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ASYMMETRIC PASS-ON EFFECT OF REAL CURRENCY ON FOREIGN TRADE IN TURKISH ECONOMY: AN ANALYSIS OF THE MARSHALL-LERNER CONDITION

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Abstract

One of the fundamental reasons for the Turkish Economy's current deficit problem is foreign trade deficit. Accurate demonstration of the effects of nominal currency increases or devaluations on foreign trade is crucial in terms of closure of these deficits in determination of practical policy set. Hence, the present study aimed to reveal whether the Marshall-Lerner Condition was satisfied for the Turkish economy. To that end, the Non-Linear Autoregressive Distributed Lag (NARDL) method was employed for the analysis covering the period of 1980-2022. Our results suggested for the concerned period that the Marshall-Lerner Condition was not satisfied for the Turkish economy in terms of both short and long term. Accordingly, our suggestion was to reduce Turkiye's foreign trade deficit through different monetary and financial policy practices other than the currency rate-focused strategies.

Keywords: Marshall-Lerner Condition, Devaluation, Foreign Trade, NARDL

Jel Codes: F11, F14

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1.Introduction

As a result of the liberalization swept all across the world along the 1980s, foreign free-trade deals, established trade pacts, free-trade territories and diversified economic integrations have steered countries to increase their foreign trade volumes. Thus, currency rates have gained a significant role in determining economic policies in both developing and developed countries due to its substantial weight on a country's competitiveness in foreign trade, which turns it into useful economic policy tool that could be utilized in balancing its foreign trade with others.

In the countries adopting fixed-currency rate policy, nominal local currencies are devalued whereas currency rates are steered through intentional market operations by central banks in interventional currency policy. Such currency policies exert determining effect on prices of import and export goods. As the economic theory describes the nominal value as the value of a unit of foreign currency in terms of a unit of local currency, a unit of increase in nominal currency rate results in certain devaluation in local currency, which makes the concerned country's goods cheaper for their trade partners and this consequently increase their export volume. On the contrary, prices of imported goods become more expensive for the locals, which results in decrease in domestic demand for imported goods (Dornbusch & Fischer, 1995: 153-161). Thus, foreign trade balances could be adjusted through changing currency rates.

The degree of increase in export and decrease in import through devaluation depends on the existence of the Marshall-Lerner Condition (MLC). Marshall (1923) and Lerner (1944) reveal in their studies that the emergence of expected effect of devaluation in local currency or increasing nominal currency value depends on price elasticity of export and import goods. According to this theory called as the Marshall-Lerner Condition in the literature, total of foreign demand elasticity of exported goods and domestic demand elasticity of imported goods are required to be greater than 1 in order to gain positive impact on foreign trade balance through depreciating nominal value of local currency by increasing the overall export volume and decreasing import.

In the broadest sense, the MLC could be given as the Equation (1) below:

$$e_{ex} + e_{im} > 1 \tag{1}$$

where, e_{ex} denotes foreign demand elasticity of export goods; e_{im} domestic demand elasticity of import goods. However, it is necessary to note that these effects tend to emerge on longer periods rather than short term such that consumers and suppliers may not accommodate

themselves to the changes in prices that occur as a result of currency change. Especially, import and export amendments cannot be implemented in short hand because of long-sighted foreign commercial contracts. Thus, "J"-shape curves emerge as a result of the fact that import goods becoming more expensive due to currency increases against export earnings bringing less foreign currency (Tragakes, 2012: 410-411). That is, the devaluation has negative effect on foreign trade balance on the short-term, but yet over the time, foreign trade balance is re-settled as the market accommodates with changing good prices. In this accommodation period, BP-curve is referred as "J"-curve by the economic literature because the foreign payments balance takes a "J" shape.

The Marshall-Lerner Condition, substantially important in terms of stability of currency markets, is a theory revealing import and export goods' supply and demand elasticities; and provides us an estimate that whether devaluation could be effective in decreasing foreign trade deficits. Decreasing balance of payment deficit by means of increasing export volume, GDP and employment as a result of currency intervention is directly related with elasticities of import and export goods. In case supply and demand elasticities of import and export goods are high, supply and demand would accommodate the currency change in relatively shorter period of time; and slightest change in currency rate would be effective on re-settlement of supply-demand balance. However, if elasticity is low, this adjustment mechanism would not work sensibly enough and currency interventions would not yield an effect on foreign trade balance as desired. In this regard, it is important for policy makers to explore whether currency rate is an effective policy tool in obtaining foreign trade balance in terms of selection of accurate policy.

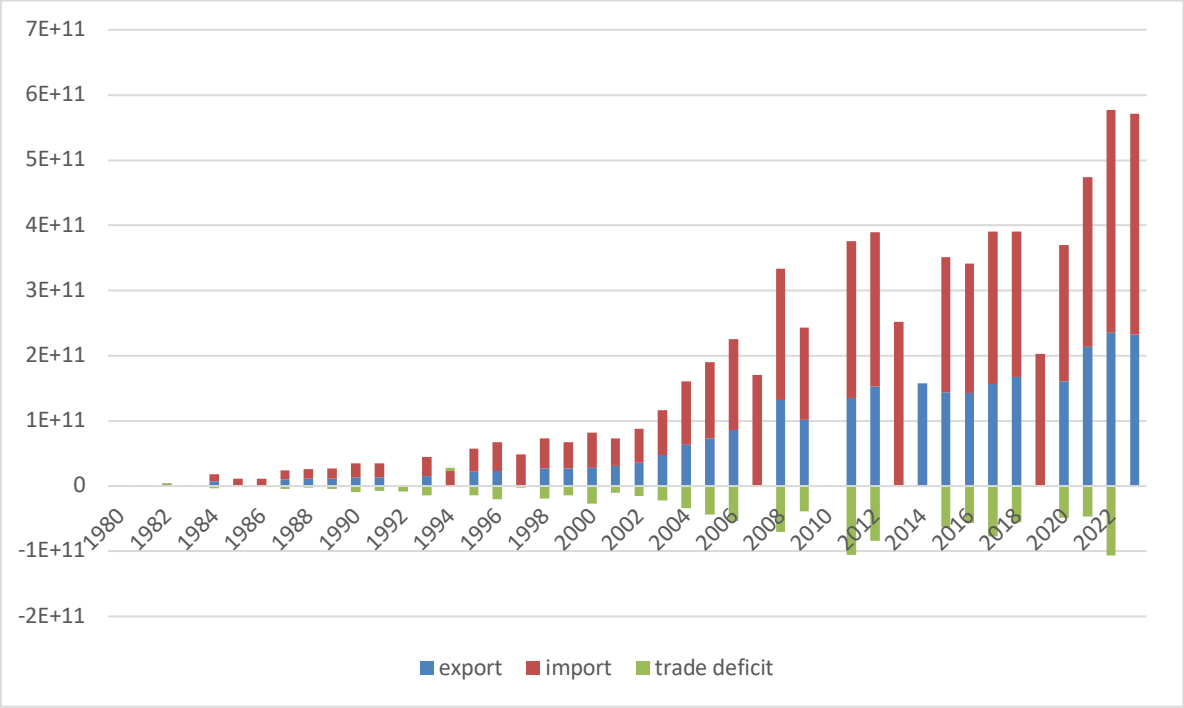
On the other hand, Alexander (1952) presented a critical perspective on the Marshall-Lerner condition by emphasizing that the massing condition is as important as trade elasticities and devaluation in achieving the trade balance of an economy. In his study, the term "massing" refers to the total expenditures made by domestic residents and emphasizes that the trade balance in an economy will improve if the output exceeds the massing capacity. In addition, he emphasizes that the economy should not be at full employment level in order to improve the trade balance through trade elasticities through devaluation. He stated that a devaluation based on the full employment level in an economy will not lead to an increase in production and thus export capacity, and that the balance of trade will be negatively affected by the continuation of imports (Vines, 2008:3).

The Turkish economy has been facing the problem of current account deficit for many years; throughout its history, it did not run a foreign trade deficit only between 1930 and 1946 (except for 1938). However, it has always faced a foreign trade deficit problem due to the fact that exports were higher than imports in other years (Mazlum, 2020:60).

While an import-substitution foreign trade policy was generally followed before 1980, after 1980, with a series of economic measures that entered the economic literature as the January 24 Decisions, a radical transformation was experienced in the Turkish economy, import-substitution policies were replaced by an export-oriented growth model and international capital movements were liberalized. Thus, with the increase in the volume of exports and imports, foreign trade deficits started to become inevitable, and especially with the Decree No. 32 of 1989, which ensured full liberalization of capital movements, the Turkish economy faced with foreign trade deficits that continued to increase and became almost chronic. Chart 1 presents data on exports, imports and foreign trade deficits of the Turkish economy between 1980 and 2023.

Chart 1

Foreign Trade Deficit between 1980-2023 (USD)



Source: Created by the author with data from TurkStat.

Chart 1 clearly shows the increase in foreign trade volume and the accompanying foreign trade deficits due to the liberalization of capital movements after 1980. For an economy that has faced the current account deficit problem for many years, it is very important to develop policies on how to close/reduce the current account deficit. Especially in an economy where one of the most important economic problems is the current account deficit, revealing the effect of exchange rates on foreign trade balance will form the basis for the foreign trade policies to be developed. First of all, if the relationship between exchange rates and foreign trade does not satisfy the Marshall-Lerner condition, exchange rates cannot be used as a policy tool to close the current account deficit. Devaluation cannot have the effect of closing the current account deficit by increasing competitiveness. This is the main motivation of this study and it is expected to contribute to the literature.

From this point, our study aims to demonstrate whether the Marshall-Lerner Condition is satisfied for the Turkish economy. In this regard, validity of the Marshall-Lerner Condition was tested for the period of 1980-2022 by means of the Non-Linear Auto-Regressive Distributed Lag (NARDL) method. The beginning of our analysis period was taken as 1980 because it was remarkable milestone of the Turkish economy, in which the liberalization period was launched.

Our study progresses as follow; the second chapter includes the literature review; the third section exhibits data, methodology and empirical analysis findings; and finally, the last chapter summarizes our results and suggestions.

2.Literature Summary

The relevant literature includes numbers of studies testing validity of the Marshall-Lerner Condition (MLC) and "J" curve hypothesis. It is inevitable to encounter different results from the studies conducted for diversified countries at different time intervals by employing various methods. Accordingly, some of these studies suggest validity of the MLC whereas some others indicate no any result. In the present study, Table 1 summarizes the studies from both domestic and foreign literature.

Table 1

Literature Review Summary

Study	Country-Period	Method	Result
Zhang (1999)	China 1986-1997	Johansen Co-Integration Analysis	Even though long term effects of currency changes in China is positive, they yield no "J" shape curve for the short term.

Wilson (2000)	S.Korea, Japan, the US 1970-1996	Granger Causality Analysis	No "J" shape curve exists with the bilateral trade relationship between S.Korea and the US.
Rehman and Afzal (2003)	Pakistan 1972-2002	ARDL-OLS Analysis	Even though short and long term effects support existence of "J"-shape curve, long term effect fails to display expected enhancement.
Mahmud et. al. (2004)	Austuralia:1966-1998, Germany;1960-1995, Japan;1960-1995, Norway;1966-1998, the UK;1957-1997, the US;1957-1997	Non-Parametric Kernel Estimator	The MLC is only satisfied with Norway; fixed currency regime display stronger effect.
Moura and Silva (2005)	Brazil 1990-2003	VAR Analysis	For the Brazil trade balance, the MLC and "J"-shape curve effect exist for the long term but not for short term.
Kimbugwe (2006)	Turkiye and 9 Trade Partner 1960-2000	ARDL and VAR Analysis	No fully supporting evidence is found for the "J"-shape curve effect with the Turkiye's bilateral trade activities.
Ay and Özşahin (2007)	Turkiye 1995-2007	VAR Analysis	Real currency exchange rate is found to be major estimator of the export and import price indexes.
Hooy and Chan (2008)	China and Malaysia 1990-2008	ARDL Analysis	The MLC is satisfied; currency depreciation accelerates trade development on the long term; but import demand is appropriate with potential "J"-shape curve model only for short term.
Alptekin (2009)	Turkiye 1992-2009	VAR Analysis	A change in currency rate has no significant effect on foreign trade balance.
Vergil and Erdoğan (2009)	Turkiye 1989-2005	ARDL Analysis	Provides evidences on existence of the "J"-shape curve.
Hepaktan (2009)	Turkiye 1980-2008	Fragmented Co-Integration Analysis	The MLC does not exist for Turkiye for the long term.
Ratha and Kang (2012)	S.Korea 1988-2011	Co-Integration and error-correction model	Afterwards of the Asia crisis, the "J"-shape curve effect is found with some of the S.Korea's trade partners.
Jamilov (2013)	Azerbaijan 2006-2009	Johansen Co-Integration	A real devaluation yields a significant positive effect on trade balance on the long term; but the "J"-shape curve is reported to be existed on the short term.
Cambazoğlu and Güneş (2016)	Turkiye and Germany 2010-2014	ARDL	Price elasticity of the trade between Turkiye and Germany is reported high; and therefore Turkiye's trade balance is expected to enhance on the long term.
Tuncay and Üstüner (2017)	Turkiye, Poland, Bulgaria, Croatia, Romania, Ukraine,	FGLS	Currency increases have no positive effect on foreign trade balance of the relevant countries and the MLC is not existed.

	Russia, Czech Republic and Hungary 2001-2015		
Uslu (2018)	80 Different Countries 1960-2016	Panel Data Analysis	The MLC is satisfied with the low income countries; real currency rate could be utilized as a policy tool to enhance foreign trade balance; but this effect is reported as weak with the high income countries.
Bakan and Akkaya (2018)	Turkiye 1950-2000	OLS	Even though the satisfaction level of the MLC is reported to be weak, elasticity of export goods is reported at lower level.
Guo (2020)	China 2008-2018	ARDL	The results show the validity of Traditional Marshal-Lerner Condition in China was investigated, while the Generalized Marshal-Lerner Condition cannot be satisfied during the sample period.
Ebadi (2020)	OECD and Asian Countries 2000-2017	DOLS, FMLS, and MLE	They found that the M-L condition holds for Asian countries but not for OECD countries and that there exist signals of J curves for Asian countries.
Akıncı (2021)	Turkiye 1992-2009	NARDL Analysis	Even though the MLC is existed on the short term, the similar finding is not valid on the long term. "J"-shape curve is found to be existed along the study period.
Altunöz (2022)	Turkiye 1993-2021	ARDL Analysis	The effect is valid for Turkish economy when both the MLC is satisfied and "J"-shape curve is existed.
Mike at all.(2022)	Turkiye 1998-2019	Fourier KPSS cointegration analysis	The findings show that the real effective exchange rate and the foreign income level have positive and statistically significant effects on the trade balance in Turkey.
Tomoiaga, Pop Sılagh (2022)	Romanian 1999-2019	Panel data	Through the analysis carried out, we obtained the result that a depreciation of the RON will lead to an improvement in the Romanian trade balance.
Akardeniz at all. (2023)	Turkiye 1998-2022	Fourier Timeseris Analysis	Significant nominal exchange rate implies that the elasticity coefficients satisfy the Extended Marshall-Lerner condition.
Aslan (2023)	Turkiye, USA 2002-2020	ARDL	The findings suggest that the Marshall-Lerner rule may be valid for foreign trade between Turkey and the US
Karademir at al. (2023)	Turkiye 2010-2022	NARDL	The results of the study reveal that the J-curve hypothesis is valid in Turkey during the period under review.
Navarro (2024)	Philippine; 1972-2021	Canonical Cointegrating Regression	Long-run analyses indicate that the ML condition is unsatisfied within the Philippine Economy, implying that strategic PHP depreciation does not necessarily indicate improvement in the trade balance.
Oyadeyi (2024)	Nigeria 1981-2021	Autoregressive distributed lag and vector autoregressive causality tests	The findings suggested that while the Marshall-Lerner condition holds, the J-Curve phenomena and the Thirlwall hypothesis are not satisfied for Nigeria.

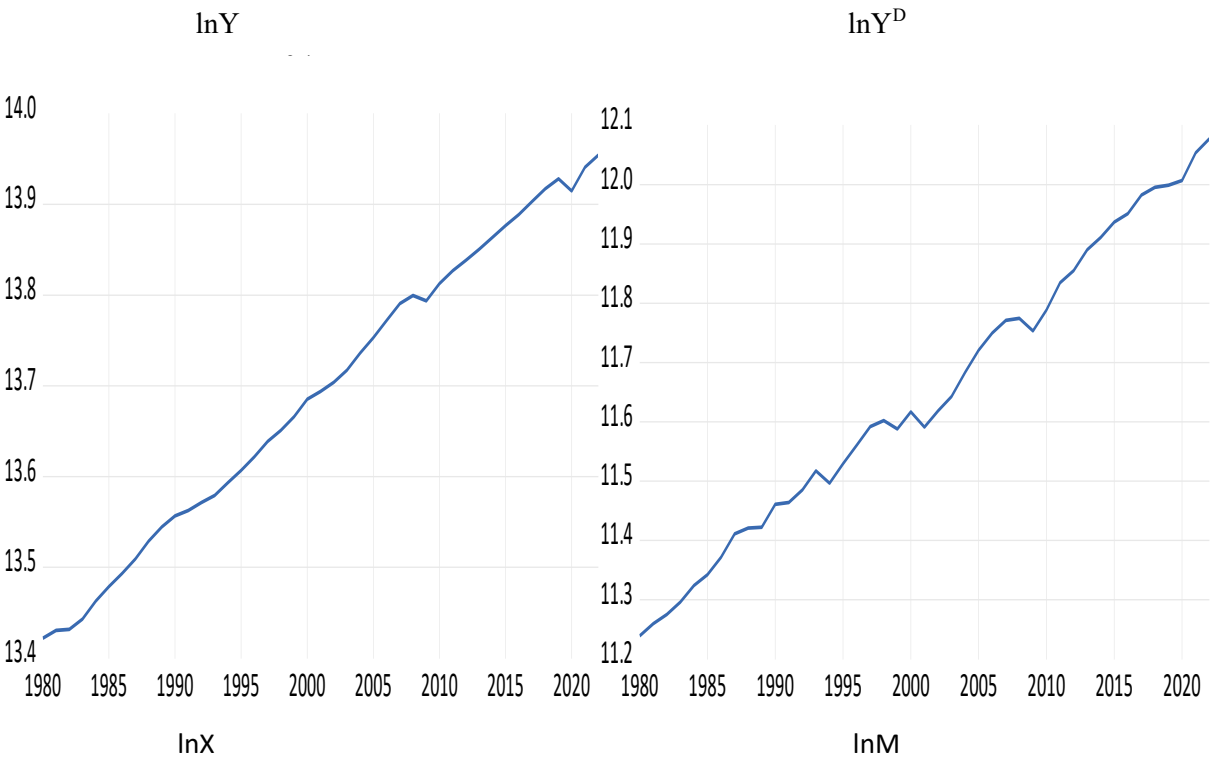
Francisco J. S. Rocha at all. (2024)	Brazil 2003-2019	BVAR Analysis	It was found that the Marshall-Lerner condition should not be rejected either.
Cheng (2024)	USA, Australia, Canada, France, UK 2003-2019	ARDL	In the study, a new Marshall-Lerner Condition is developed and found to be appropriate for the countries in question.

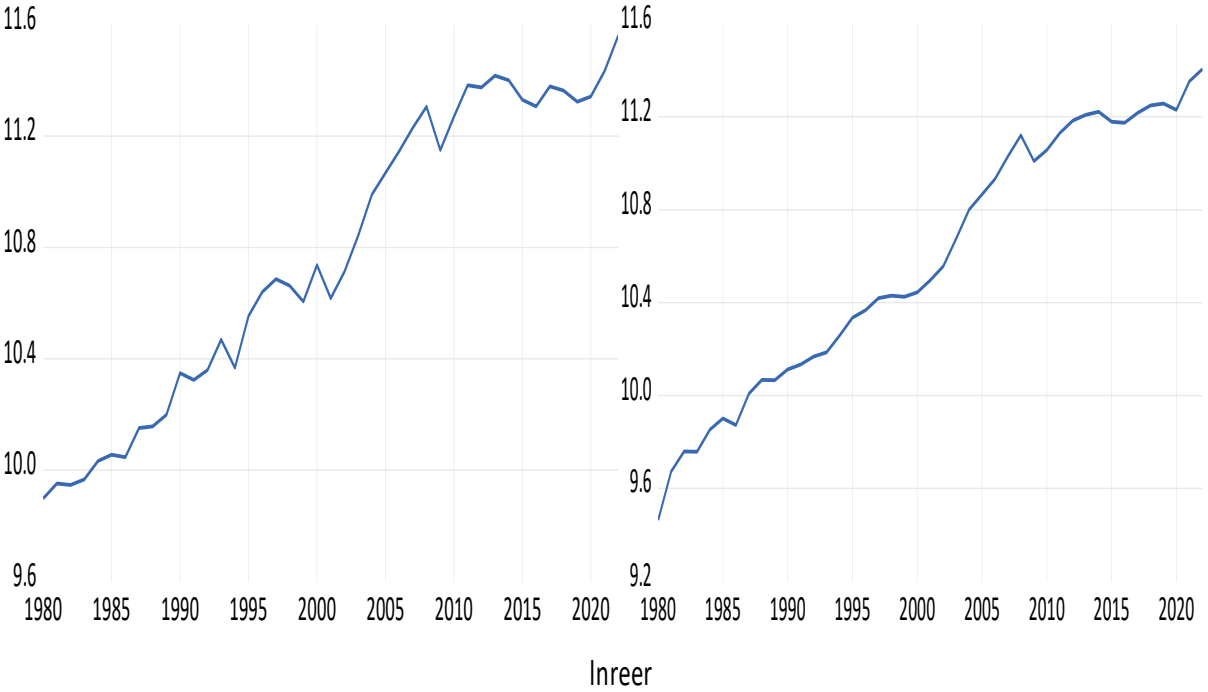
3.Data Set and Method

In the present study, the validity of the Marshall-Lerner Condition was tested for the period of 1980-2022 by analyzing annual data through the NARDL method. Our data employed in the study was obtained from the official World Bank data sources. They were included into the analysis process in logarithmic form. Chart 2 exhibits our time series employed in the study.

Chart 2

Time Series





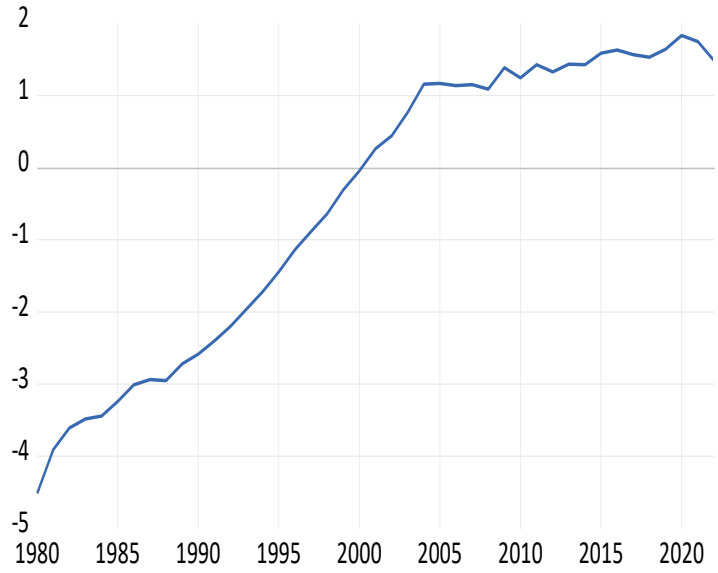


Table 2 exhibits explanations of the variables in our study. Our dependent variables were import and export figures in USD. Export variable was taken as dependent variable in the first model whereas import was dependent in the second model.

Table 2

Variables

Variables	Descriptive	Resources
Export	lnX	World Bank
Import	lnM	World Bank

Real Effective Currency Rate	lnReer	Estimated with the ratio of *eP / P**
Turkiye's GDP	lnY	World Bank
Global GDP	lnY^D	World Bank

Real currency rate is the first independent variable which was estimated with the ratio of *eP / P**. In this ratio, *e, P* and *P** denote nominal currency rate, foreign price level and domestic price level, respectively. Price levels were described as consumer price index and the US price index was utilized as foreign price index. Another independent variable of our study was domestic and foreign income levels. Whereas the domestic income level was indicated with the Turkiye's GDP, the foreign income level was indicated average global GDP level. These variables included in our analysis were selected in line with the current literature. Table 3 summarizes the descriptive statistics of the variables.

Table 3

Descriptive Statistics

	lnX	lnM	lnReer	lnY	lnY^D
Mod	10.58241	10.76930	-0.481281	11.64776	13.69187
Median	10.49602	10.71226	0.262314	11.61682	13.69391
Maximum	11.40516	11.56076	1.830886	12.07715	13.95422
Minimum	9.463893	9.898176	-4.515896	11.23888	13.42169
Standard dev.	0.560157	0.536928	2.045952	0.242973	0.164606
Skewness	-0.170631	-0.159417	-0.441550	0.093389	-0.058185
Kurtosis	1.710813	1.566948	1.635214	1.898530	1.746764
Jarque-Bera	3.186413	3.861566	4.734491	2.236220	2.838254
Probability	0.203273	0.145035	0.093739	0.326897	0.241925
Total	455.0437	463.0800	-20.69510	500.8538	588.7505
Tot.Stnd.Dev.	13.17857	12.108205	175.8085	2.479514	1.137998
# of Observation	43	43	43	43	43

According to Table 3, skewness was close to zero; and all variables displayed normal distribution; kurtosis value was less than 3 which kurtosis value of normal distribution. Moreover, all of time series displayed normal distribution. Thus, it could be concluded that the NARDL method is appropriate for our analysis.

Study models:

$$lnX_t = \alpha_1 + \beta_1\, lnReer_t + \beta_2\, lnY_t + \quad (2)$$

$$lnM_t = \alpha_1 + \beta_1\, lnReer_t + \beta_2\, lnY^D{}_t + \ \varepsilon_t \quad (3)$$

where, lnX_t denotes export; lnM_t denotes import; $lnReer_t$ denotes real currency rate; lnY_t denotes domestic income; $lnY^D{}_t$ foreign income; ε_t error term.

The NARDL model suggested by Shin *et al.* (2014) allows us analyze short and long term relationships among variables in a non-linear form. In the NARDL model, variables are separated into positive and negative constituents. This approach allows positive and negative shocks between variables to analyze. This method is superior than conventional co-integration tests in terms of analyzing whether there is an asymmetric effect. Moreover, stationarity of time series at different levels of I(0) or I(1) do not create a constraint for the NARDL method. The NARDL method is not applied if stationarity of time series is obtained at I(2).

For any x_t explanatory variable, x_0;

$$e_i^+ = max\,(e_i,0) \qquad e_i^- = min\,(e_i\,,0) \quad (4)$$

$$x^t = x_{t-1} + \qquad e_t = x_0 + \text{å}_{i=1}^{t} \qquad e_i = x_0 + \text{å}_{i=1}^{t} \qquad e_i^+ + \text{å}_{i=1}^{t} e_i^- \quad (5)$$

$$x^+ = \text{å}_{i=1}^{t} \quad e_i^+ \qquad ve \qquad x^- = \text{å}_{i=1}^{t} \quad e_i^- \quad (6)$$

Series in the Equations (5) and (6) were separated into positive and negative constituents. Positive and negative effects in the Equations (6) were denominated as x^+ and x^-, respectively. In the NARDL model, long term co-integration relationship could be given as in Equation 7.

$$y^t = \sigma^+ x_t^+ + \sigma^- x_t^- + u_t \quad (7)$$

Our null hypothesis suggesting there is no co-integration relationship among variables was given as H_0: $\delta = \vartheta^+ = \vartheta^- = 0$ whereas the alternative hypothesis was given as: H_1 : $\delta \neq \vartheta^+ \neq \vartheta^- \neq 0$. As a result of the long term asymmetry test, long term multipliers were $L_{op}^+ = \vartheta^+ / -\delta$, $L_{op}^- = \vartheta^- / -\delta$; if δ =0, then it could be implied as that there is no long term

asymmetric relationship. Short term asymmetry is again tested with the Wald test as given by the Equation (8) below;

$$\sum_{i=1}^{m-1} \vartheta_{t-1}^{+} = \sum_{i=1}^{m-1} \vartheta_{t-1}^{-} \quad (8)$$

Equations (9) and (10) below give the NARDL model including both positive and negative effects. (+) and (-) exponential symbols denotes separated positive and negative sections, respectively. Δ denotes difference; EC_{t-1} denotes one-period lagged value of error term series estimated co-integration relationship. In this regard, short term coefficients;

$$lnM_t = \alpha_0 + \sum_{i=1}^{n} \propto_{1i} \Delta lnM_{t-1} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{+}_{t-i} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{-}_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta lnY_{t-i} + \propto_2 EC_{t-1} \quad (9)$$

$$lnX_t = \alpha_0 + \sum_{i=1}^{n} \propto_{1i} \Delta lnX_{t-1} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{+}_{t-i} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{-}_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta lnY^{D}_{t-i} + \propto_2 EC_{t-1} \quad (10)$$

Finally, Equations (11) and (12) below exhibits long term relationships among variables:

$$lnM_t = \alpha_0 + \sum_{i=1}^{n} \propto_{1i} \Delta lnM_{t-1} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{+}_{t-i} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{-}_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta lnY_{t-i} + \varepsilon t \quad (11)$$

$$lnX_t = \alpha_0 + \sum_{i=1}^{n} \propto_{1i} \Delta lnX_{t-1} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{+}_{t-i} + \sum_{i=0}^{n} \beta_i \Delta lnReer^{-}_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta lnY^{D}_{t-i} + \varepsilon t \quad (12)$$

3. Findings

In the time series analyses, the first step is to conduct stationarity test. In our study, Lee and Strazicich's (2003) unit root test with two breaks was implemented in addition to the conventional ADF and PP Unit Root analyses. Table 4 summarizes ADF and PP test results whereas Table 5 exhibits the results of Lee and Strazicich's (2003) unit root test with two breaks.

Table 4

Unit Root Test Results

VARIABLES	MODEL WITH CONSTANT		MODEL WITH CONSTANT AND TREND	
	LEVEL	FIRST DIFF.	LEVEL	FIRST DIFF.
ADF TEST RESULTS				

lnX	-1.8853	-6.4827***	-2.5283	-6.3999***
lnM	-0.7231	-7.2910***	-2.2374	-7.2074***
lnY	0.0899	-6.8039***	-2.6376	-6.7360***
lnY^D	-0.4349	-6.6051***	-2.5944	-6.5584***
lnReer	-3.5637**	-2.5611***	0.4884	-5.2178***
PP TEST RESULTS				
lnX	-0.7063	-7.2983***	-2.3074	-7.2152***
lnM	-1.8433	-6.4993***	-2.7133	-6.4092***
lnY	0.4137	-7.2846***	-2.6376	-7.2124***
lnY^D	-0.6269	-7.2792***	-2.5944	-8.0981***
lnReer	-2.9801**	-4.4231***	0.3234	-5.2114

*, ** and *** indicate that the relevant variable is stationary at 10%, 5% and 1% significance levels, respectively.

According to the ADF and PP Unit Root test results in Table 4, lnReer variable become stationary at the level whereas other variables become stationary when their first difference is taken at 1% significance level.

Table 5

Results of the LM Unit Root Test with Two Breaks: Model Crash A

VARIABLES	$S_{(t-1)}$	T_B	K
lnX	-3,624**	2003; 2008	6
lnM	-3,867**	1994; 2002	8
lnY	-5,285***	1993; 1998	4
lnY^D	-2,727	1999; 2003	0
lnReer	-2,217	2008; 2010	4

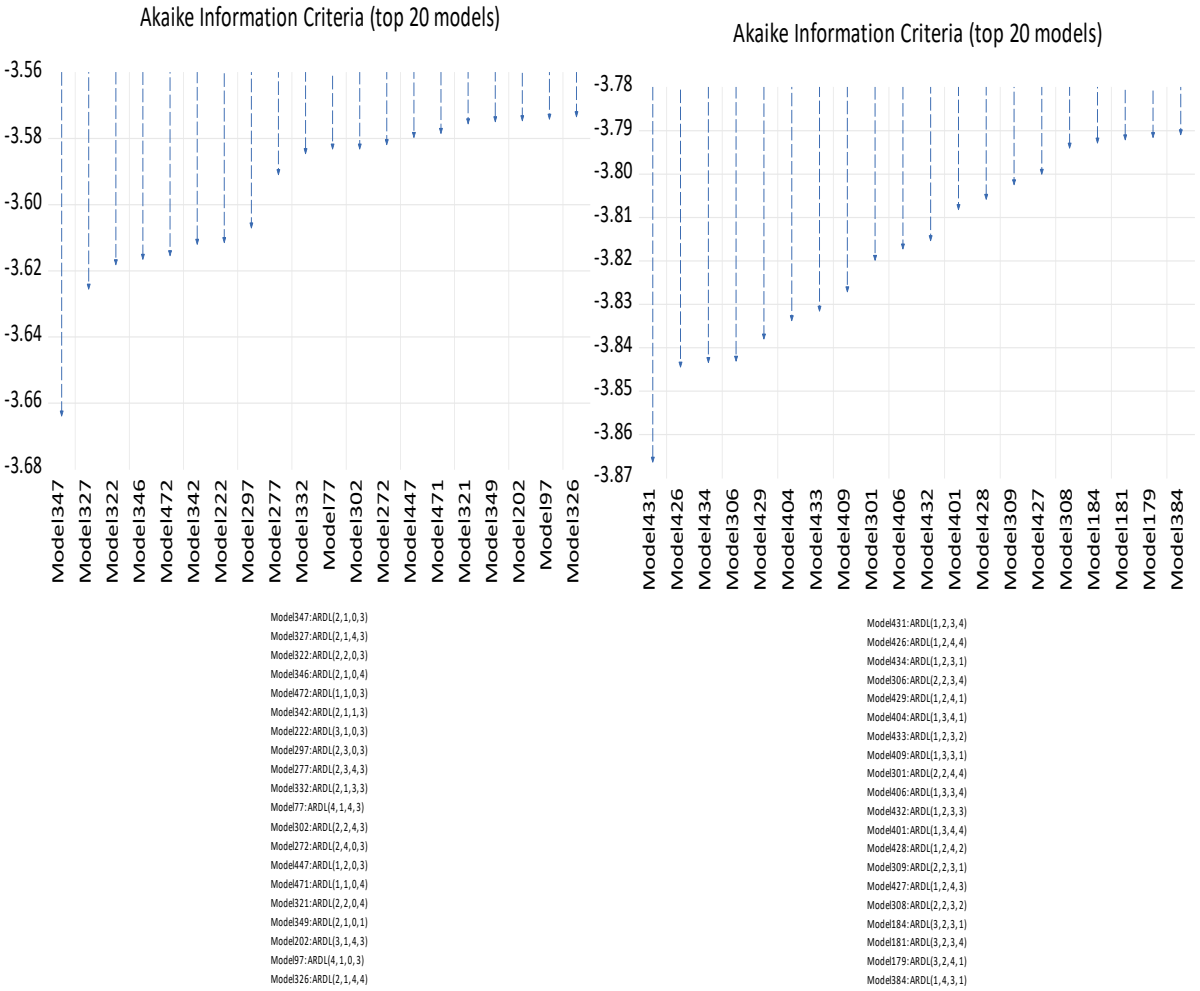
*, ** and *** indicate that the relevant variable is stationary at 10%, 5% and 1% significance levels, respectively. $S_{(t-1)}$ denotes critical values; T_B denotes break dates; and K denotes lag lengths.

According to Table 5, the results of the LM with two breaks on the Model A with constant suggested that all variables did not have unit root with structural break except lnReer and lnY^d. In this case, our results suggested that the NARDL test could be implemented because stationarity degrees of the variables were different.

The further section of our analysis was to explore whether there was long term co-integration relationship among variables. To that end, first it was required to determine appropriate lag length. Table 6 exhibits lag lengths estimated according to the Akaike information criterion for both models.

Table 6

Lag Lengths for the Model 1 and 2



According to Table 6, for the first model in which export variable was selected as dependent variable by the Akaike information criterion in determination of lag length, NARDL was found as (2,1,0,3); for the second model in which import variable was taken as dependent variable NARDL was found as (1,2,3,4). In order to reveal whether there is long term co-integration relationship among variables, F-test statistics value is required to be greater than the table value suggested in the study of Peseran *et al.* (2001). Table 7 exhibits F-test results.

Table 7

F-Test Results

MODEL 1: EXPORT (2,1,0,3)							
		1% critical value		5% critical value		10% critical value	
k	F stat.	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
3	4.285	4.29	5.61	3.23	4.35	2.72	3.77
MODEL 2: IMPORT (1,2,3,4)							
k	F stat.	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
3	10.597	4.29	5.61	3.23	4.35	2.72	3.77

Not: k denotes the number of independent variable in the model. Number of lag lengths is 4 according to the Akaike criterion of the Eviews 12.0 Software.

Table 7 exhibits F-test results. F-test value was estimated as 4.285 for the first model, and 10.597 for the second model. Co-integration relationship was determined between variables at 10% significance level for the first model, and at 1% significance level for the second model. These findings allowed us to proceed with the further stages of our study analysis.

Table 8

NARDL Analysis Results

MODEL 1: EXPORT (2,1,0,3)				MODEL 2: IMPORT (1,2,3,4)			
VARIABLE	COEFFICIENT	T-STAT.	P	VARIABLE	COEFFICIENT	T-STAT.	P
Long term findings							
lnY^D	3.087174**	2.239119	0.0327	lnY	2.581320***	4.716372	0.0001
$lnReer^+$	0.048673	0.590286	0.5594	$lnReer^+$	0.030473	0.730301	0.4720
lnReer-	0.569633	1.536485	0.1349	lnReer-	1.490187***	4.565320	0.0001
Short term findings							
C	-10.25310***	-4.340675	0.0001	C	-8.769289***	-6.914429	0.0000
$DlnReer^+$	-0.177922***	-3.073242	0.0045	$DlnReer^+$	0.084669	1.380976	0.1795

$DlnReer^{+}(1)$	1.590798***	25.37167	0.0001	$DlnReer^{+}(-1)$	-0.136366**	-2.166649	0.0400
$DlnY^{D}$	2.894608***	3.213330	0.0031	$DlnReer^{-}$	-0.365093***	-3.010091	0.0059
$DlnY^{D}(-1)$	-0.699158	-0.753495	0.4570	$DlnReer^{-}(-1)$	-0.706129***	-2.932523	0.0071
$DlnY^{D}(-2)$	-2.403254**	-2.660246	0.0124	$DlnReer^{-}(-2)$	-0.768650***	-3.312857	0.0028
				DlnY	3.949139***	12.55151	0.0000
CointEq(-1)*	-0.324264***	-4.342248	0.0001	CointEq(-1)*	-0.452649***	-6.890324	0.0000

Diagnostic test statistics

R^2	0.527219	R^2	0.865927
D.W.	1.842736	D.W.	1.924926
B.G.	0.598659 (0,5564)	B.G.	1.533849 (0,2370)
ARCH	0.572784 (0,8084)	ARCH	0.470937 (0,9212)
Ramsey-Reset	0.336850 (0,7387)	Ramsey-Reset	0.377870 (0,7088)
Jarque-Bera	0,945281 (0,6233)	Jarque-Bera	0,266904 (0,8750)
W_{UD}	-1.108048 (0,2761)	W_{UD}	-4.316860*** (0.0002)
W_{KD}	-2.541297**(0,0161)	W_{KD}	-4.316860 ***(0.0002)

D denotes the difference of the relevant variable. BG denotes Breusch-Godfrey auto-correlation test; ARCH denotes White variable variance test; Ramsey-Reset denotes the model specification test; Jarque-Bera denotes normality. The values in the parentheses next to aforesaid parameters indicate probability values. W_{UD} denotes long term asymmetry test; W_{KD} denotes short term asymmetry test.

Table 8 exhibits diagnostic test results as well as long and short term findings. The R-squared value is 0.52 for the first model and 0.86 for the second model. In this case, the R-squared value indicating the explanatory power of both models is higher for the second model and its explanatory power is higher. According to diagnostic test results, there is no autocorrelation or heteroscedasticity issue with both models. Our series displayed normal distribution; no specification error was found with the models as well. Moreover, as implied from the results of the Wald test, no asymmetry relationship between *reer* and *export* on the long term for the first model; but asymmetry relationships were found at 5% significance level on the short term. For the second model, our results revealed asymmetric relationships between *reer* and *import* on both short and long term at 1% significance level.

In the light of the findings concerning long term relationship, a positive and statistically significant relationship was determined between *foreign income* and *export* for the first model.

That is, a 1% increase in foreign income would result in a 3.02%-increase in export and vice versa. This finding was found to be accommodating with the economic theory. On the other hand, a 1% increase in *real effective currency rate* would result in a 0.04% increase in *export*; and but 1% decrease would result in 0.56% decrease. However, these two findings were not statistically significant.

In considerations of our results regarding long term relationships of the second model, a positive and significant relationship was determined between *domestic income* and *import* at 1% level. That is, 1% increase in *domestic income* would result in 2.58% increase in *import* and vice versa. There was no significant relationship determined between *real effective currency rate* and *import*. However, a 1% decrease in real effective currency rate would result in 1.49% decrease in import, which was statistically significant at 1% level. In order to satisfy the Marshall-Lerner Condition, total of export and import elasticities is required to be greater than 1. For the long term, this requirement was not satisfied (0.048+0.030>1); and accordingly the MLC was not valid for the long term.

In consideration of our findings regarding short term relationship, it was seen that a 1% increase in *reer* would result in 0.17% decrease in *export* on the short term for the first model. Increasing real currency rate mean a decrease in the nominal currency rate or an increase with the general price level of a host country, or a decrease with the general price levels of partner countries. Increases in *reer* result in weaker foreign competitive power due to decrease in export and increasing import volumes (Uslu, 2018:796). Therefore, it could be concluded for the short term that increases in *reer* could result in negative effect on foreign trade balance. Moreover, a positive and significant relationship was determined between *foreign income* increase and export at 1% significance level, which is in conformity with economic theory. Additionally, 1% increase in domestic income was found to increase export by 2.89%.

In consideration of our findings regarding the second model, a positive but statistically insignificant relationship was determined between *reer* increase and *import* on the short term. However, a significant and negative relationship was determined between *reer* decrease and *import* at 1% significance level. That is, a 1% decrease in *reer* would result in 0.36% increase in import. In both models, the ECT coefficient was found negative and statistically significant, which suggested that error-correction model was operating accurately. The requirement for satisfaction of the Marshall-Lerner condition is that total elasticities of export and import is to be greater than 1. For the short term, the MLC was not met because the total elasticity was less than the threshold (-0,177+0,084>1) for Turkish economy.

Finally, Figure 1 and 2 report the CUSUM test, cumulative sum of residuals, and the CUSUMQ test, cumulative sum of squares, for the first and second models, respectively. In both models, it was determined that cumulative residuals and cumulative sum of squares remained within 95% confidence interval, which supported the idea that model coefficients were consistent.

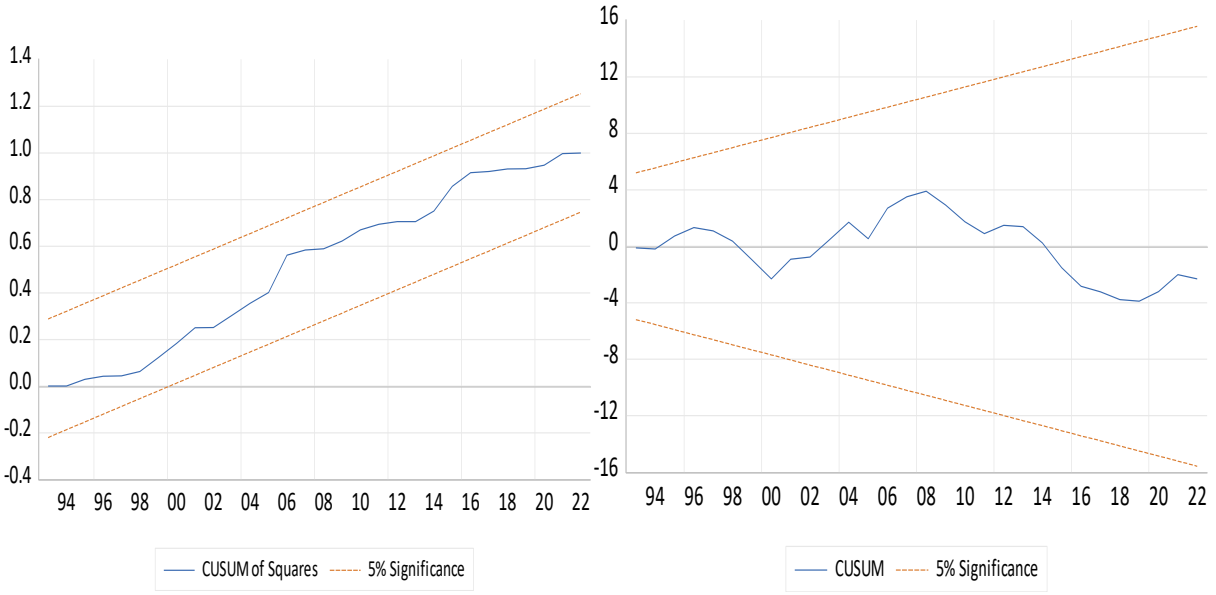


Figure: 1

Model 1 CUSUM² and CUSUM Test Results

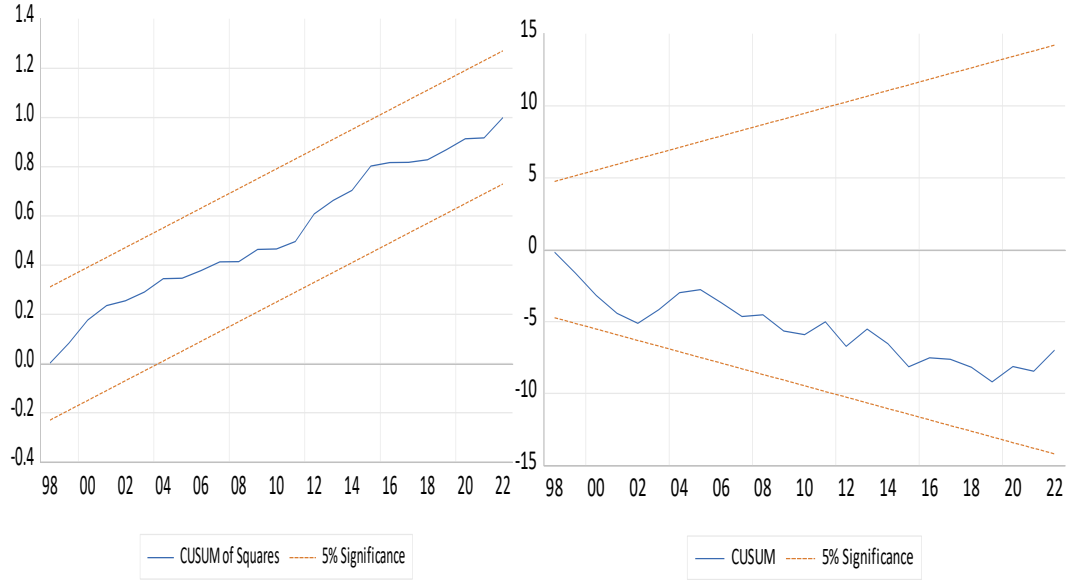


Figure: 2

Model 2 CUSUM² and CUSUM Test Results

4. Result

In the present study, validity of the Marshall-Lerner Condition was analyzed for Turkish economy covering the period of 1980-2022 by employing Non-Linear Autoregressive Distributed Lag (NARDL) method. When our findings were considered as a whole, the effect of real currency increases on import was not found statistically significant in both short and long term. However, it was determined that real currency decreases were found to have increasing effect on import on the short term but this effect turned to opposite way on the long term and decreases import. Even though the effects of increases and decreases in real currency on export were not found statistically significant on the long term, increases in real currency displayed decreasing effect on export on the short term. Total elasticities of export and import is required to be greater than 1 to satisfy the Marshall-Lerner condition. Accordingly, it was concluded that the MLC was not satisfied for the Turkish economy for both short and long terms because total elasticities were less than 1, (-0.177+0.084>1) and (0,048+0,030>1), respectively. Moreover, our finding that long term coefficients were not statistically significant supported our conclusion that the MLC was not satisfied. In this case, it could be inferred for the Turkish economy that the public expectation which asserts real currency changes have enhancing effect on foreign trade balance on the long term by increasing export and decreasing import was not valid for study period. This finding, in the meantime, could also be interpreted as that "J"-shape curve was not valid for Turkish economy. In order to catch "J"-shape curve, real currency changes are expected to affect foreign trade negatively on the short term; but positively on the long term. Yet, in the present study, real currency rate changes were not found to affect import and export positively on the long term. Thus, statistically insignificant status of our finding supported this conclusion. Similarly, studies of Hepaktan (2009), Kemeç and Kösekahyaoğlu (2015), Tuncay and Üstüner (2017) report that the MLC is not satisfied for the Turkish economy, which are in conformity with our findings.

From this point, in an economy in which the MLC is not satisfied, it is not possible to utilize the currency rate as a policy tool to enhance foreign trade balance. In this regard, when foreign trade composition of Turkish economy was taken into consideration, it should be noted that any potential devaluation could result in serious economic issues. As a result of devaluation, especially increasing cost of imported goods could invite a shrink in manufacturing as well as a spark in inflation, one of the substantial economic problems of Turkiye, through resulting cost hikes. In parallel with decreasing trend of import, deteriorating effect of sensitive

dependency of Turkeys export to mediatory goods imported could widen foreign trade deficit on the contrary to what is expected in general.

Incapacity of currency rate policy as a remedy to foreign trade deficit brings different economic and financial policies into agenda for Turkish economy instead of devaluation. In this case, policies focusing on increasing domestic savings and offering incentives for direct foreign investments which could enhance consistent and long-term employment opportunities and export volume, rather than short-term hot money inflow could be suggested. Eventually, taking long-term and persistent measures such as improving quality of exported goods and initiating structural reforms enhancing composition of foreign trade rather than entering into price competition through devaluation would result in more solid positive solutions especially for a country like Turkiye yielding chronic foreign trade deficit. In sum, it could be concluded that "non-price competition" is the fundamental policy suggestion of the present study.

The sensitivity of the global economic climate faced by open emerging economies, coupled with the weakness in their financial structures, makes their economies more vulnerable, and fluctuations in the USD in particular pose downsides and serious risks due to foreign exchange dependence. Hence, another policy recommendation of the study could be to trade in local currencies to get out of this economic dilemma.

This is an issue that is being discussed and debated in many countries, especially in the BRICS countries. Russia is one of the first countries in the world to take the first step in this area, and its applicability for the Turkish economy has been explained and proposed in detail in the National Economy Model prepared by Baş (2005). In this model, it is emphasized that if countries trade with local currencies in international trade, they will be free from the negative effects of foreign currencies, especially the USD, on their economies. There are empirical studies in the literature that emphasize that trade in local currencies positively affects the economies of countries and can be considered as another policy recommendation for policy makers, especially in closing the foreign trade deficit.

Finally, as with any study, this study also has some limitations. Although the study does not have sufficient data set, methodology and time constraints, more data, more sophisticated methodologies and perhaps analysis on a peer group of countries (such as the fragile five) would enhance the contribution of the literature.

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