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Economic and Political Implications of De-Dollarizing Saudi Oil Transactions: An Analysis of a Panel Quantile Regression Focused on European Union Countries

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Abstract. This article explores the economic and political implications of de-dollarization in Saudi oil transactions, by focusing on the European Union countries. It examines how an increased euro usage in these transactions influences the real exchange rate of the euro against the dollar and the volume of the oil imports from Saudi Arabia. A new de-dollarization indicator is introduced, measured as the proportion of the total imports denominated in euros relative to the total imports in all currencies. By using panel data from 2000 to 2023 for 13 EU oil-importing countries, the study applies quantile regression to capture heterogeneous effects across the conditional distribution. The findings show that de-dollarization positively and significantly affects the euro's real exchange rate at all quantiles. However, its impact on oil import volumes varies: it is negative for countries with low to moderate oil dependency (quantiles 0.25 and 0.5) but becomes insignificant for highly oil-dependent countries (quantile 0.75). Key implications for EU countries include: *i*) adjusting monetary policies to stabilise exchange rates, optimising reserves, and promoting the euro use in energy trade; and *ii*) strengthening regional energy cooperation and diversifying their supply sources in order to reduce vulnerabilities.

Keywords: de-dollarization in Saudi oil transactions; real exchange rate; EU oil-importing countries; quantile regression.

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1. Introduction

Since the 1970s, the US dollar has established itself as the benchmark currency for international oil transactions, due to a strategic agreement between Saudi Arabia and the United States. This arrangement created a mutually beneficial relationship: Saudi oil sales were exclusively denominated in dollars, while the United States ensured regional security for its partner. However, the termination of this agreement after nearly five decades marks a historical turning point, potentially heralding disruptions to the global economy. In 2024, Saudi Arabia adopted a de-dollarization policy, driven by geopolitical and economic transformations. Influencing factors include the rise of alternative currencies such as the euro and the Chinese yuan, investment diversification, and responses to international pressures related to energy policies (Aggarwal, 2020; Arnold, 2024).

Saudi Arabia's strategic reorientation poses a significant challenge to the global economy, particularly for the European Union (EU) countries, which are major consumers of Saudi oil. As the EU's principal trading partner and oil importer, it must now navigate an environment where the dollar is expected to be replaced by national currencies, fully embracing its strategic role on the global economic stage, according to the European Central Bank (June 2022). This shift could have not only economic repercussions for the exchange rates but also redefine strategic alliances between Saudi Arabia and European oil-importing countries, leading to a reduced dependence on the US dollar within the European Union (Saaida, 2024).

The de-dollarization of Saudi oil transactions raises a critical question: What are the economic and political implications for EU countries? The central focus of this study is therefore on the consequences of de-dollarization, both economic and political, for EU oil-importing countries. Addressing this question requires analysing the current dynamics and understanding the implications of this shift based on two fundamental hypotheses: Economic Hypothesis: The de-dollarization of Saudi oil transactions will increase the real exchange rate of the euro against the dollar, thereby reducing import costs for EU countries. Political Hypothesis: Saudi Arabia's decision to de-dollarize may lead to a reduction in oil imports by altering the terms of trade and payment.

This subject has not been empirically explored. In the absence of direct data, an indicator measuring de-dollarization is proposed: the share of imports denominated in euros relative to total imports. The empirical analysis in this study relies on quantile regression applied to panel data covering the period of 2000–2023, encompassing 13 major oil-importing countries within the European Union. Quantile regression is particularly suited to this analysis as it captures differentiated effects of de-dollarization across various quantiles of the exchange rate and import volume distributions. This approach provides a more comprehensive understanding of potential repercussions at different levels of impact, whether extreme or moderate (Koenker and Bassett, 1978). Several researchers have employed this methodology in similar contexts, examining the relationships between the exchange rates, monetary policy, and international trade, where non-linear effects are frequently observed (Umar and Bossman, 2022; Geldner, 2024).

The remainder of this article is structured as follows: Section 2 provides the research context related to exchange rates, oil transactions, dollarization, and de-dollarization. Section 3 outlines the empirical analysis methodology. Section 4 presents the empirical findings. Section 5 offers an economic and political interpretation of the findings. Section 6 summarizes the main conclusions and provides recommendations.

2. Research Background and Related Studies

De-dollarization refers to the process by which nations reduce their reliance on the US dollar in international transactions by increasing the use of alternative currencies, such as the euro or the yuan (Alogoskoufis, 1997). This shift encompasses the diversification of foreign exchange reserves and economic dealings (Prasad, 2014; Vidal et al., 2022), driven by both economic and geopolitical imperatives. The process has profound implications for the structure of the global financial flows (Setser, 2023; Gopinath, 2024).

Recent economic literature has been focusing on the implications of de-dollarization, particularly its effects on exchange rates and the import dynamics of oil-importing nations. The adoption of alternative currencies has reshaped the financial and trade landscape, with notable studies examining the influence of oil prices on the currency values.

Beckmann and Czudaj (2013), using a Markov process, highlighted how declining oil prices lead to an appreciation of the US dollar, underscoring the role of dollarization in oil-dependent economies.

Complementing this, Pershin et al. (2016) employed a VAR model to analyse the impact of the oil price volatility on exchange rates in Kenya, Tanzania, and Botswana. Their findings underscored the nuanced and varied effects of dollarization across distinct economic contexts. Similarly, Jawadi et al. (2016), by utilising GARCH models, demonstrated that declining oil prices contribute to the depreciation of the US dollar against the euro, thus further emphasising the global economic repercussions of dollarization.

Nusair and Olson (2019) applied quantile regression to investigate the differentiated effects of dollarized oil price shocks on exchange rates in Asian economies. Their findings revealed pronounced vulnerabilities at extreme quantiles, particularly during economic crises, illustrating the non-linear and asymmetric nature of these impacts. Chatziantoniou et al. (2023), through decomposed connectivity measures, identified direct and indirect linkages between oil-exporting and oil-importing economies, providing insights into the broader implications of the oil price volatility, albeit without directly addressing de-dollarization.

Further insights were provided by Umar and Bossman (2023), who employed a quantile connectivity methodology to examine the relationship between oil price shocks and exchange rates. Their approach revealed significant non-linearities, highlighting the diverse impact of oil price fluctuations across different economic conditions.

Saaida (2024) explored de-dollarization's effects on trade flows in emerging markets, focusing on the proportion of dollar-denominated transactions and trade volumes, while

Todorova et al. (2024) examined the evolution of the US dollar's dominance in international payments. Their findings linked monetary and geopolitical factors to shifts in the global currency landscape, accounting for fluctuations between the dollar and other major currencies.

In summary, the diverse methodologies and findings in the existing literature illustrate the complex interplay between dollarization, de-dollarization, and the global economic dynamics. The outcomes vary significantly depending on the economic context, the degree of oil dependency, and the intensity of oil price shocks, offering a nuanced understanding of the evolving role of currencies in international trade and finance.

3. Empirical Analysis

The empirical analysis of the implications of Saudi oil transaction de-dollarization focuses on 13 EU members as key oil-importing countries: Germany (GR) is the EU's largest economy and one of its main oil importers. France (FR) is a leading EU economy with substantial energy dependence; Italy (IT) is another major importer with one of Europe's largest economies; Spain (SP) is a key oil importer with a diversified economic base; Netherlands (NE) is a crucial hub for energy trading in Europe; Belgium (BE) is notable for its advanced oil infrastructure and refining capacity; Greece (GC) is a recovering economy, highly susceptible to currency fluctuations; Finland (FI) heavily relies on energy imports due to its cold climate and limited domestic production; Portugal (PO) and Ireland (IE) are significantly reliant on oil imports for energy and transportation; Austria (AU) is a stable economy with a robust industrial sector; Slovenia (SI) is a small yet industrially advanced EU member with modest oil import needs, primarily for transportation and energy; Luxembourg (LU) is a small but wealthy EU nation, with relatively modest oil import volumes.

Quantile regression, as demonstrated by the studies of Nusair and Olson (2019) and Umar and Bossman (2023), is distinguished by its ability to capture asymmetric and non-linear effects, which traditional methods often overlook. Building on these works, we shall apply this method to analyse the impact of de-dollarization on two variables at different levels of their distribution (0.25, 0.5, 0.75): the real exchange rate of the euro against the dollar and the volume of Saudi oil imports by the European Union countries.

3.1. Model Specification

Due to the limited sample size, the application of the dynamic panel quantile regression requires the introduction of fixed effects as well as the first lag of the dependent variable to control for heterogeneity (Koenker and Bassett, 1978; Koenker and Hallock, 2001; Colak and Erden, 2021; Clarke et al., 2023). The model is thus defined as:

$$Q_{y_{it}}(\tau|\eta_i, y_{it-1}, x_{it}, z_{it}) = \eta_{\mathrm{i}} + \alpha_{\tau t}(\tau) y_{it-1} + \beta_{\tau t}(\tau) x_{it}^{T} + \varepsilon_{it} \quad (1)$$

where:
Q is a quantile function; y_{it} is the dependent variable; η_i represents the fixed effects;[1] x_{it} represents the independent variables vector; ε is the error terms; i is the country index, τthe quantile index, T is the total number of observations per countries, and τ represents the τth quantile.

3.2. Data

Although studies on the relationship between exchange rates, de-dollarization, and oil transactions are scarce, this analysis draws on underlying interaction results from the currently existing literature, which has proposed numerous fundamental determinants of the real exchange rate. The present analysis uses the set of fundamentals adopted in the works by Lee et al. (2008), Chen et al. (2016), and Marbuah (2018).

Variable of interest

De-dollarization (DD) is estimated by the authors as the share of imports in euros relative to total imports across all currencies by using the *Observatory of Economic Complexity* (OEC) data.

Dependent/Mediating variables[2]

The Real Exchange Rate (RER)[3] is the real value of the euro relative to the US dollar, estimated by the authors by using the (WB) data; however, it is a mediating variable because it influences the cost of dollar-denominated oil, which actually makes the imports more or less expensive (Colak and Erden, 2021); Volume of Oil Imports from Saudi Arabia (OI) calculated by the authors as the share of barrels imported relative to Saudi Arabia's total import volume, by using the OEC data.[4]

Control variables

The Brent oil price (OP) is expressed in US dollars (US), it is the main variable explaining the real exchange rate in oil-importing countries (Chen et al., 2016); The inflation rate (π) is expected to either discourage or stimulate domestic consumption, thereby in-

[1] A dummy variable for each cross-sectional unit, taking '1' for the corresponding observation and '0' for all other observations.

[2] The real exchange rate serves as both a control variable in estimating the volume of oil imports from Saudi Arabia and a dependent variable in the first model. Its mediating role is essential for capturing the intricate relationship between oil markets and currency fluctuations. This methodological framework is consistent with the studies of Korley and Giouvris (2022).

[3] The real exchange rate also includes price indices. It is expressed as: $RER = p \times \frac{CPI^*}{CPI}$, where p denotes the nominal exchange rate euro/dollar; CPI and CPI* are domestic and foreign (US) consumer price indices.

[4] Oil imports in this context encompass both crude oil and all refined petroleum products.

fluencing the relative price of non-tradable goods and resulting in either real appreciation or depreciation (Lee et al., 2008; Colak and Erden, 2021);The Gross Domestic Product per capita (GDP/c), expressed in constant prices (2015 = 100), reflects the economic productivity and demand for a country's currency, which affects its value relative to others (Lee et al., 2008). This data was sourced from the Federal Reserve Economic Dataset (FRED), provided by St. Louis Federal Reserve.

The models are formulated in the logarithmic (*l*) form except for the inflation variable, which is in the growth rate.

Building on these foundations, we propose Model 1, which examines the effects of these determinants on the real exchange rate by incorporating the key variable of de-dollarization:

$$Q_{y_{it}}(\tau|\eta_i, y_{it-1}, x_{it}, z_{it}) = \eta_{\mathrm{i}} + \alpha_\tau RER_{it-1} + \beta_{1\tau} DD_{it} + \beta_{2\tau} OP_{it} + \beta_{3\tau}\pi_{it} + \beta_{4\tau} GDP/c_{it} + \varepsilon_{it} \quad (2),$$

and Model 2, which examines the effects of de-dollarization on the volume of oil imports from Saudi Arabia:[5]

$$Q_{y_{it}}(\tau|\eta_i, y_{it-1}, x_{it}, z_{it}) = \eta_{\mathrm{i}} + \alpha'_\tau OI_{it-1} + \beta'_{1\tau} DD_{it} + \beta'_{2\tau} RER_{it} + \varepsilon_{it} \quad (3)$$

4. Empirical Findings

A preliminary analysis reveals a positive link between the real exchange rate and euro-denominated imports, while a negative relationship exists with oil imports from Saudi Arabia.

Figure (1-**a**) shows that, at the extremes of the regression line, Austria and Finland have a much higher share of imports in euros than would be expected based on the predicted real exchange rate of the euro against the dollar. This discrepancy may reflect the influence of specific factors, such as bilateral trade agreements or national monetary preferences (Saaida, 2024). Germany and Greece occupy an intermediate position, indicating an economically balanced stance. In contrast, Greece, with a significant deviation below the trend, highlights structural inefficiencies and low competitiveness. Spain, France, Italy, and the Netherlands show a balance between their real exchange rate and their share of imports in euros, suggesting stable trade integration within the EU. Belgium, with a lower-than-expected real exchange rate, may reflect strong price competitiveness or imbalances in its trade flows (Korley and Giouvris, 2022). It may also indicate economic barriers or a preference for other currencies in international trade transactions (Rodrik, 2008). The economies of Portugal, Slovenia, Ireland, and Luxembourg, characterised by

[5] Although some studies suggest that oil prices and population influence the imports, we have not considered these factors, while assuming that bilateral agreements, trade preferences, and energy policies mitigate the impact of the global price fluctuations (Baumeister and Kilian, 2016). Additionally, the population rate does not reflect the specificities of imports from a particular country (Feyrer, 2007).

high real exchange rates, show slight deviations from the regression line. These discrepancies suggest that their economies are influenced both by regional Eurozone dynamics, and also by country-specific factors. For example, Luxembourg's strong financial sector and Ireland's business-driven approach likely contribute to these variations, there by highlighting the role of national characteristics alongside broader regional trends. These nuances demonstrate how individual countries within the Eurozone, despite common regional ties, can experience unique economic influences.

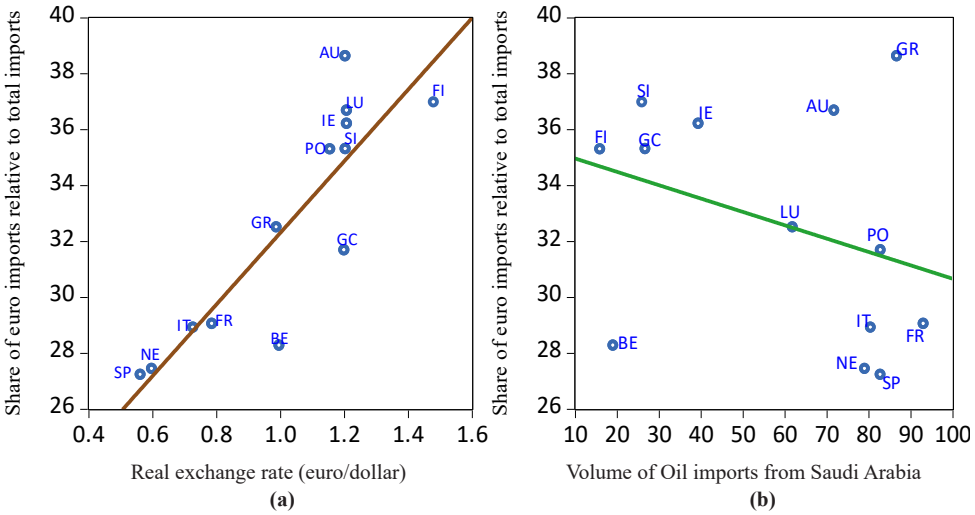

Figure 1. Regression of the euro imports share on the real exchange rate, and the oil imports from Saudi Arabia, respectively

Regarding the volume of oil imports from Saudi Arabia, Figure (1-**b**) shows that, in Germany and Austria, the use of the euro in the international trade is weakly correlated with a reduction in oil imports from Saudi Arabia. This could be due to the economic strength of these countries, characterised by large dollar reserves, which limits disruptions in euro-denominated transactions (Gopinath et al., 2022). In general, countries with a higher share of euro-denominated imports tend to import more Saudi oil, and vice versa. This suggests that the share of euro imports does not significantly affect oil transactions in large European economies. The positions of France, Spain, Italy, and the Netherlands reveal an inverse relationship between the use of the euro and the volume of Saudi oil imports. This trend can be explained by cost adjustments related to the use of a common currency (Saaida, 2024), which enhances competitiveness in trade relations and moderates the import volumes. Finland, Greece, Ireland, and Slovenia show that a greater use of the euro in trade transactions is linked to a reduction in Saudi oil imports, likely due to the diversification of their energy sources and a reduced dependence on oil as a result of other economic or industrial priorities. This trend is also observed in Belgium, although the pressure for de-dollarization is less pronounced there. Finally, the positions of Luxembourg

and Portugal suggest that, due to their diversified economies, these countries reduce their oil imports while increasing those denominated in euros. This could be driven by strategies to diversify their supply sources, optimise costs, and reduce their dependence on Saudi oil. This dynamic may also encourage de-dollarization, a phenomenon facilitated by the decreasing dominance of the dollar in the strategic energy sector.

Regressions (2) and (3) are estimated by using a panelised version of the loss function, setting the penalty parameter λ to 1, and then 0.5; the results are unchanged. Table 1 presents the results from the quantile regression estimation.

Table 1. Quantile regression estimation

	Model 1			**Model 2**		
	τ =0.25	τ =0.5	τ =0.75	τ =0.25	τ =0. 5	τ =0.75
RER_{-1}	0.212 [11.00]**	0.346 [10.62]**	0.627 [18.70]**	–	–	–
OI_{-1}		–		0.474 [12.33]**	0.135 [3.93]**	0.02 [0.52]
OP	0.172 [10.43]**	0.175 [8.11]**	0.178 [7.42]**	–	–	–
DD	0.415 [8.45]**	0.443 [9.27]**	0.375 [7.01]**	–20.41 [–8.10]**	–3.59 [–2.90]**	–0.57 [–1.15]
π	–0.026 [–6.81]**	–0.03 [– 5.10]**	–0.024 [–2.36]**	–	–	–
GDP/c	0.172 [2.361]**	0.208 [2.813]**	0.047 [2.40]**	–	–	–
RER	–	–	–	–4.471 [–1.13]	0.01 [0.17]	0.05 [0.05]
Adj R-sq	0.441	0.539	0.532	0.463	0.382	0.110
Prob (LR-stat)	0.0000	0.0000	0.0000	0.0000	0.0000	0.1816
Q-stat	11.442[(b)]	11.570[(b)]	11.728[(b)]	11.622[(b)]	12.014[(b)]	–
Skewness	0.228	0.220	0.205	0.0675	0.272	–
Kurtosis	2.586	2.685	2.477	3.210	2.708	–
Jarque-Bera	3.852[(a)] (0.145)	2.981[(a)] (0.225)	4.478[(a)] (0.106)	0.777[(a)] (0.677)	4.764[(a)] (0.092)	–
Root MSE	0.04511[(b)]			0.08832 [(b)]		
R-RESET	(0.333) [(c)] 0.326	(0.462) [(c)] 0.298	(0.246) [(c)] 0.768	(0.701) [(c)] 0.073	(0.588)[(c)] 0.026	–
Wald-test		(0.2155) [(d)]			(0.0744) [(d)]	

Source: Authors' compilation. ** significant at the 5% significance level; [ ] t-student ( ) P-value;[(a)] The null hypothesis that the residuals follow a normal distribution is accepted at the 5% significance level;[(b)] The null hypothesis of no residuals autocorrelation is accepted at the 5% significance level;[(c)] The null hypothesis of the regression model is well-specified, is accepted at the 5% significance level; [(d)]The null hypothesis, stating that the estimated coefficients for the different variables are equal across quantiles, is accepted at the 5% significance level.

Model (1)

At the 0.25 quantile, which represents countries with relatively low real exchange rates, a significant positive influence (0.415) of de-dollarization (DD), measured by the share of imports in euros, is observed. This indicates that, in these contexts, an increase in the share of imports in euros plays a key role in strengthening the real exchange rate.

Other determinants include the first lag of the exchange rate (RER_{-1}: 0.212), oil prices (OP: 0.172), and GDP/c (0.172), all of which have a positive effect on the real exchange rate, whereas inflation (π: -0.026) exerts negative pressure, and these results are consistent with those of Lee et al. (2008) and Chen et al. (2016).

At the 0.5 quantile, which represents countries with a moderate real exchange rate, the results show that de-dollarization (DD) with a positive coefficient (0.443) continues to play a major role, confirming the significant impact of the share of imports in euros on the real exchange rate. The first lag of the exchange rate (RER_{-1}: 0.346) remains significant and indicates a moderate persistence of past variations on the current exchange rate. Oil prices (OP: 0.175) and GDP/c (0.208) also exert positive effects, suggesting that economic stability and changes in oil prices influence the real exchange rate (Lee et al., 2008). In contrast, the inflation rate (π: -0.03) has a negative, albeit moderate, effect (Chen et al., 2016).

At the 0.75 quantile, representing countries with relatively high real exchange rates, the results show that de-dollarization (DD) continues to positively influence the real exchange rate, but with a weaker effect compared to the 0.25 and 0.5 quantiles (0.375). The lag of the exchange rate (RER_{-1}: 0.627) is particularly high, suggesting strong persistence of past exchange rate fluctuations in these contexts. Oil prices (OP: 0.178) continue to exert a positive influence, while the inflation rate (π: -0.024) remains negative, albeit of a small magnitude. GDP/c (0.047) has a more moderate positive effect, indicating that economic growth plays a less decisive role in contexts with higher exchange rates.

Statistically, the results suggest that, in countries with lower and moderate real exchange rates, the proportion of imports in euros has a moderate positive effect on the real exchange rate. This effect remains significant in countries with higher exchange rates, but with a weaker impact.

Figure 2 highlights that, although de-dollarization has a positive effect on the real exchange rate, this effect varies across quantiles, suggesting that de-dollarization plays a more stabilising role in countries with less volatile real exchange rates. This variation may indicate a non-linear relationship between de-dollarization and monetary stabilisation, where the effects are more pronounced in less economically unstable contexts. From the 0.8 quantile onwards, the impact of de-dollarization becomes highly pronounced, reaching 0.6 at the 0.9 quantile, which indicates an increasing influence in the contexts of exceptionally high exchange rates. The confidence interval does not include zero, validating the robustness of these results.

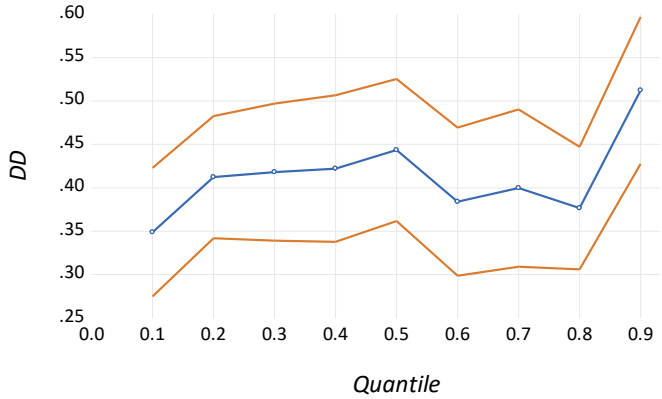

Figure 2. Quantile process estimate of (*DD*) in Model 1

Model (2)

The results of Model 2 for the 0.25 quantile reveal that the volume of oil imports (OI) from Saudi Arabia is positively influenced by its lag (0.47). Conversely, de-dollarization (*DD*), measured by the share of imports in euros, exhibits a pronounced negative effect (-20.41), suggesting that the reduction of dependence on the dollar could constrain oil imports. The real exchange rate (*RER*), with a statistically non-significant coefficient (-4.471), does not appear to be an explanatory factor (Marbuah, 2018).

At the 0.5 quantile, Model 2's results indicate that the volume of oil imports (OI) remains positively influenced by its lag, although this effect is reduced (0.135). Dollarization (DD) shows a reduction in oil imports, but this effect is less pronounced. Specifically, with an estimated coefficient of (-3.92), the impact of the reduction diminishes as the quantile increases. Statistically, this suggests a heterogeneous relationship between the share of euro-denominated imports and the volume of oil imports from Saudi Arabia, where the impact of the variable (DD) varies according to the distribution of the dependent variable (OI).[6] The real exchange rate (RER) remains statistically non-significant (0.01), thus confirming that it does not have a decisive effect on oil imports from Saudi Arabia (Marbuah, 2018).

At the 0.75 quantile, the probability associated with the overall model (0.1618) is well above 0.05, and none of the explanatory variables reach the threshold of significance. This indicates a lack of statistically valid relationships between the variables at this quantile level. These results suggest that, for countries characterised by higher volumes of oil imports, the analysed factors do not significantly explain the observed variations.

Figure 3 illustrates the degrees of de-dollarization (*DD*) within the framework of Model 2. The results show a progressive, though increasingly less pronounced, decline

[6] The absence of heterogeneity is confirmed by the Wald test, as presented in Table 1.

in oil imports from Saudi Arabia as the use of the euro increases. The phenomenon is statistically significant for quantiles 0.25 and 0.50, but it becomes non-significant from the 0.75 quantile onwards. This observation suggests a shift towards trade mechanisms less dependent on the US dollar. Therefore, the result supports our political hypothesis, although it is only valid in the short and medium term. The hypothesis advocates for the diversification of trade partners and a reduction in dependence on the dollar, while aligning with a broader strategy and more independent exchange conditions for European countries.

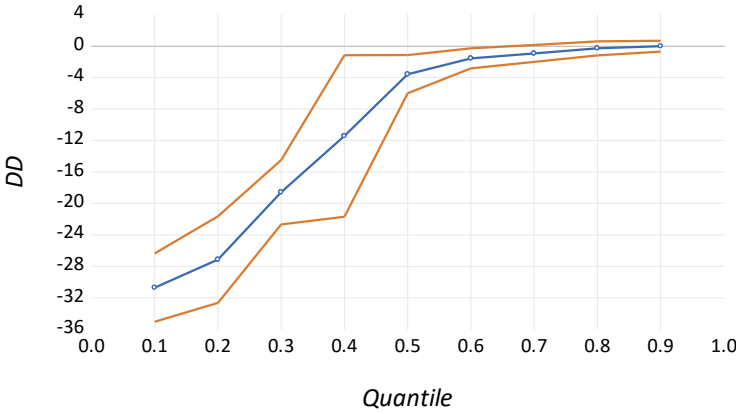

Figure 3. Quantile process estimate of (*DD*) in Model 2

5. Economic and Political Interpretation of Empirical Results

The results of our research indicate that the impact of de-dollarization on the real exchange rate varies according to its level, highlighting distinct economic and political dynamics within the European Union countries. In countries with low real exchange rates, such as France, Italy, Spain, and the Netherlands, de-dollarization significantly contributes to the appreciation of the local currency. By increasing the use of the euro for imports, these countries reduce their dependence on the US dollar (Blanchard and Galí, 2007), which provides greater monetary flexibility and facilitates the adoption of independent monetary policies (Noble, 2023). This, in turn, plays a crucial role in managing exchange rates and inflation (Stiglitz, 2003) while helping to stabilise import costs, particularly for commodities, and improving the trade balance (Baumeister and Kilian, 2016). Overall, the positive effect of de-dollarization fosters local currency stability, thereby enhancing resilience against global monetary crises.

In countries with moderate real exchange rates, such as Germany, Belgium, Ireland, Slovenia, Luxembourg, Greece, and Portugal, the effect of de-dollarization is somewhat more pronounced. This can be explained by a growing diversification of the monetary policy tools and the stability of these economies within the Eurozone (Li, 2023; Koráb et al., 2023). In these countries, the benefits of de-dollarization are more significant, as the

impact of the monetary policy is more sensitive to fluctuations in international currencies. The ability to manage imports more effectively and reduce the trade balance pressure provides greater stability in the face of external disturbances (Stiglitz, 2003; Saaida, 2024). However, Slovenia, despite its significant exchange rate fluctuation between 2011 and 2015, presents a special case. Its economy remains relatively fragile compared to larger Eurozone economies, making it more vulnerable to external shocks and diminishing the effectiveness of de-dollarization. As Obstfeld and Rogoff (1995) highlight, internal macroeconomic imbalances and relatively high inflation limit the benefits of de-dollarization, rendering Slovenia more susceptible to external disturbances.

When examining the impact of de-dollarization on the volume of oil imports from Saudi Arabia, significant variations are observed across European countries, depending on both their oil import volumes and economic structures. In countries with low oil import volumes, such as Belgium, Finland, Greece, and Slovenia, de-dollarization has a substantial negative effect. These economies, which are less reliant on oil imports, suffer more from de-dollarization due to their limited bargaining power in the global oil market and their dependence on the dollar for international transactions. A reduction in the use of the dollar in trade with Saudi Arabia results in higher costs and a decreased flexibility, negatively impacting the oil import volumes. These small open economies are particularly sensitive to commodity price fluctuations and currency volatility, which further intensifies the negative effects of de-dollarization (Gouvea, 2023).

In countries with moderate oil import volumes, such as Austria, Germany, Ireland, and Luxembourg, the negative impact of de-dollarization is less pronounced. These economies are better diversified and are also more integrated within the Eurozone, which provides some protection against the adverse effects of de-dollarization. Their ability to negotiate trade agreements and adapt to fluctuations in the energy demand mitigates the negative impact (Aysan et al., 2022). However, while the effect of de-dollarization is less severe, it still presents challenges, especially in terms of disruptions in trade relations with oil producers and an increased energy price volatility (Arslanalp et al., 2022). Gopinath et al. (2022) suggest that, in these intermediate economies, monetary policy tools and the capacity to adjust to currency fluctuations can mitigate, but not entirely eliminate, the negative consequences of de-dollarization (Baffes et al., 2022).

For countries with high oil import volumes, such as France, Spain, Italy, Portugal, and the Netherlands, the impact of de-dollarization appears negligible. These countries benefit from diversified trade relations, which compensate for initial disruptions caused by de-dollarization. Their global bargaining power and integration within the European Union, which uses the euro as a reserve currency, shield them from the full impact of fluctuations in the oil market and currency variations (Wenhong, 2023; Chen, 2023). Consequently, de-dollarization has a relatively neutral impact, allowing these countries to maintain stable oil imports despite global economic disruptions.

Finally, the analysis of the real exchange rate shows that it has no significant effect on the volume of oil imports from Saudi Arabia across the three groups of countries studied. This can be attributed to the fact that the global oil market is predominantly influenced

by external factors, such as the international oil prices and geopolitical relations, rather than by internal currency fluctuations (Ahmad et al., 2022; Arnold, 2024).

6. Conclusion

This study investigates the political and economic implications of the de-dollarization of Saudi oil transactions by employing quantile regression analysis on panel data spanning from 2000 to 2023 for 13 European Union countries and major oil importers. The study aimed to measure de-dollarization through the share of imports paid in euros relative to the totality of imports in all currencies. The findings demonstrate that de-dollarization impacts both the real exchange rate and the oil imports in distinct manners, contingent on each country's degree of energy dependence. In those countries which are highly dependent on Saudi oil, de-dollarization reduces oil imports by enhancing the monetary flexibility and allowing more efficient import cost management. Notably, the effect on the real exchange rate is more significant: as the euro usage increases, the local currency appreciates more markedly. For countries with moderate oil dependence, de-dollarization mitigates import fluctuations and facilitates a controlled appreciation of the real exchange rate, thereby enabling better management of reserves and transactions. In contrast, countries denoted by low dependence on Saudi oil exhibit a weaker impact on the real exchange rate, as they diversify their supply sources, resulting in only a moderate effect on their import volumes. The results thus substantiate the initial economic and political hypotheses posited in this study.

The de-dollarization of oil transactions has both economic and political implications. Economically, it increases the vulnerability of smaller economies which are heavily reliant on foreign currencies, necessitating diversification of energy sources and more flexible management of their monetary reserves. For energy-dependent countries, a greater use of the euro facilitates more flexible import cost management and stabilises the local currency. Politically, the EU calls for strengthened cooperation to promote the euro in energy exchanges, thus reinforcing monetary sovereignty. Smaller economies could gain economic independence but will need enhanced political coordination to manage this transition. This shift could help rebalance global economic power by offering alternatives to the dollar dominance. Additionally, de-dollarization encourages diversification of trade partners, especially in Asia, Africa, and Latin America. In Europe, it could boost the use of the euro, thereby further contributing to regional monetary sovereignty. Emerging economies would gain influence by reducing their dollar dependence, but this will require global political coordination to manage economic risks and promote viable alternatives.

Future research could extend these findings by examining the long-term geopolitical implications of de-dollarization in energy markets, based on real-time data over extended periods. Further studies exploring the effects of shifts in currency preferences on oil pricing and regional cooperation agreements could offer valuable insights for decision-makers. Additionally, incorporation of dynamic factors such as energy transitions and the rise of digital currencies in trade transactions could provide new research avenues for better anticipating the evolution of global markets.

Author contributions

Feriel Dermechi: Conceptualisation, methodological design, formal analysis, investigation, writing – original draft, writing – revised version, and visualisation.
Ahmed Zakane: Reading the original and revised versions (review, corrections, and editing).

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Additional data

Table 2. Panel unit root results

	I(0)			**I(1)**		
	Levin-Lin-Chu	*Im-Pesaran-Shin*	*Fisher ADF*	*Levin-Lin-Chu*	*Im-Pesaran-Shin*	*Fisher ADF*
l(DD)	[-3.139]** (0.000)	[-3.956]** (0.000)	[61.946]** (0.000)	-	-	-
l(OI)	[-2.666]** (0.003)	[-3.721]** (0.000)	[57.003]** (0.000)	-	-	-
l(RER)	[-7.34]** (0.009)	[-1.87]** (0.030)	[34.33] (0.126)	[-9.77]** (0.000)	[-9.23]** (0.000)	[121.69]** (0.000)
l(OP)	[-2.686]** (0.003)	[-0.502] (0.307)	[22.69] (0.650)	[-9.949]** (0.000)	[-8.479]** (0.000)	[111.70]** (0.000)
(π)	[-1.021] (0.153)	[-0.443] (0.328)	[29.351] (0.295)	[-7.974]** (0.00)	[-8.013]** (0.000)	[117.82]** (0.00)
l(GDP/c)	[-2.343]** (0.009)	[-1.233] (0.108)	[32.202] (0.186)	[-8.933]** (0.000)	[-7.471]** (0.000)	[100.03]** (0.000)

Source: Authors' compilation. Notes: ** Significant at 5% level. [ ] statistic test; ( ) P-value.

Table 3. Summary of statistics

	l(RER)	*l*(OI)	*l*(DD)	*l*(OP)	(π)	*l*(GPD/c)
Mean	0.169	2.281	3.462	4.091	2.213	10.410
Std. Dev.	0.139	4.009	0.127	0.469	2.119	0.469
Skewness	-0.049	0.192	-0.120	-0.480	1.774	-0.733
Kurtosis	2.550	2.821	2.469	2.154	9.095	2.864
Jarque-Bera	2.757**	2.341**	4.411**	21.28	642.0	6.170***
	(0.269)	(0.352)	(0.110)	(0.000)	(0.000)	(0.024)

Source: Authors' compilation. The table presents the four first moments and the (JB) normality test. ( ) P-value. ** Significant at 5%; *** Significant at 1%.

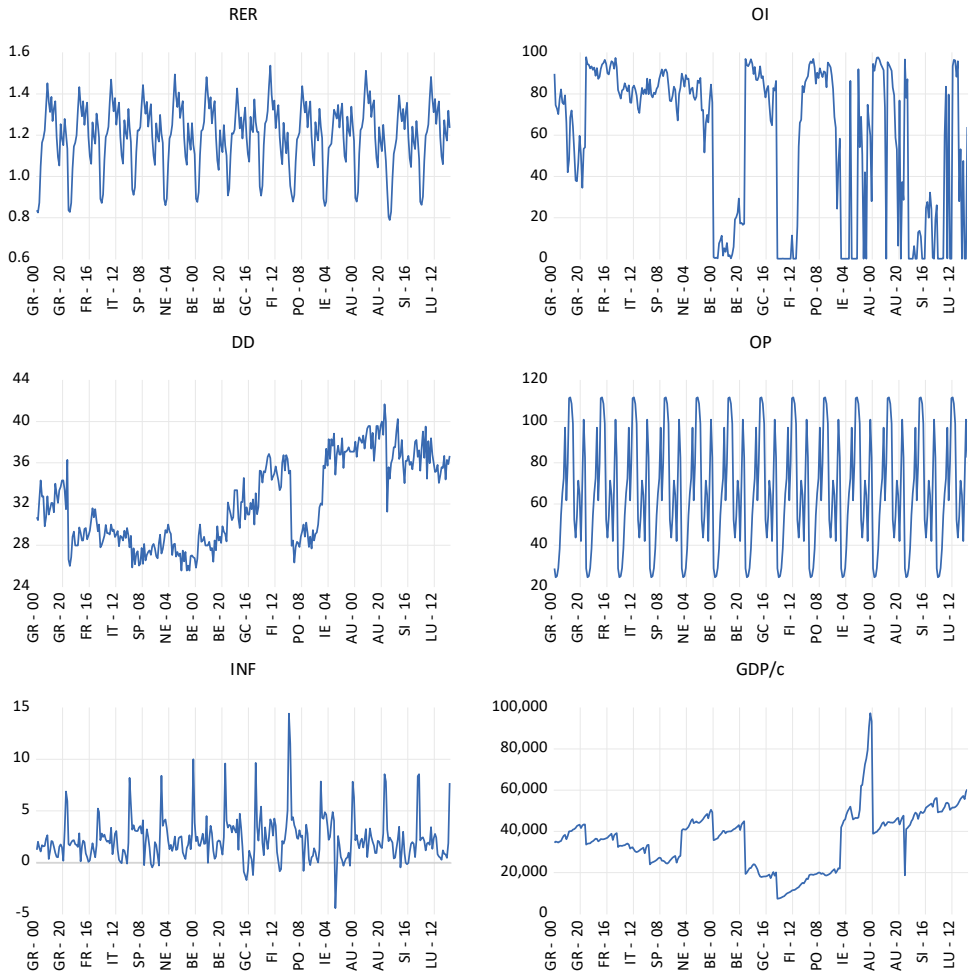

Figure 4. Time series plot of the variables