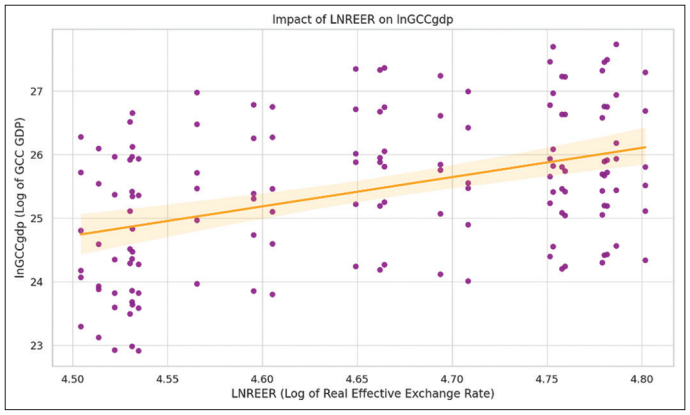
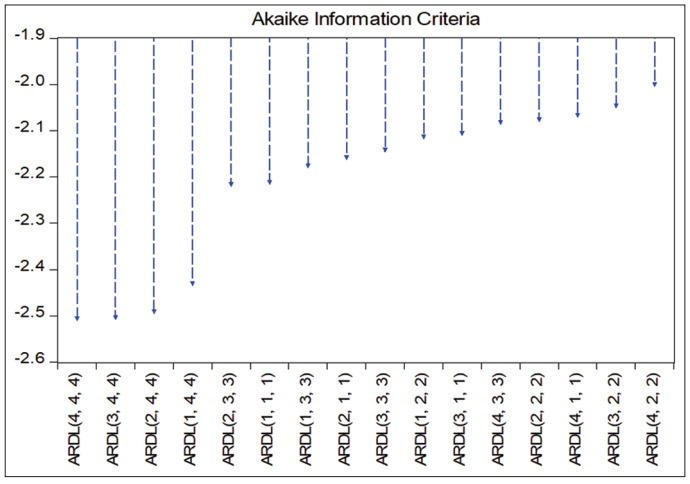


Figure 5: Lag selection order of ARDL model based on the akaike information criterion



Source: Authors

significant based on different test statistics, with weighted test statistics, which reveal the long-run relationship between the variables. The Kao test, based on the ADF test, also divulges the same results, where the p-value of the test is <0.05, which leads to the rejection of the null and acceptance of the alternative hypothesis of cointegration among variables. The panel ARDL by Pesaran and Smith (1995) explains the cross-sections in the ARDL panel for short-run and long-run models. Other researchers

(Ahmed and Khalifa, 2024; Ulussever et al., 2024; Yasser et al., 2024) used panel ARDL approaches to solve variable associations with automatic lag selection in the model (Osmanovic and Alvi, 2022) and determined that foreign direct investment inflows, energy imports, stock investment, and oil are central determinants of GCC countries' economic growth.

The hypotheses formulated in this study are as follows:
Ho_1 - India's exports of petroleum products have no effect on the GDP of GCC countries in the short and long run
H_{A1} - India's exports of petroleum products affect the GCC countries' GDP in the short and long runs.
Ho_2 - The real effective exchange rate of India has no effect on the GCC countries' GDP in the short and long run
H_{A2} - The real effective exchange rate of India affects the GCC countries' GDP in the short and long run.

Table 2: Variables and data sources

Code	Description	Data Source
LNGDPGCC	Log of GDP of the GCC countries.	Gross domestic product at current US Dollar taken from World Development Indicators.
LNPETEX	Log of Total Petroleum Products Exports to GCC.	Value in Lakhs of Rupees taken from the Ministry of Commerce and Industry, Government of India.
LNREER	Log of Real Effective Exchange Rate in Rupees per Dollar.	Taken from Bruegel Think Tank.

Source: Authors

Table 3: Panel unit root estimates

Summary	LNGDPGCC	LNPETEX	LNREER
Mean	25.44	14.31	4.65
Median	25.46	15.02	4.66
Maximum	27.73	16.18	4.80
Minimum	22.91	7.98	4.50
Standard deviation	1.15	2.04	0.10
Skewness	−0.09	−1.75	−0.10
Kurtosis	2.26	5.39	1.41
Jarque-Bera	3.47	108.23	15.31
Probability	0.17	0.00	0.0004
Sum	3664.41	2061.021	670.57
Sum Sq. Dev.	191.97	596.83	1.59
Observation	180	180	180
LNGDPGCC	1.00		
LNPETEX	0.46	1.00	
LNREER	0.41	0.69	1.00

Source: Authors

3.3. Empirical Model

The following equation specifies the Panel ARDL model:1)

$$\Delta y_t = \alpha_o + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \sum_{i=1}^{p} \delta_i \Delta x_{t-i}$$

$$+ \sum_{i=1}^{p} \varepsilon_i \Delta z_{t-i} + \lambda 1 y_{t-i} + \lambda 2 x_{t-i} + \lambda 3 z_{t-i} + \mu_t \quad (1)$$

Here, the variable being tested is yt, and λ1, λ2, and λ3 are long-run coefficients, and βi, δi, and εi are short-run dynamics coefficients where α0 and μt are constants and error terms, respectively.

$$\Delta lnGDPGCC = \alpha o + \sum_{i=1}^{p} \beta_i \Delta lnPETEX_{t-i}$$

$$+ \sum_{i=1}^{p} \delta_i \Delta lnREER_{t-i} + \lambda 1 lnpetex_{t-i} + \lambda 2 lnreer_{t-i} + \mu_t \quad (2)$$

In Equation 2, Lngdpgcc is the GDP of the selected GCC countries in the dataset. LNPETEX is the total export of petroleum products from India to all GCC countries, and LNREER is India's real effective exchange rate, as shown in Table 2. Finally, μt denotes the stochastic error terms with white noise properties and explains the unexplained parts of the model. Variables were transformed into logarithmic forms, as log transformation reduces dispersion in the data and improves efficiency.

4. RESULTS AND DISCUSSION

The current analysis uses the panel ARDL to determine the short and long-run dynamics, which are mentioned in Equations 1 and 2. The empirical results show that the regressors used, which were the real effective exchange rate and petroleum products export, are statistically significant. The petroleum product exports to the GCC from India will also harm the GDP of GCC countries in the short run. The most important effect of India's export potential of petroleum products is on the economy of the United Arab Emirates. The short-run impact on the economy of the UAE is shown in Table 1. There is an adverse effect of -0.05% on the GDP of the United Arab Emirates as petroleum product exports by India to GCC increase by a unit percentage due to the import of oil and its products from India by GCC nations due to refined oil demand, which shortly affects the GDP to decline. The economy's GDP is affected by the

Table 4: Panel unit root estimates

Test	Levin, Lin and Chu		LM Pesaran and Shin W-stat		ADF - Fisher Chi-square		PP - Fisher Chi-square	
Variables	Stats	P-value	Stats	P-value	Stats	P-value	Stats	P-value
LNGDPGCC I (0)	−3.93	0.90	−1.17	0.12	15.96	0.19	13.22	0.35
LNGDPGCC I (1)	−8.40	0.00	−6.74	0.00	62.45	0.00	62.26	0.00
LNPETEX I (0)	−4.43	0.72	−0.52	0.30	11.20	0.51	8.42	0.75
LNPETEX I (1)	−19.72	0.00	−18.83	0.03	167.0	0.00	167.0	0.00
LNREER I (0)	−0.55	0.28	−1.22	0.11	15.04	0.23	15.04	0.23
LNREER I (1)	−10.96	0.00	−8.38	0.00	72.21	0.00	82.04	0.00

Source: Authors

Table 5: Panel cointegration test

Test-A	Pedroni cointegration test			
	Stats	P-value	Weighted Stats	P-value
Panel v-Statistic	3.290564	0.0000	3.414510	0.0000
Panel rho-Statistic	−3.001923	0.0000	−2.872751	0.0000
Panel PP-Statistic	−4.898218	0.0000	−5.114255	0.0000
Panel ADF-Statistic	−4.993590	0.0000	−5.194884	0.0000
Group rho-Statistic	−1.839867	0.0000	-	-
Group PP-Statistic	−5.947614	0.0000	-	-
Group ADF-Statistic	−5.894119	0.0000	-	-
Test-B	Kao cointegration test			
ADF	t-Statistic		P-value	
	−2.270971		0.0116	

Note: Significance Levels and Asterisk Notation P-Value * 10% level, P-Value ** 5% level and P-Value *** 1% level, (D) typically denotes the first difference of variable coefficients. Source: Authors

amount of imports (Velaj and Bezhani, 2022). Imports affect Iran's economic growth (Zadeh et al., 2014). Oil imports affect the GDP of the Organization for Economic Co-operation and Development (OECD) countries (Jiménez-Rodríguez and Sánchez, 2005). Oil imports affect different countries by reducing their economic size and growth (Gupta, 2008). A country's economic size depends on exports, gross fixed capital formation, and final consumption expenditures (Khan et al., 2022).

In contrast, two countries of the GCC, namely Qatar and Kuwait, are affected in the short run by the petroleum products exported from India to the GCC from 1995 to 2025 which cause the GDP of GCC to affected by the 0.004 and 0.001%, as there is very low level of economic activity with India in view of trade and commerce, there coefficient depicts the value which is less than the proportionate means the petroleum product exports to Qatar and Kuwait by India are very low as compare to other GCC states and this low coefficient signs represents that Qatar and Kuwait are less effected from India's exports in petroleum products to Qatar and Kuwait. In this study, the short-term shock of petroleum products exported by India will decrease the GDP of Oman by −0.04% if the oil products exported by India rise by a unit percentage. Meanwhile, Saudi Arabia highly imports petroleum and its products from India owing to consumption demand, which will reduce the GDP in the short run by −0.04% as exports by India in products grow by a unit percentage, as seen in Table 1. The P-values are also statistically significant, which is <5% level of significance in the short run.

In the long run, the petroleum product exports from India positively affect the GDP of GCC countries, as seen in the impact on the GDP of the GCC in the long run in Table 1. In the long run, petroleum product exports are significantly associated with GCC countries' GDP, which means that a unit rise in the potential for petroleum products from India to GCC countries causes the GDP of the GCC countries to be positively affected by 0.18%. This reveals that in the long run, the petroleum product exports from India to GCC will have a favourable effect on the GDP of GCC, as shown in Figure 3, the scatter plot diagram with regression line pattern moves upward. Therefore, the null hypotheses of no effect of India's exports of petroleum products on the GDP of the GCC countries in the short and long run are rejected because the P-values are statistically significant at <0.05%, as shown in Table 1. Consequently, the alternative hypothesis is accepted, which states that India's exports of petroleum products affect the GCC countries' GDP in the short and long run.

Real effective exchange rates harm all GCC countries in the short run by decreasing the size of the economy, with GDP as a proxy for economic growth. The UAE GDP declined by 0.91% as the unit rose in REER. Saudi Arabia and Oman are highly affected by the persistent rise and fluctuations in India's real effective exchange rate, as mentioned in Table 1. The GDP of Oman and Saudi Arabia decreased by −1.17%, with a unit percent rise in India's REER. Similarly, REER hurt the GDP of all GCC countries, as found by (Bouoiyour and Selmi, 2015; Comunale, 2017; Sharaf and Shahen, 2022; Vdovychenko, 2021; Yan et al., 2016). An elevated REER value makes exports more expensive and imports more affordable, thus degrading trade competitiveness. Bahrain's economic size declined by −0.55% as India's REER rose by a unit percentage, while the P-value is statistically significant at the 5% level. Kuwait's trade relations with India in recent years have been low, with considerable fluctuations in trade, resulting in a decline in the GDP of Kuwait by −1.34% if there is a unit rise in India's REER. The GDP of Qatar declined by −0.60% in the short run, while the probability value was significant. In the long run, GCC countries will anticipate the exchange rate, and their economic sizes will not be affected much by the real effective exchange rate.

Simultaneously, their trade with other countries grew efficiently, exports became cheaper, and the economic growth of GCC countries grew, as shown in Table 1. GDP increases by 1.47% if there is a unit percentage increase in the REER of India in the long run, and its effect is positive on the GDP of GCC countries because a rise in REER in India will make exports expensive and imports cheaper, which in turn improves the trade balance and overall GDP of GCC countries. When a country's REER increases, its goods and services become relatively more expensive than those of its trading partners. This makes exports less attractive and imports more appealing, leading to a decline in trade competitiveness. Consequently, such a country is likely to find it harder to sell its products in the global market, especially to countries with which it trades most frequently. Therefore, the rising real effective exchange rate has a beneficial impact on the GDP of the GCC countries. The long-run positive impact of the REER on the GCC's GDP is represented in Figure 4 by a scatterplot diagram with an upward trend. Therefore, the null hypotheses of no effect of the real effective exchange rate of India on the GDP of GCC countries in the short and long run are rejected because the probability values are significant and <0.05%, as shown in Table 1. Consequently, the alternative hypothesis is accepted, that there is an effect of the real effective exchange rate of India on the GDP of GCC countries in the short and long run.

Although petroleum exports are the key component of India's trade basket with the GCC, the non-petroleum exports, like textiles, agriculture, machinery, and chemicals, are increasingly becoming important. To further elaborate on the analysis, it is significant to determine whether the impact of the real effective exchange rate (REER) is limited to petroleum exports or is more comprehensive across the sectors, thus shaping the growth of GCC

economies. One advantage of petroleum exports is the fact that India has high-quality refining capabilities and the geographical positioning of the GCC. These exports are also quite price inelastic, where the demand is associated with structural energy needs and long-term supply deals. A sharpening of the value of REER (by making Indian products more expensive in the foreign market) has a weakly negative impact on the GDP of GCC in the short run because it increases the price of imported refined fuel, as illustrated in Figure 1. However, in the long run, the relationship becomes positive, as indicated by the long-run coefficient signs in Table 1. GCC economies also have the advantage of access to competitively refined fuels without the high cost of domestic refining. This enables the redirection of resources to diversification strategies, hence positively impacting GDP growth in the long term. The non-petroleum exports, conversely, are much more susceptible to the fluctuations in the exchange rates. Goods like textiles and machinery are competing on the international markets where price competition is the key. Therefore, an increase in the REER will cause a steep decline in demand, which has a greater negative short-run impact on GCC imports and, consequently, GDP. Although a depreciated rupee can enhance competitiveness in the long-term, there are a limited number of positive spill-over effects to GCC growth, as most of the non-petroleum imports can be substituted and GCC states have diversified sourcing options based in Europe, East Asia, and other emerging markets. These two opposite outcomes indicate a sectoral imbalance in the effect of REER on trade and growth. Though the initial effect on the growth of the GCC is dampened by exchange rate appreciation, petroleum exports offer a long-run stabilizing effect on GCC growth, which highlights the strategic complement of the refining industry in India to GCC energy demand. By comparison, non-petroleum exports are far more REER-sensitive and relay currency volatility directly into GCC economic performance. It implies that, even though the Indian refining power is stabilizing trade transactions, the expanded India-GCC trade is prone to REER shocks.

4.1. Robustness Tests

In this study, diagnostics were applied to determine the model's overall stability, as mentioned in Table 6. The Breusch-Pagan test for heteroscedasticity represents a P = 0.138, which is higher than the significance level and justifies the homoscedasticity in the model, as the null hypothesis of the Breusch-Pagan test depicts the homoscedasticity in the model (Breusch and Pagan, 1979). The second test for cross-sectional dependence also proves no serial correlation problem in the cross-sectional dataset, as illustrated by the P = 0.490, which is higher than the significance level. According to the Pesaran LM test, the null hypothesis of no cross-sectional dependence is accepted. Moreover, multicollinearity is also an issue in panel data, which is not present in this study, as the variance inflation factor value is <3, and it shows no multicollinearity in the model. Finally, the overall reliability of the model is shown from the robustness check in Table 6, with no misspecification in the data confirmed through the RESET test (Ramsey, 1969), and the normality in the dataset shown by the Jarque-Bera test (Bera and Jarque, 1982). The robustness test confirms the stability of the Panel ARDL estimates, which affirms that petroleum product exports and the real effective exchange rate affect the GDP of GCC countries in the short and long run.

4.2. Causality Estimates

The direction of causality between the variables can be seen in Table 7, which represents the null hypotheses of all variables. The first null hypothesis is that LNPETEX does not Granger-cause LNGCCGDP, which is rejected because the probability value of the test is less than the 5% significance level. This means that petroleum product exports to the GCC countries from India are Granger-cause and significantly affect the GDP of the GCC countries. The second null hypothesis is that LNGCCGDP does not Granger-cause LNPETEX and is accepted because the probability value of the test is 0.1310, more than 0.05. As a rule of thumb, this null hypothesis is accepted, meaning that the GDP of GCC countries does not Granger-cause or affect petroleum product exports. The same scenario is applied to the third null hypothesis, which states that LNREER does not Granger-cause LNGCCGDP, indicating that the real effective exchange rate does not affect the GDP of GCC countries. This is rejected because the P-value of REER in the Granger causality test is significant (<0.05). So, the probability value is <0.05, and as per the thumb rule, the null hypothesis is rejected, and the alternative hypothesis is accepted (Engle and Granger, 1987), which means the real effective exchange rate of India Granger-causes and affects the GDP of GCC countries. The opposite fourth null hypothesis is that LNGCCGDP does not Granger-cause LNREER. This is accepted because the probability of the test is more than the significance level, which is 6.0107, which means that the GDP of GCC countries has no effect on India's REER. Moreover, Table 7 mentions two more null hypotheses, the fifth and sixth, one of which is that the real effective exchange rate does not Granger-cause or affect the export of petroleum products from India to the GCC. Second, the petroleum products export to the GCC does not Granger-cause or affect the real effective exchange rate of India. Both null hypotheses, the fifth and

Table 6: Robustness checks

Test	P-value
Breusch-Pagan (Heteroscedasticity)	0.138
Pesaran LM (Cross-Section Dependence)	0.490
Pesaran CD (Cross-Section Dependence)	0.557
Variance Inflation Factor (Multicollinearity Test)	1
Ramsey RESET Test	0.46
Jarque-Berra (Normality)	0.256

Source: Authors

Table 7: Granger causality test

Null Hypothesis	F-Statistic	Probability
LNPETEX does not Granger Cause LNGCCGDP	4.99786	0.0081
LNGCCGDP does not Granger Cause LNPETEX	2.06519	0.1310
LNREER does not Granger Cause LNGCCGDP	9.19071	0.0002
LNGCCGDP does not Granger Cause LNREER	16.0464	6.0107
LNREER does not Granger Cause LNPETEX	9.03232	0.3222
LNPETEX does not Granger Cause LNREER	16.2019	5.1157

Source: Authors

sixth, are accepted as the probability value of both is more than the significance level. This clarifies the unidirectional Granger causal relationship between variables, where the regressors affect the independent variable.

5. CONCLUSION

The current study investigated the impact of India's petroleum product exports to GCC countries in the short and long run and the real effective exchange rate on the GDP of GCC countries from 1995 to 2025 using panel ARDL. The finding in the short run illustrates the effect of petroleum product exports from India to GCC on the GDP of the United Arab Emirates, Oman, Bahrain, and Saudi Arabia, as shown in Table 1, with statistically significant probability values. The results demonstrate that the increase in the petroleum export potential with GCC countries has a substantial adverse short-term effect on the GDP of the GCC countries, with a reduction of about 1-5% of GDP, depending on the amount of petroleum import values. In the long run, the petroleum product exports to GCC positively affect the GDP by 0.18%. Indicating that India's petroleum product export potential will increase the GDP and growth of the GCC countries over time, because importing countries spend less on the refining and distillation process of crude, which increases revenue and overall economic growth. Moreover, if we look into the GCC landscape, the panel ARDL manifests that the real effective exchange rate harms the GDP of Saudi Arabia, Oman, and the UAE in the short run. While in the long run, its effects are positive, because a rise in India's real effective exchange rate will reduce the level of trade competitiveness, consequently having an indirect impact that improves the gross domestic product of GCC countries. This study included some critical diagnostic tests to check the model's robustness and goodness of fit. This study is free from the heteroscedasticity issue in the panel dataset, as the p-value of the Breusch-Pagan test is 0.138, which is more than the significance level of 0.05, indicating the acceptance of the null hypothesis of constant variance and homoscedasticity in the model. Another major problem in the panel dataset is the cross-sectional dependence. In this study, the dataset is not incorporated with issues mentioned in Pesaran scaled LM and Pesaran CD tests, where the P-value is more than the significance level, leading to accepting the null hypothesis of no cross-section dependence (correlation) in the specified model. Furthermore, there is no issue of multicollinearity in the model as shown by the variance inflation factor (VIF) test. The Ramsey reset test mentions the significance of the panel ARDL regression, as the p-value is more than the significance level, proving no misspecification or error in the panel ARDL regression estimates with normality in the data, as denoted by the Jarque-Bera test. The Granger causality test affirms the unidirectional causality, where the REER and petroleum product exports from India to the GCC are affecting the economic size (GDP) of GCC countries. Based on the findings, there are recommendations such as the governments of both regions should maintain their exchange rate, which, in return, does not affect both the country's market, and GCC countries should anticipate the fluctuation in the price and real effective exchange rate of India to avoid the short-run effect on the GDP. The countries of the Gulf Cooperation Council should reduce the tariff on imported commodities of petroleum products from India, as more tariffs on imports will cause the price of the item to be high and affect trade and GDP in the short run. The GCC countries should promote a free trade agreement like CEPA to enhance economic relations.

India has the option of specializing in high-value, clean fuels (aviation turbine fuel, low-sulphur diesel, petrochemicals, lubricants) that the GCC countries will not lose even as they cease relying on crude oil. As a reputable supplier, India has the ability to secure long-term supply contracts to supplement GCC strategic reserves. Form India-GCC joint ventures in downstream refining and storage as well as petrochemicals whereby GCC states can invest in refineries in India, whereas India guarantees stable offtake contracts. With GCC countries transitioning to sustainability (Vision 2030, UAE Net Zero 2050), India will be able to export biofuels, hydrogen-compatible fuels, and petroproducts that can be used in renewable energy. This goes into the investment of refining trade in the green transition period. With a well-managed REER that will not cause a high appreciation of the rupee, the cost of Indian exports will remain competitive, and the demand of the GCC importers will remain steady. Promoting rupee-dirham or rupee-riyal trade settlements increased dollar independence, transaction expenses, and stabilized the exchange-rate risks on both sides. REER policy can be employed during crashes of oil prices or global recessions in which India has to assist exports so that its refining products retain their market appeal to GCC markets. GCC economies are slowly decreasing their hydrocarbon dependency, so India must extend trade to support their diversification agenda, like providing intermediate inputs to non-oil sectors of GCC (plastics, fertilizers, and pharmaceuticals). Through its refining expertise, it provides consulting, engineering, and technology transfer to its own energy diversification projects within the GCC. Connecting refining trade to renewable ventures, e.g., India importing GCC green hydrogen, and exporting refined/bio-based fuels. Locating Indian ports and refineries as re-export locations of GCC trade to Africa and East Asia. Expanding on top of existing frameworks such as CEPA (UAE) into a wider India-GCC FTA, lowering tariffs on refined fuels and petrochemicals. Introduce India-GCC energy cooperation councils to synchronize the refining exports of India with the diversification schedules of GCC. Bring GCC sovereign wealth funds to invest in Indian downstream refining, petrochemicals, and renewable energy. India can leverage its refining power to make it an irreplaceable provider of refined fuels and petrochemical inputs, as it slowly transitions to green fuels and energy services. India has endeavoured to keep commerce with GCC countries vibrant by ensuring that the REER management is aligned with competitiveness, facilitating currency stability, and the diversification strategies of GCC countries, by ensuring that the country is not over-reliant on crude oil.

In the case of India, the results underscore the importance of being competitive in non-petroleum exports by prudently managing the exchange rates, but at the same time, consolidating its refining advantage as a long-term stabilizer of trade. In the case of the GCC, there is an indication that the export of petroleum by India will remain positive for growth, but in the event that it diversifies beyond hydrocarbons, it will be subject to more intense effects of the REER, and as such, exchange rate stability and bilateral

trade agreements will become more imperative. In general, the GCC countries should implement policies that aim to develop an attractive business environment through reduced tariffs, simplified customs practices, and transparent rules, alongside infrastructure improvement and targeted sector incentives for specific sectors, combined with efforts to push economic growth away from oil and encourage GCC bloc regional cooperation for better trade flow. This study invites other researchers and policymakers to conduct further investigations into petroleum exports by India to different countries and how these exports will cause importing countries to react to the macroeconomic background. The study of India-GCC trade dynamics can be enhanced in the future by clearly including oil price indices as explanatory or moderating factors. India is a fundamental in determining the refining margins and the importation demand of the GCC economies due to oil prices. Increasing oil prices not only raise the cost of importing crude oil to India but also the value of exported refined petroleum, and higher oil incomes in GCC countries drive the demand for imports, including Indian products. On the other hand, a declining oil price decreases the importation expense of India and decreases the export earnings, and decreased GCC oil revenues undermine aggregate import demand and growth opportunities. The addition of oil price indices would hence represent cyclical and structural correlations between petroleum exports, REER, and GCC economic growth. Besides, oil prices can take the edge off the relationship between the REER and trade by increasing or reducing competitiveness with high- and low-price regimes. By adjusting this factor, it means that Global energy shocks do not confound the effects of REER and trade, which can enable stronger results.

6. FUNDING STATEMENT

This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia. Grant Number: [KFU253291].

REFERENCES

A, Elsherif, M. (2024). Assessing the Impact of Real Exchange Rate Misalignments on Economic Growth in Arab Countries. EKB Journal Management System, 15(1), 438-485.

Abdalla, M.A., Abdelbaki, H.H. (2014), Determinants of economic growth in GCC economies. Asian Journal of Research in Business Economics and Management, 4(11), 46-62.

AbouElseoud, M. S., & Alkhaldi, F. K. (2023). Economic Growth—Climate Change Nexus in GCC States: A Panel ARDL Approach. International Conference on Sustainable Islamic Business and Finance (SIBF), 371–375.

AbuDalu, A., Ahmed, E.M., Almasaied, S.W., Elgazoli, A.I. (2014), The real effective exchange rate impact on ASEAN-5 economic growth. International Journal of Economics and Management Sciences, 3(2), 1-11.

Ahmed, A.A.A., Khalifa, W. (2024), Role of energy consumption, information and communications technology, and economic complexity in promoting environmental sustainability: Implications for gulf countries. Natural Resources Forum, Blackwell Publishing, 49(2), 1168-1186.

Ahmed, S.S., Nazir, S. (2016), Oil prices and REER with impact of regime dummies. Journal of Economics Bibliography, 3(1), 123-133.

Ahmed, W.M. (2020), Stock market reactions to domestic sentiment: Panel CS-ARDL evidence. Research in International Business and Finance, 54, 101240.

Alam, M.A., Urfi, G., Kunroo, M.H. (2025), India's ASEAN trade intensity determinants. Economic and Political Weekly, 60(31), Preprint.

Ashour, M.M. (2023), Asymmetric effect of real effective exchange rate and Saudi non-oil export determinants. Cogent Social Sciences, 9(2), 1–29, 2278206.

Azhar, M. (2021), India's emergence as a petroleum products exporter. The Journal of Energy and Development, 47(1/2), 75-100.

Baek, J. (2021), A new look at the oil price-exchange rate nexus: Asymmetric evidence from selected OPEC member countries. Economic Analysis and Policy, 70, 172–181.

Barkat, K., Jarallah, S., Alsamara, M. (2024), Do exchange rate changes improve the trade balance in GCC countries: Evidence from Nonlinear Panel Cointegration. The International Trade Journal, 38(2), 184-200.

Baydoun, H., Aga, M. (2021), The effect of energy consumption and economic growth on environmental sustainability in the GCC countries: Does financial development matter? Energies, 14(18), 1-17.

Bera, A.K., Jarque, C.M. (1982), Model specification tests: A simultaneous approach. Journal of Econometrics, 20(1), 59-82.

Bouoiyour, J., Selmi, R. (2015), GCC countries and the nexus between exchange rate and oil price: What wavelet decomposition reveals? International Journal of Computational Economics and Econometrics, 5(1), 55-70.

Breusch, T.S., Pagan, A.R. (1979), A simple test for heteroscedasticity and random coefficient variation. Econometrica, 47(5), 1287-1294.

Charfeddine, L., Barkat, K. (2020), Short-and long-run asymmetric effect of oil prices and oil and gas revenues on the real GDP and economic diversification in oil-dependent economy. Energy Economics, 86, 104680.

Comunale, M. (2017), Dutch disease, real effective exchange rate misalignments and their effect on GDP growth in EU. Journal of International Money and Finance, 73(Part B), 350–370.

Elsherif, M.A. (2024), Assessing the impact of real exchange rate misalignments on economic growth in Arab Countries. 55(2),1(15), 438.

Engle, R.F., Granger, C.W. (1987), Co-integration and error correction: Representation, estimation, and testing. Econometrica: Journal of the Econometric Society, 55, 251-276.

Gupta, E. (2008), Oil vulnerability index of oil-importing countries. Energy Policy, 36(3), 1195-1211.

Hidthiir, M.H., Ahmad, Z., Junoh, M.Z.M., Yusof, M.F.B. (2024), Dynamics of economic growth in ASEAN-5 countries: A panel ARDL approach. Discover Sustainability, 5(1), 145.

Jiménez-Rodríguez, R., Sánchez, M. (2005), Oil price shocks and real GDP growth: Empirical evidence for some OECD countries. Applied Economics, 37(2), 201-228.

Kahsay, S.G., Patena, W. (2020), An empirical study of the behaviour of real exchange rates in the UAE. International Journal of Business Performance Management, 21(1-2), 55-75.

Kao, C. (1999), Spurious regression and residual-based tests for cointegration in panel data. Journal of Econometrics, 90(1), 1-44.

Khan, U., Khan, A.M., Siddiqi, N.A. (2022), Economic growth and its relationship with the macroeconomic factors: An analysis of Oman. Problems and Perspectives in Management, 20(4), 356-364.

Kulkarni, M., Tikyani, J., & Singh, K. K. (2023). Impact of COVID-19 on Import and Export of Petroleum Products and Crude Oil in India. In book: Proceedings of 3rd International Conference on Recent Trends in Machine Learning, IoT, Smart Cities and Applications, ICMISC, 21–31.

Lau, L.S., Ng, C.F., Cheah, S.P., Choong, C.K. (2019), Panel data analysis

(stationarity, cointegration, and causality). In: Environmental Kuznets Curve (EKC). Netherlands: Elsevier. p. 101–113.

Magazzino, C. (2016), The relationship between real GDP, CO_2 emissions, and energy use in the GCC countries: A time series approach. Cogent Economics and Finance, 4(1), 1152729.

Nasir, M.A., Al-Emadi, A.A., Shahbaz, M., Hammoudeh, S. (2019), Importance of oil shocks and the GCC macroeconomy: A structural VAR analysis. Resources Policy, 61, 166-179.

Noor, H., Noor, S. (2024), A gravity model approach for determining foreign direct investment flows between India and the gulf cooperation council (GCC) countries. Saudi Journal of Economics and Finance, 8(7), 220-229.

Okunade, A. A., You, X., & Koleyni, K. (2018). Cross-country medical expenditure modeling using OECD panel data and ARDL approach: Investigating GDP, technology, and aging effects. Health Econometrics, 127, 327–358.

Osmanovic, N., Alvi, S. (2022), A determinants of FDI in the economy of GCC countries: A PMG ARDL approach. Operational Research in Engineering Sciences: Theory and Applications, 5(3), 92-107.

Pedroni, P. (2004), Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econometric Theory, 20(3), 597-625.

Pesaran, M.H., Smith, R. (1995), Estimating long-run relationships from dynamic heterogeneous panels. Journal of Econometrics, 68(1), 79-113.

Ramsey, J.B. (1969), Tests for specification errors in classical linear least-squares regression analysis. Journal of the Royal Statistical Society Series B: Statistical Methodology, 31(2), 350-371.

Sharaf, M.F., Shahen, A.M. (2022), Asymmetric impact of real effective exchange rate changes on domestic output revisited: Evidence from Egypt. International Trade, Politics and Development, 7(1), 2-15.

Singh, R. K., & Kumar, A. (2022). Navigating Determinants of India's Business Relations with GCC Countries: Evidence from the Gravity Model Theory. Prabandhan: Indian Journal of Management, 15(6), 1–27.

Ulussever, T., Pata, U. K., & Kartal, M. T. (2024). Evaluating the influence of technology, energy consumption, and financial progress on material footprint in GCC countries. Environmental and Sustainability Indicators, 23, 1-10.

Vdovychenko, A. (2021), Empirical Estimation of REER Trend for Ukraine. Graduate Institute of International and Development Studies Working Paper.

Velaj, E., Bezhani, E. (2022), The impact of import and export to GDP growth-the case of Albania. Review of Economics and Finance, 20, 791-796.

Yan, G., Li, S., Lin, Y., Li, J. (2016), Real effective exchange rate and regional economic growth in China: Evidence from provincial data. China and World Economy, 24(6), 43-63.

Yasser, M., Salman, D., Essam, M. (2024), HDI, oil prices, government expenditures in GCC: Evidence from a cross sectional ARDL approach. Ekonomika, 103(3), 91-105.

Zadeh, M. S. K., Abdollahian, E., & Ziaei, S. M. (2014). The impact of imports and macroeconomic variables on the economic growth in Iran. Life Science Journal, 11(12s), 84–88.

APPENDIX

Figure 1A: Effect of petroleum product exports to GCC on inflation, and real GDP growth of GCC region with a set of stylized global shock markers such as Asian crisis 1998, Global financial crisis 2008, Oil crash 2014, Pandemic 2020, and Rebound 2022.

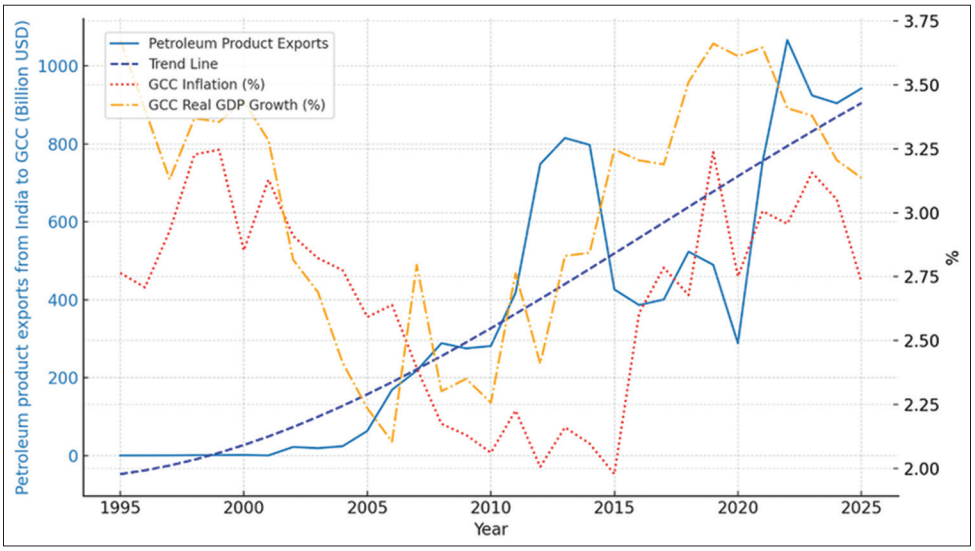


Figure 2A: Effect of real effective exchange rate on inflation and real GDP growth of the GCC region with a set of stylized global shock markers such as the Asian crisis of 1998, the Global financial crisis of 2008, the Oil crash of 2014, the Pandemic of 2020, and the Rebound of 2022.