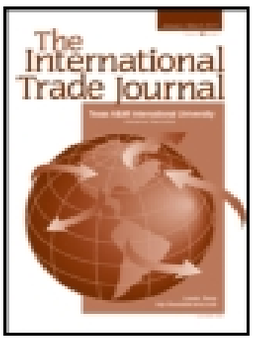

The International Trade Journal

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uitj20

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To cite this article: Karim Barkat, Shaif Jarallah & Mouyad Alsamara (2022): Do Exchange Rate Changes Improve the Trade Balance in GCC Countries: Evidence from Nonlinear Panel Cointegration, The International Trade Journal, DOI: 10.1080/08853908.2022.2121341

To link to this article: https://doi.org/10.1080/08853908.2022.2121341

Published online: 07 Sep 2022.

THE INTERNATIONAL TRADE JOURNAL
https://doi.org/10.1080/08853908.2022.2121341

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Do Exchange Rate Changes Improve the Trade Balance in GCC Countries: Evidence from Nonlinear Panel Cointegration

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ABSTRACT

This study examines the asymmetric impact of the nominal effective exchange rate (NEER) on the trade balance in GCC countries over the period of 2000:Q1 to 2017:Q4. The empirical findings of the nonlinear pooled mean group (PMG) estimator reveal the presence of a J-curve shape where an increase in NEER (currency depreciation) deteriorates the trade balance in the short run and improves it in the long run. Findings also prove that the trade balance's response to NEER positive changes is greater compared to negative changes. The policy implication of these findings reveals that NEER is a useful tool to sustain the trade balance.

KEYWORDS

Trade balance; nominal effective exchange rates; foreign prices and nonlinear panel cointegration; GCC countries

I. Introduction

Over the recent decades, the nature and transmission channel of the effect of the exchange rate on the trade balance have been the focus of debate among many scholars and policymakers around the world. Why countries run different trade balance positions and what the role of the exchange rate is are crucial questions for many countries (Alessandria and Choi 2021). In particular, these questions are of utmost importance for vulnerable economies in which trade patterns depend mainly on a specific commodity (Javid, Sharif, and Alkhathlan 2018). Several theoretical and empirical works emphasized the impact of exchange rate movements on the trade balance (Arize, Malindretos, and Igwe 2017; Kreuger 1983; Magee 1973; Nguyen, Tran, and Nguyen 2022).

Although there are several economic variables that may affect the performance of the trade balance, prominence is given to the exchange rate variable for several reasons. First, the short-run impact of the exchange rate could be different from the long-run impact due to the price elasticity of exports and imports. Thus, currency depreciation can deteriorate the trade balance only in the short run, whereas it might improve it in the long run, showing a J-curve phenomenon (Javid, Sharif, and Alkhathlan 2018; Magee 1973; Nusair 2017).

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Second, exchange rate changes might have an asymmetric impact on the trade balance in the sense that the adjustment process of the trade balance could be nonlinear in response to exchange rate fluctuations. This indicates that the response of trade balance to exchange rate positive changes is different from its response to exchange rate negative changes (Bahmani-Oskooee, Bose, and Zhang 2018; Bahmani-Oskooee and Fariditavana 2014). The main reason beyond these asymmetries is that the responsiveness degree of import prices and exports prices to exchange rate changes is different; consequently, trade volume and trade balance will react in an asymmetric way (Bahmani-Oskooee and Fariditavana 2016; Nguyen, Tran, and Nguyen 2022; Nusair 2017).

However, the economic theory regarding the linkage between exchange rate changes and international trade is mixed and inconclusive. A large strand of literature advocates that there is a negative nexus between trade balance and exchange rate fluctuations (see, for example, Chowdhury (1993); Arize (1997); Rahman and Serletis (2009); and Alsamara and Mrabet (2019)). However, numerous studies suggest that it is not always the case that the presence of the inverse relationship is valid (Broda and Romalis 2010; Nicita 2013). In addition, the standing empirical literature does not often discuss the trade balance responsiveness to exchange rate movements in the case of a pegged exchange rate regime.

In this regard, Gulf Cooperation Council[1] (GCC hereafter) countries are an excellent laboratory to investigate the impact of exchange rate movements on the trade balance in the presence of a pegged exchange rate regime via the US dollar. However, GCC's exchange rates with respect to other currencies witness considerable changes, thus examining whether such changes have a significant impact on the trade balance in GCC countries. Therefore, this study constructs a nominal effective exchange rate (NEER) to account for cross-exchange rate changes.

Figures 1 and 2 represent the possible relationship between nominal effective exchange rate movements and trade balances in GCC countries. Trade balances in GCC countries show important dynamics that might reflect its responses to several factors such as real GDP, oil prices, and nominal effective exchange rate movements. The global financial crisis of 2008 and oil price drop in 2015 seem to have a substantial impact on trade balances in these countries.

GCC countries are non-diversified economies and oil-dependent countries (IMF 2020). Thus, GCC's trade balances depend highly on oil and gas exports, in which the prices of such commodities are highly fluctuated. Moreover, hydrocarbon sectors (oil and gas) revenues in these countries account for more than 80% of government revenues and their trade balances. Therefore,

[1]The Gulf Cooperation Council consists of six countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

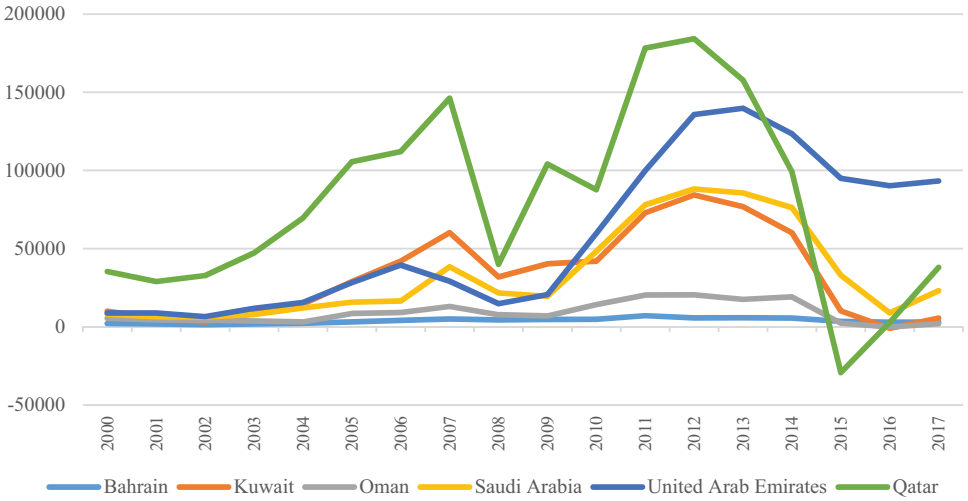

Figure 1. Trade balance in GCC countries (in millions US $). Source: World Bank Indicators.

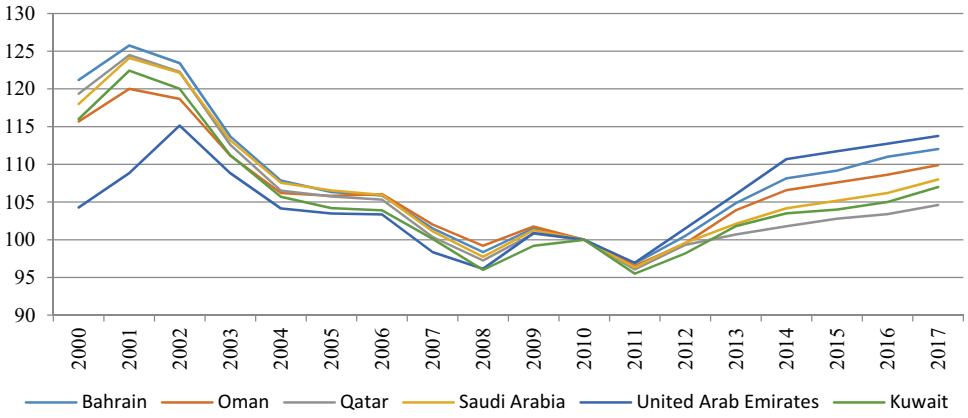

Figure 2. Nominal effective exchange rate index in GCC countries. Source: World Bank Indicators.

this empirical study emphasizes the role of oil price as a main determinant of trade balances in these oil-exporting countries. Furthermore, given that the GCC countries' consumption pattern depends largely on foreign imports of goods and services (Alsamara, Mrabet, and Dombrecht 2018; Alsamara et al. 2017; IMF 2020; Alsamara, Mrabet, and Hatemi-J 2020), this study highlights the influence of foreign prices in the main trading partners on the trade balance performance. Accordingly, the objective of this study is to bridge the existing gap in the current literature by examining the asymmetric impact of the nominal effective exchange rate on the trade balance for the GCC countries. We employ the recently developed nonlinear panel model to estimate the asymmetric impact of NEER on the trade balance in both the long and short

run. Finally, we account for the impact of the world financial crisis on trade balances in GCC countries.

This article is organized as follows: Section 2 provides a literature review. The description of the data, model, and the empirical methodology are presented in Section 3. Furthermore, the empirical results are discussed in Section 4 followed by conclusions and policy implications in Section 5.

II. Literature review

The theoretical background of the exchange rate impact on the trade balance goes back to the seminal work of Orcutt (1950). This theory emphasizes the role of export and import price elasticity in achieving trade balance stability, formerly known as the Marshall-Lerner condition (Arize, Malindretos, and Igwe 2017; Bahmani-Oskooee, Bose, and Zhang 2018; Onakoya, Johnson, and Ajibola 2019). According to the Marshall-Lerner condition, currency depreciation may cause an enhancement in the trade balance only if the volumes of exports and imports are appropriately elastic with respect to the real exchange rate (Krugman and Obstfeld 2005). Several empirical studies examined the linkage between trade flow and exchange rate by estimating demand and price elasticities (Bahmani-Oskooee and Fariditavana 2016; Goldstein and Khan 1976; Javid, Sharif, and Alkhathlan 2018). Thus, economies may be able to reduce the trade balance deficit by devaluating the local currency, where the economy's imports/exports will be more expensive/cheaper. However, currency depreciation influences the trade balance inversely in the short run, whereas this movement of the trade balance successively over time adjusts to reflect a J-curve phenomenon (Bahmani-Oskooee and Fariditavana 2016; Nusair 2017).

Recent studies provide robust empirical evidence of the nexus between currency fluctuations and the trade balance. Most of these studies have used newly developed advanced time series estimation techniques such as autoregressive distributed lags (ARDL) and nonlinear autoregressive distributed lags (NARDL), (see, for instance, Bussiere (2013); Bahmani-Oskooee and Baek (2016); Bahmani-Oskooee, Ghodsi, and Halicioglu (2017); Arize, Malindretos, and Igwe (2017); and Onakoya, Johnson, and Ajibola (2019)). Bahmani-Oskooee, Harvey, and Hegerty (2017) examined the divergence effects of the exchange rate on British trade balances using the nonlinear ARDL model. Their empirical results show long-run asymmetries with six of eight trading partners. In the same way, Onakoya, Johnson, and Ajibola (2019) found similar results for the Nigerian economy. In this context, Bahmani-Oskooee, Ghodsi, and Halicioglu (2017) examined the real exchange rate impact on the Japanese trade balance with 12 countries by considering both the linear and nonlinear ARDL models. They reveal that in the long run, Japanese imports

and exports show growth as the Japanese yen depreciates and exhibit mixed interaction with yen appreciations compared with yen depreciations.

Adding to this, Bahmani-Oskooee and Fariditavana (2015) revisit the J-curve effect through the use of both linear and nonlinear techniques using quarterly data for Canada, the US, China, and Japan. In all countries, they found that the impact of exchange rate fluctuations on the trade balance were asymmetric. In the same vein, Bahmani-Oskooee and Halicioglu (2017) investigated the impact of exchange rate changes on the trade balance of Turkey. Using ARDL and NARDL estimation methods, they found strong evidence supporting asymmetric effects of exchange rate movements on Turkey's trade balance with its partners. Their study generally affirms the J-curve formation.

Some studies using linear estimation techniques found that the J-curve was disproven. For example, Iyke and Ho (2017) conducted a study in Ghana using linear and nonlinear models. They examined the impact of real exchange rate changes on the trade balance from the period of 1986Q1 to 2016Q3. In the linear specification, there was no proof of the presence of a short- or long-run impact, and so, in this case, the J-curve is disproven. On the other hand, the nonlinear specification showed that there was an effect of exchange rate changes on the trade balance wherein depreciations improve the trade balance in the long run, but appreciations had no effect. As a result, there is evidence of the presence of the J-curve phenomenon in this case. In the same vein, Chang, Rajput, and Ghumro (2018) examined whether the asymmetric impact of exchange rate fluctuations on the trade balance may change because of the financial crisis. They employed both linear and nonlinear ARDL models, and they pointed out that the short-run asymmetries only exist in the post-crisis period. However, the long-run asymmetries exist for the whole period.

Furthermore, Bahmani-Oskooee, Bose, and Zhang (2018) conducted a study employing a non-linear ARDL model for China and its trading partners to investigate the relationship between real exchange rates and trade balances. Their findings support the presence of short-run asymmetric effects of the exchange rate. The J-curve was supported concerning the appreciation or depreciation of the yuan in the US and four other trading partners. Alessandria and Choi (2021) investigated the relationship between the US trade balance and real exchange rate. They found that the large US trade deficit is due to the increasing share of trade to GDP. They also revealed that long-run asymmetries are larger than short-run asymmetries. It is worth mentioning that most of the existing empirical studies have focused on an individual country, and little has been done for the group of countries. In addition, none of these studies emphasized the role of the global financial crisis on the trade balance dynamic. Therefore, this study attempts to fill this gap by investigating the impact of the exchange rate on the trade balance in GCC countries using a nonlinear panel estimation technique.

III. Data, model, and the empirical methodology

Data

In this empirical study, we focus on the asymmetric impacts of the nominal effective exchange rate (NEER), prices, scale variables, and oil price changes on the trade balance of GCC countries. We use quarterly data for the 2000:Q1 to 2017:Q4[2] period to explore the relationship between trade balance and exchange rate changes in GCC countries. To do so, we construct two important variables: first, the trade balance (TB) is measured by the ratio between exports and imports in constant prices. Second, the nominal effective exchange rate (NEER) is the weighted average of exchange rates with respect to the currency in 18 trading partner countries using the variant trade share of imports as weights. Given that the cross-exchange rate is the geometric average of the cross-exchange rate indexes of the trading partners, the NEER index can be written as follows:

$$\mathrm{NEER}_{jt} = \prod_{i=1}^{18} \left(\frac{E_{jt}}{E_{it}}\right)^{\omega_{ijt}}$$

E_{it} and E_{jt} are the exchange rates in the trading partners and GCC countries, respectively. ω_{ijt} is the imports different weights of GCC trade partners. An increase or decrease in NEER represents currency depreciation and appreciation, respectively. Moreover, an increase in NEER is expected to have long-run positive and short-run negative impacts on the trade balance.

Additionally, we include several explanatory variables such as real GDP (RGDP), world real GDP (WRGDP), domestic consumer price index (CPI) of GCC countries, foreign consumer prices (FCPI) of GCC's trade partners, and oil price (OP). However, domestic income (RGDP) and CPI are expected to be inversely related to the trade balance. In contrast, foreign income (WRGDP), FCPI, and OP are predicted to have a positive impact on the trade balance (Bahmani-Oskooee, Bose, and Zhang 2018).

All the selected variables are used in their logarithmic forms. The data sources are mainly the International Financial Statistics (IFS) of the International Monetary Fund (IMF) and the World Bank (WB). Table 1 reports the descriptive statistics of the selected variables.

Model specification

It is common in the literature that trade balance models can be explained by the exchange rate and other two variables of economic activity such as domestic and foreign real GDP (Bahmani-Oskooee and Fariditavana 2016).

[2]Trade balance data for some GCC countries are not available before 2000.

Table 1. Panel descriptive statistics (GCC panel group).

	LTB	LNEER	LOP	LRGDP	LWRGDP	LCPI	LFCPI
Mean	−0.78	4.67	4.02	11.63	4.63	4.50	4.60
Median	−0.78	4.65	4.08	11.69	4.64	4.55	4.59
Maximum	0.24	4.85	4.80	13.45	4.70	4.82	4.76
Minimum	−1.84	4.53	2.96	9.62	4.52	4.07	4.43
Std. Dev.	0.44	0.08	0.53	1.06	0.04	0.19	0.05
Skewness	0.18	0.62	−0.24	−0.09	−0.52	−0.39	0.07
Kurtosis	2.32	2.42	1.77	1.93	2.89	2.03	3.77
Observations	408	408	408	408	408	408	408

This study examines the impact of the nominal effective exchange rate and other explanatory variables on the GCC's trade balance ($TB_{i,t}$). Following Arize, Malindretos, and Igwe (2017) and Bahmani-Oskooee and Halicioglu (2017), trade balance can be explained by several macroeconomic variables such as exchange rate, domestic real GDP (RGDP), and foreign real GDP (WRGDP).

Given that GCC countries are highly dependent on oil exports, oil price (OP) is expected to have a crucial role in explaining trade balance performance. In addition, GCC countries' exchange rate regimes are pegged with respect to the US dollar, and our empirical analysis will use the constructed index of the nominal effective exchange rate (NEER). Moreover, GCC countries rely mainly on imported goods and services. Therefore, domestic and foreign prices are expected to have a substantial impact on the trade balance. Thus, we will augment the model by adding the domestic price level (CPI) and the foreign price index (FCPI) as follows:

It is worth mentioning that we construct the nominal effective exchange rate index for the GCC countries based on the trade weights of 20 trade partners of GCC countries. In addition, we construct the foreign consumer price index for each GCC country to capture the impact of foreign prices on the trade balance. Thus, the empirical model is represented as follows:

$$TB_{i.t} = \alpha + \beta NEER_{i,t} + \gamma \mathrm{OP}_{i,t} + \vartheta RGDP_{i,t} + \theta WRGDP_{i,t} + \delta CPI_{i,t} + FCPI_{i,t} + \varepsilon_{i,t} \tag{1}$$

In order to account for the nonlinear responses of the trade balance to NEER changes, we will further estimate the nonlinear model by applying the accumulated sums of positive and negative changes of NEER (Shin, Yu, and Greenwood-Nimmo 2014). Thus, the estimated nonlinear model can be written as follows:

$$TB_{i.t} = \alpha + \beta_1 NEER^{+}_{i,t} + \beta_2 NEER^{-}_{i,t} + \gamma \mathrm{OP}_{i,t} + \vartheta RGDP_{i,t} + \theta WRGDP_{i,t} + \delta CPI_{i,t} + FCPI_{i,t} + \varepsilon_{i,t} \tag{2}$$

where $NEER^{+}_{i,t}$ represents the accumulated sums of positive changes of NEER.

$NEER^{-}_{i,t}$ represents the accumulated sums of negative changes of NEER:

$$NEER^{-}_{i,t} = \sum_{i=1}^{t} \Delta NEER^{-}_{i,t} = \sum_{i=1}^{t} \min\left(\Delta x_{i,t}, 0\right)$$

Empirical methodology

Before starting the estimation process and evaluating the relationship between trade balance and its determinants, we should first check for the stationarity of the variables under consideration. In the second step, it is important to examine the existence of a long-run relationship among the specified variables using a suitable panel cointegration test. Finally, we will perform the panel autoregressive distributed lags (ARDL) estimation technique suggested by Pesaran, Shin, and Ron (1999), (2001) to investigate the long- and short-run impact of the selected variables on trade balance performance in the GCC economies.

Following Pesaran, Shin, and Smith (1999), we use the pooled mean group (PMG) estimator to avoid the serious heterogeneity bias that could arise if we use a dynamic fixed effect (DFE) model (Pesaran and Smith 1995). Pesaran, Shin, and Smith (1999) indicated that the PMG method is more efficient since it allows for long-run homogeneity and short-run heterogeneity in the panel ARDL model. In addition, Pesaran, Shin, and Ron (1999) propose employing using the Hausman (1978) test for analysis of the homogeneity of long-run coefficients.

IV. Empirical results

Panel unit root tests

This empirical study employs the panel unit root test method proposed by Im, Pesaran, and Shin (2003) to check the stationarity order of the variables that are used in the estimation. This test is a prerequisite to investigate the relationship between trade balance and its determinants. The results of the Im, Pesaran, and Shin (2003) unit root test are reported in Table 2. These results indicate that all the selected variables are cointegrated in order one (I(1)), except trade balance which is cointegrated in order zero (I(0)). This implies that the panel autoregressive distributed lags (ARDL) estimation technique is more suitable for such an investigation.

Given that the Im, Pesaran, and Shin (2003) unit root test assumes that cross sections are independent, it is important to examine the cross-section dependence (CSD) in the panel data. To ignore such an examination may lead to insignificant results. The presence of CSD between the designated countries indicates that the empirical analysis should be founded on the second

Table 2. Panel unit root test.

	Level		Difference	
Variables	Im, Pesaran, and Shin W-Stat	p-value	Im, Pesaran, and Shin W-Stat	p-value
LTB	−4.23**	0.03	−5.30***	0.000
LNEER	1.37	0.91	−7.45***	0.000
LRGDP	−1.81	0.99	−2.83***	0.001
LWRGDP	−1.49	0.86	−6.41***	0.000
LCPI	2.96	0.99	−4.29***	0.001
LFCPI	6.17	0.99	−3.16***	0.001
LOP	−0.092	0.46	−9.49***	0.000

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 3. Panel cross-section dependence test.

Variables	Stat. (Breusch-Pagan LM)	Prob
LTB	201***	0.00
LNEER	798***	0.00
LRGDP	923***	0.00
LWRGDP	937***	0.00
LCPI	884**	0.00
LFCPI	1020***	0.00
LOP	1020***	0.00

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

generation of panel unit root tests that allow for CSD (Breitung and Pesaran 2008). Table 3 shows that the null hypothesis of no cross-section dependence is rejected and confirms the presence of CSD between the selected countries. These results are normal given that GCC countries have several common features in terms of economic and social aspects.

Given the existence of CSD among the GCC countries, the empirical analysis applies the second-generation panel unit root test that accounts for both CSD across countries and the heterogeneity slope. In this context, the CIPS test suggested by Pesaran (2007) is an efficient tool to examine the stationarity level of the selected variables. Table 4 indicates that all of the selected variables are integrated of order one at the 1% significance level. These results indicate that a possible long-run relationship exists among the selected variables in our trade balance model.

Panel cointegration tests

Given that the results of the second generation of unit root tests indicate that there is a possible long-run relationship, the next step is to check for cointegration using the Westerlund (2007) cointegration test. This test has four different components, and the null hypothesis states that there is no

Table 4. Panel unit root test with cross-sectional dependence.

	CIPS z(t-bar)	CIPS z(t-bar)
Variables	Level	Difference
LTB	−2.1	3.4**
LNEER	−1.8	4.2***
LRGDP	−2.3	3.6***
LWRGDP	−2.2	3.8***
LCPI	−1.6	5.2***
LFCPI	−1.4	4.9***
LOP	−2.6	5.6***

Note: ***, **, and * indicate that the test statistic is significant at the 1%, 5%, or 10% level, respectively.

Table 5. Cointegration tests.

	Value	Robustp-value
Gt	−4.62***	0.000
Ga	−21.55**	0.000
Pt	−12.42***	0.000
Pa	−42.13***	0.000

Note: ***, **, and * indicate that the test statistics is significant at 1%, 5%, and 10% levels, respectively.

cointegration. The first two (Gt, Ga) test the cointegration hypothesis for each individual country, whereas the Pt and Pa tests inspect for the panel. Table 5 represents these cointegration tests and confirms the existence of the long-run relationship.

Panel estimation results

Given that cointegration tests have proved the existence of the long-run relationship among the selected variables of the trade balance model in the GCC countries, we will move forward and estimate the long- and short-run elasticities of our model using the linear and nonlinear PMG estimators. Table 6 reports the long-run estimated results and shows that NEER has a significant positive impact on the trade balance in GCC countries only when we use the nonlinear model. The nonlinear model of the trade balance in Table 6 reveals that the trade balance's response to positive changes in NEER (currency depreciation) is greater than its response to negative changes (currency appreciation), proposing that NEER changes have asymmetric impacts on the trade balance in GCC countries. In the long run, a 1% increase in NEER positive changes will improve the trade balance by 1.98% in comparison to a 0.68 deterioration in the trade balance for NEER negative changes.

Overall, the responsiveness of import and export prices to NEER increases (currency depreciation) is larger than its responsiveness to NEER decreases (currency appreciation). This can be explained by the fast reaction of markets

Table 6. Long-run panel estimation results (full sample).

Linear Model		Nonlinear Model		Nonlinear Model with 2008 FC dummy	
Variables	*Coeff.*	*Variables*	*Coeff.*	*Variables*	*Coeff.*
LNEER	1.48	*LNEER_POS*	1.98***	*LNEER_POS*	2.12***
		LNEER_NEG	0.68**	*LNEER_NEG*	0.87**
LRGDP	−0.57*	*LRGDP*	−1.48***	*LRGDP*	−1.22**
LWRGP	−3.40***	*LWRGP*	1.22**	*LWRGP*	0.98**
LOP	0.63**	*LOP*	0.65***	*LOP*	0.81***
LCPI	−1.62***	*LCPI*	−1.80***	*LCPI*	−1.42**
LFCPI	2.36	*LFCPI*	1.94*	*LFCPI*	1.35*
				FC2008	*−0.28***
Hausman Test	*4.41*	*Hausman Test*	*12.63****	*Hausman Test*	*10.42****

in response to currency deprecation through increasing exports and/or reducing imports, which may lead to a trade balance improvement (Nguyen, Tran, and Nguyen 2022). However, markets have several restrictions and domestic prices are inelastic when currency appreciates, which may lead to a trade balance deterioration. Moreover, given that GCC countries follow a fixed exchange rate system with respect to the US dollar, an increase in NEER (currency depreciation) is driven by the US dollar and will lead to an enhancement of the trade balance in the long run through the exports channel. In particular, oil international prices are assessed in US dollars and most of the GCC countries are oil-exporting economies. These long-run empirical results shown in Table 6 so far confirm the long-run predicted path of the J-curve hypothesis in the GCC countries.

Moreover, the nonlinear model in Table 6 shows that the long-run impacts of other variables are statistically significant and have the predicted signs. Domestic income and domestic prices have a negative impact on the trade balance, whereas foreign income, foreign prices, and oil prices have a positive impact on the trade balance in GCC countries. This implies that an increase in domestic income and domestic consumer prices will increase imports and decrease exports, respectively, and cause a significant deficit in the trade balance in these countries. This is very relevant for the GCC countries when we take into account that most of these countries are rich economies with high incomes, and their consumption pattern is largely based on imports. In contrast, an increase in world income, oil prices, and foreign prices will lead to more exports and less imports, which will improve the trade balance position in GCC countries.

In addition to exploring the asymmetric impact of NEER on the trade balance, we also reexamine this context by investigating whether this relationship between the selected variables changes as a result of the 2008 world financial crisis. The effect of this financial crisis is considered by adding to the non-linear model a dummy variable (FC08) that takes the value of 1 from 2008 forward and 0 otherwise. The empirical results show that the impact of the 2008 financial crisis is significant and negative as shown in Table 6. The

impact of the other variables is still significant and has the relevant signs. More interestingly, findings indicate that the impact of NEER positive and negative changes is larger in magnitude when we include the dummy of the 2008 financial crisis. This interesting finding reveals that the financial crisis can be one of the reasons that underlines the nonlinear response of the trade balance. Therefore, our empirical estimation reveals that investigating the asymmetric relationship without considering the global financial crisis may lead to misleading results.

Table 7 shows the short-run estimations of the nonlinear models of the trade balance in GCC countries. The sign of the error correction term is negative and statistically significant and shows that the speed of adjustment toward the long-run equilibrium is 15%. Furthermore, most of the short-run coefficients of the selected variables are statistically significant. Interestingly, the impact of NEER is negative and different from the long-run positive impact on the trade balance. More precisely, the short-run estimations of the nonlinear model in Table 7 show that the trade balance responses to positive changes in NEER (currency depreciation) are greater than its responses to NEER negative changes (currency appreciation) in the short run. This proposes that NEER changes have negative and asymmetric impacts on the trade balance in the short run in GCC countries. In the short run, a 1% increase in NEER positive changes will deteriorate the trade balance by 0.65% compared to 0.22 improvements for NEER negative changes.

This asymmetric impact of NEER on the trade balance can be explained by the immediate and quick response of markets to changes in exchange rate and import prices. However, producers need more time to respond due to the market restrictions. However, these short-run empirical results shown in Table 7 confirm the short-run predicted path of the J-curve hypothesis in the GCC countries. This trade balance worsening in the short run is predicted because the short-run imports price will react quickly to meet exchange rate changes. Thus, price rigidity and the dominant subsidies system in some of the

Table 7. Short-run panel estimation results (full sample).

Nonlinear Model	
Variables	*Coeff.*
EC_t	−0.15**
D(LTB(−1))	0.54***
D(LNEER_POS(−1))	−0.65**
D(LNEER_NEG(−1))	−0.22*
D(LOP)	0.15**
D(LFCPI)	1.55**
C	1.57*

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 8. Panel autoregressive distributed lag short-run estimation results. (Individual countries).

Variable	Bahrain	Oman	Qatar	Saudi Arabia	UAE	Kuwait
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
EC_t	−0.15***	−0.04	−0.12**	−0.18***	−0.06***	−0.01***
D(LTB(−1))	0.61***	0.43***	0.45***	0.54***	0.59**	0.59***
D(LNEER_POS)	−0.92**	−0.36	−1.22**	−1.34***	−0.62***	−0.18
D(LNEER_NEG)	−0.57**	0.67	−0.78*	−0.68**	−0.42**	−0.92**
D(LRGDP)	−3.43	−0.80*	−2.86**	−0.72**	0.20	−2.55**
D(LWRGDP)	1.14***	0.26	3.19***	1.29***	0.15*	−1.75***
D(LCPI)	0.76*	1.64**	0.99	−0.28	0.63*	−0.95
D(LOP)	−0.06***	0.01***	0.12***	0.05***	0.03***	0.05***

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

GCC countries might be the main reasons beyond the nonlinear response of trade balance (Alsamara et al. 2017; Nguyen, Tran, and Nguyen 2022).

Overall, these empirical results (Tables 6 and 7) of the short- and long-run estimation of the trade balance in GCC countries confirm the predicted path of the J-curve hypothesis.

Moreover, the nonlinear model in Table 7 shows that the short-run impacts of other variables are statistically significant and have the predicted signs. In particular, the lagged value of the trade balance, foreign prices, and oil prices are the main determinants of the short-run movement of the trade balance. Table 8 represents the short-run estimations of the individual countries. Except for Oman, the error correction terms for these countries are negative and statistically significant. The empirical results reveal that NEER has an asymmetric negative impact on the trade balance in Bahrain, Qatar, Saudi Arabia, and the UAE.

V. Conclusion

The impact of exchange rate changes on the trade balance has been extensively addressed over the recent decades and still enthusiastically invites debate and discussion by many scholars and policymakers around the globe. A country's trade volume is evidently having a significant influence and is determined by the exchange rate movements in the short run as well as the long run. However, the impact varies. This study detects the key determinants of the trade balance in GCC countries over the period of 2000:Q11 to 2017:Q4. Our investigation shows that these factors include the nominal effective exchange rate (NEER), domestic income, domestic prices, foreign income, foreign prices, and oil prices.

Furthermore, this study empirically examines the asymmetric impact of the exchange rate on the trade balance in GCC countries. To do so, we build an important variable called the nominal effective exchange rate (NEER). This variable represents the weighted average of the cross-exchange rate indexes with respect to the currency in 18 trading partner countries and uses the

variant trade share of imports as weights. Moreover, this study focuses on the nonlinear response of trade balance to NEER positive and negative changes.

Thus, this study employs the recently advanced panel techniques and specifically uses the nonlinear autoregressive distributed lags (NARDL) estimation technique in the context of a panel pooled mean group. This technique incorporates the issue of heterogeneous slope coefficients among these groups of countries. Additionally, these newer procedures take into account the issue of cross-sectional dependence across countries.

Our empirical results provide supporting evidence of a J-curve pattern in GCC countries. Therefore, an increase in NEER (currency depreciation) will deteriorate the trade balance in the short run and improve it in the long run. Furthermore, we also discover that NEER has an asymmetric impact on the trade balance. The trade balance in GCC countries will respond more to NEER increases (currency depreciation) than to currency appreciation. As earlier mentioned, this nonlinear response of the trade balance can be explained mainly by the short-run import price rigidity and the long-run adjustment of export prices in GCC countries (Nguyen, Tran, and Nguyen 2022). The empirical analysis indicates that our findings are very important for policymakers in the GCC countries. GCC countries are small open economies and highly dependent on oil and gas exports to improve and sustain trade balance positions. However, as mentioned earlier, GCC countries can use the nominal effective exchange rate to avoid a sudden deterioration in the trade balance. Furthermore, the nominal effective exchange rate can be a very useful tool to improve the trade balance in the long run.

Acknowledgment

Open Access funding provided by the Qatar National Library. This paper was made possible by an NPRP grant (NPRP12S-0311-190314) from the Qatar National Research Fund.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Alessandria, George, and Horag Choi. 2021. "The Dynamics of the U.S. Trade Balance and Real Exchange Rate: The J Curve and Trade Costs?" *Journal of International Economics* 132:103511. doi: 10.1016/j.jinteco.2021.103511

Alsamara, Mouyad, and Zouhair Mrabet. 2019. "Asymmetric Impacts of Foreign Exchange Rate on the Demand for Money in Turkey: New Evidence from Nonlinear ARDL." *International Economics and Economic Policy* 16 (2): 355–356. doi:10.1007/s10368-018-0421-y.

Alsamara, Mouyad, Zouhair Mrabet, and Michel Dombrecht. 2018. "Asymmetric Import Cost Pass-through in GCC Countries: Evidence from Nonlinear Panel Analysis." *Economic Modelling* 75 (July): 432–440. doi:10.1016/j.econmod.2018.07.014.

Alsamara, Mouyad, Zouhair Mrabet, Michel Dombrecht, and Karim Barkat. 2017. "Asymmetric Responses of Money Demand to Oil Price Shocks in Saudi Arabia: A Non-Linear ARDL Approach." *Applied Economics* 49 (37): 3758–3769. doi:10.1080/00036846.2016.1267849.

Arize, Augustine C. 1997. "Conditional Exchange-Rate Volatility and the Volume of Foreign Trade: Evidence from Seven Industrialized Countries." *Southern Economic Journal* 64 (1): 235–254. doi:10.2307/1061049.

Arize, Augustine C, John Malindretos, and Emmanuel U. Igwe. 2017. "Do Exchange Rate Changes Improve the Trade Balance: An Asymmetric Nonlinear Cointegration Approach." *International Review of Economics and Finance* 49 (February): 313–326. doi:10.1016/j.iref.2017.02.007.

Bahmani-Oskooee, Mohsen, and Jungho Baek. 2016. "Do Exchange Rate Changes Have Symmetric or Asymmetric Effects on the Trade Balance? Evidence from U.S.-Korea Commodity Trade." *Journal of Asian Economics* 45:15–30. doi:10.1016/j.asieco.2016.06.001.

Bahmani-Oskooee, Mohsen, Niloy Bose, and Yun Zhang. 2018. "Asymmetric Cointegration, Nonlinear ARDL, and the J-Curve: A Bilateral Analysis of China and Its 21 Trading Partners." *Emerging Markets Finance and Trade* 54 (13): 3130–3151. doi:10.1080/1540496X.2017.1373337.

Bahmani-Oskooee, Mohsen, and Hadise Fariditavana. 2014. "Do Exchange Rate Changes Have Symmetric Effect on the S-Curve." *Economics Bulletin* 34 (1): 164–173.

Bahmani-Oskooee, Mohsen, and Hadise Fariditavana. 2015. "Nonlinear ARDL Approach, Asymmetric Effects and the J-Curve." *Journal of Economic Studies* 42 (3): 519–530. doi:10.1108/JES-03-2015-0042

Bahmani-Oskooee, Mohsen, and Hadise Fariditavana. 2016. "Nonlinear ARDL Approach and the J-Curve Phenomenon." *Open Economies Review* 27 (1): 51–70. doi:10.1007/s11079-015-9369-5.

Bahmani-Oskooee, Mohsen, and Ferda Halicioglu. 2017. "Asymmetric Effects of Exchange Rate Changes on Turkish Bilateral Trade Balances." *Economic Systems* 41 (2): 279–296. doi:10.1016/j.ecosys.2016.07.001.

Bahmani-Oskooee, Mohsen, Seyed Hesam Ghodsi, and Ferda Halicioglu. 2017. "UK Trade Balance with Its Trading Partners: An Asymmetry Analysis." *Economic Analysis and Policy* 56:188–199. doi:10.1016/j.eap.2017.09.005

Breitung, Jörg, and Hashem Pesaran. 2008. "Unit Roots and Cointegration in Panels." *The Econometrics of Panel Data* 46: 279–322.

Bussiere, Matthieu. 2013. "Exchange Rate Pass-through to Trade Prices: The Role of Nonlinearities and Asymmetries." *Oxford Bulletin of Economics and Statistics* 75 (5): 731–758. doi:10.1111/j.1468-0084.2012.00711.x.

Chang, Bisharat Hussain, Suresh Kumar Oad Rajput, and Niaz Hussain Ghumro. 2018. "Asymmetric Impact of Exchange Rate Changes on the Trade Balance: Does Global Financial Crisis Matter?" *Annals of Financial Economics* 13 (4): 1–18. doi:10.1142/S201049521850015X.

Chowdhury, Abdur R. 1993. "Does Exchange Rate Volatility Depress Trade Flows ? Evidence from Error- Correction Models." *The Review of Economics and Statistics* 75 (4): 700–706. doi:10.2307/2110025

Christian, Broda, and David E. Weinstein. 2010. "Exporting Deflation ? Chinese Exports and Japanese Prices." In *China's Growing Role in World Trade*, edited by Robert C. Feenstra and Shang-Jin Wei, 203–227. Chicago, IL: University of Chicago Press.

Goldstein, Morris, and Mohsin Khan. 1976. "Large versus Small Price Changes and the Demand for Imports." *IMF Econ Rev* 23 (1): 200–225. doi:10.2307/3866671.

Hausman, Jerry. A. 1978. "Specification Tests in Econometrics." *Econometrica* 46 (6): 1251–1271. doi:10.2307/1913827

IMF. (2020). "Economic Prospects and Policy Challenges for the GCC Countries." Policy Paper No. 2020/065, International Monetary Fund, Washington, D.C.

Im, Kyung So, M. Hashem Pesaran, and Yongcheol Shin. 2003. "Testing for Unit Roots in Heterogeneous Panels." *Journal of Econometrics* 115 (1): 53–74. doi:10.1016/S0304-4076(03)00092-7.

Iyke, Bernard Njindan, and Sin Yu Ho. 2017. "The Real Exchange Rate, the Ghanaian Trade Balance, and the J-Curve." *Journal of African Business* 18 (3): 380–392. doi:10.1080/15228916.2017.1315706.

Javid, Muhammad, Fatima Sharif, and Khalid Alkhathlan. 2018. "Oil Price Volatility and Interdependency of GCC Economies and North East Asian Economies." *Energy Strategy Reviews* 21 (March): 172–179. doi:10.1016/j.esr.2018.06.008.

Kreuger, Anne.O. 1983. *Exchange Rate Determination*. Cambridge: Cambridge University Press.

Krugman, Paul. R, and Obstfeld Maurice. 2005. *Economía internacional*. Addison Wesley: Pearson educación.

Magee, Stephen P. 1973. "Currency Contracts, Pass-Through, and Devaluation." *Brookings Papers on Economic Activity* 1973 (1): 303–325. doi:10.2307/2534091

Mouyad, Alsamara, Zouhair Mrabet, and Abdulnasser Hatemi-J. 2020. "Pass-through of Import Cost into Consumer Prices and Inflation in GCC Countries: Evidence from a Nonlinear Autoregressive Distributed Lags Model." *International Review of Economics and Finance* 70 (August 2019): 89–101. doi:10.1016/j.iref.2020.07.009.

Nguyen, Quang Dong, Thi Ha Tran, and Quang Huy Nguyen. 2022. "Do Changes in the Exchange Rate Have an Asymmetric Effect on the Trade Balance between Vietnam and Japan?" *International Economic Journal* 36 (1): 59–76. doi:10.1080/10168737.2021.2012222.

Nicita, Alessandro. 2013. "Exchange Rates, International Trade and Trade Policies." *International Economics* 135–136:47–61. doi: 10.1016/j.inteco.2013.10.003

Nusair, Salah A. 2017. "The J-Curve Phenomenon in European Transition Economies: A Nonlinear ARDL Approach." *International Review of Applied Economics* 31 (1): 1–27. doi:10.1080/02692171.2016.1214109.

Onakoya, A. B., S. B. Johnson, and O. J. Ajibola. 2019. "Exchange Rate and Trade Balance: The Case for J-Curve Effect in Nigeria." *KIU Journal of Social Sciences* 4 (4): 47–63.

Orcutt, Guy H. 1950. "Measurement of Price Elasticities in International Trade." *Review of Economics and Statistics* 32 (2): 117–132. doi:10.2307/1927649

Pesaran, M Hashem. 2007. "A Simple Panel Unit Root Test in the Presence of Cross-Section Dependence." *Journal of Applied Econometrics* 22 (2): 265–321. doi:10.1002/jae.

Pesaran, M. Hashem, Yongcheol Shin, and J. Smith Richard. 2001. "Bounds Testing Approaches to the Analysis of Level Relationships." *Journal of Applied Econometrics* 16 (3): 289–326. doi:10.1002/jae.616.

Pesaran, M. Hashem, Yongcheol Shin, and P. Smith Ron. 1999. "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels." *Journal of the American Statistical Association* 94 (446): 621–634. doi:10.1080/01621459.1999.10474156.

Pesaran, M. Hashem, and Ron Smith. 1995. "Estimating Long-Run Relationships from Dynamic Heterogeneous Panels." *Journal of Econometrics* 68 (1): 79–113. doi:10.1016/0304-4076(94)01644-F.

Rahman, Sajjadur, and Apostolos Serletis. 2009. "The Effects of Exchange Rate Uncertainty on Exports." *Journal of Macroeconomics* 31 (3): 500–507. doi:10.1016/j.jmacro.2008.12.005.

Westerlund, Joakim. 2007. "Testing for Error Correction in Panel Data." *Oxford Bulletin of Economics and Statistics* 69 (6): 709–748. doi:10.1111/j.1468-0084.2007.00477.x.

Yongcheol, Shin, Yu Byungchul, and Matthew Greenwood-Nimmo. 2014. "Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework." In *Festschrift in Honor of Peter Schmidt*. NY New York: Springer New York, 281–314. doi:10.1007/978-1-4899-8008-3.