

ORIGINAL ARTICLE

ASYMMETRIC J CURVE RELATION BETWEEN TÜRKİYE AND HER EUROPEAN TRADE PARTNERS: A NARDL METHOD*

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Abstract

This research delves into the asymmetrical impacts, both short and long term, of the real strengthening or weakening of Türkiye's currency against that of the 28 European Union member countries, on its bilateral trade balance. The study aims to uncover potential asymmetries in the relationship between Türkiye's currency depreciation and its trade balance with the EU 28 countries, while also considering the possibility of a J-curve effect. By utilizing the Non-Linear Autoregressive Distributed Lag Model (NARDL) introduced by Shin et al. (2013), which accounts for asymmetric relationships, the analysis examines whether Türkiye's trade balance with her EU 28 partners reacts differently to currency appreciation and depreciation. The findings from the non-linear ARDL analysis conducted in this study lend support to the hypothesis of an asymmetrical relationship, both in the short and long term, between the real appreciation of foreign exchange rates and Türkiye's bilateral trade balance with the EU 28 countries, potentially indicating the presence of a J-curve effect.

Keywords

Devaluation, Foreign Trade Balance, J-Curve, NARDL.

JEL Classification

F32, C58, G15.

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1. INTRODUCTION

Governments may formulate certain policies in response to trade deficits. Trade deficits occur when a country's exports, or external sales, are less than its imports, or external purchases. This leads to a depletion of the foreign exchange reserves that the country pays to other nations. This perspective traces back to the era of mercantilism in economic history. According to mercantilists, a nation's precious metal reserves should be acquired through trade or, if necessary, through warfare, and the wealth and prosperity of a nation depended on these reserves primarily being within the country. This viewpoint remains relevant for many countries today. Consequently, when shaping their trade policies, nations aim to have foreign exchange reserves surpassing their foreign exchange obligations (Seyidoğlu, 2007:451; Karluk, 2013:631). Therefore, economic policies have been developed to balance foreign trade. These mainly encompass expenditure-changing and expenditure-switching policies. Expenditure-changing policies primarily involve fiscal and monetary measures. Hence, expenditures and income are adjusted and augmented to strive for external equilibrium. On the other hand, expenditure-switching policies aim not to alter total expenditure but to modify the distribution between domestically produced goods and services and foreign goods and services (Salvatore, 2013:573-575). In places where free trade is limited, these policies include customs duties and quotas. In places where free trade is common and where exchange rates are fixed, these policies include deliberate actions by the government like devaluing and revaluing the domestic currency against foreign currencies (Seyidoğlu, 2007:453).

The relationship between exchange rates and balance of trade, a fundamental topic in international economics, has been examined for many years within the framework of the Marshall (1923) and Lerner (1944) Condition and the J Curve, exploring various methods to test this relationship with different countries and their trading partners. The elasticity approach proposed by Marshall and Lerner suggests that the elasticity of import and export demand is sufficiently high to improve the trade balance with changes in the exchange rate. However, Magee (1973) was the first to present a contradictory phenomenon, stating that despite the depreciation of the dollar in 1971, the US trade balance worsened. Theoretically, he argued that due to delays in trade flows following changes in exchange rates, it is possible for the trade balance to deteriorate after changes in the exchange rate (Bahmani-Oskooee and Goswami, 2003; Jamilov, 2013:1).

Well known as the J Curve hypothesis, this theory has been examined bilaterally for different countries and groups of countries, with various studies conducted to either support or refute this hypothesis. Until recent years, these relationships were only considered with a symmetric assumption regarding the relationship between exchange rates and the balance of trade. However, for the first time in recent years, a method developed by Shin et al. (2013), utilizing the non-linear ARDL method, has been able to reveal asymmetric relationships between these two variables. Unlike methods in similar thesis studies, this study utilizes the non-linear Autoregressive Distributed Lag model (NARDL) as a more reliable, meaningful, and optimal method for measuring the non-linear and asymmetric effects of devaluations or exchange rate increases on the balance of trade, and investigating the phenomenon of the J Curve. Thus, the analysis considers the fact that Türkiye's balance with its trading partners may exhibit different, i.e., asymmetric, responses to real exchange rate increases and decreases.

2. A REVIEW OF THE LITERATURE AND THE THEORETICAL BACKGROUND OF THE RELATIONSHIP BETWEEN THE MARSHALL-LERNER CONDITION AND THE J CURVE.

There are many studies examining the relations between Türkiye's exchange rate changes and foreign trade. These studies, especially on the existence of the J Curve effect, differ in terms of the period examined, foreign trade partners and analysis methods.

To the best of our knowledge, Saraçoğlu (1996), Durusoy and Tokathlıoğlu (1997), Altıntaş and Çetin (2008), Vergil and Erdoğan (2009), Çil, Güriş and Kıran (2010), Bal and Demiral (2012), Karaçor and Gerçeker (2012), Demirtaş (2014), Karamelikli (2016), Aksu et al. (2017), Bahmani-Oskooee and Halıcıoğlu (2017), Kılıç et al. (2018), Ünal (2021) are studies that support the existence of the J curve effect for Türkiye. On the other hand, Akbostancı (2004), Karagöz and Doğan (2005), Peker (2008), Keskin (2008), Alptekin (2009), Kemeç and Kösekahyaoğlu (2015), Karamelikli (2016), Berke and Akarsu (2017), Cergibozan and Arı (2018), Kılıç et al. (2018), Küçüksoy and Akkoç (2020), Kopuk and Beşer (2020), Güler (2021), Ramzan (2021) and Ceyhan and Gürsoy (2021) did not support the existence of the J curve effect for Türkiye.

The rapid acceleration of economic globalization since the 1980s has significantly increased the volume of international trade and financial transactions. In this dimension, globalization has facilitated the interconnection and interdependence of countries. The sensitivity level of economies and their mutual influencing power has increased following any external shock. It is possible to observe this change in macroeconomic factors. In this sense, the balance of trade is considered one of the most important macroeconomic indicators of countries and is seen as a factor ensuring the continuity of economic stability. The balance of trade, a fundamental topic in international economics, investigated the relationship between trade and relative prices using static demand theory, highlighting the magnitude of demand elasticity for imports and exports (Backus et al., 1992:2). With the impact of the stagflation crisis of 1973, the devaluation of many industrial countries led to the prevailing notion that exchange rate flexibility would safeguard trade deficits and protect countries from adverse effects originating from other countries, enabling them to manage their economies better using fiscal and monetary policies. This notion is generally based on the belief that demand elasticity for imports and exports is sufficiently high to improve the trade balance with changes in the exchange rate. However, Magee (1973) first noticed that despite the depreciation of the dollar in 1971, the US trade balance worsened. Later, theoretically, it was argued that delays in the response of trade flows to changes in the exchange rate could lead to the deterioration of the trade balance following changes in the exchange rate. When delays occur, eventually the trade balance improves. Such a short-term change, resembling the letter J, is known in the literature as the J Curve phenomenon (Bahmani-Oskooee and Goswami, 2003; Jamilov, 2013:1)

According to the International Economics Theory, the impact of implementing a devaluation on the national currency can improve the external trade balance. Changes in exchange rates create two types of effects on trade flows: the price effect and the volume effect. The price effect results from the change in exchange rates, causing imports to become more expensive and exports to become cheaper for domestic buyers in the short term. Due to the time required for exports and imports to adjust to the new exchange rate, there is a short-term disturbance in the trade balance. The validity of goods already purchased or ordered and short-term contractual obligations at the time of devaluation is the main reason for this. When trade volume begins to adapt to changes in exchange rates, the volume effect of devaluation reverses the trade balance movement, thus improving it (Jamilov, 2013:1). In the long run, the dominance of the volume effect over the price effect signifies the Marshall-Lerner Condition. The effects of exchange rates or foreign trade levels on the external trade balance have long been the subject of research. In this regard, the Marshall-Lerner Condition, considered a fundamental approach, explains the external trade balance with the elasticity of demand for exports and imports (Akbulut-Bekar ve Terzi, 2016:96).

3. MODEL, DATASET, AND METHODOLOGY

In this study, the external trade balance model of a single country to be utilized will be constructed using the frameworks and arrangements presented in the studies of Rose and Yellen (1989), Rose (1990), Bahmani-Oskooee and Ratha (2007), Bahmani-Oskooee and Wang (2006), Halıcıoğlu (2008), Bahmani-Oskooee and Kutun (2009), Bahmani-Oskooee and Gelan (2012), Bahmani-Oskooee and

Fariditavana (2015, 2016), Nusair (2017), and Arı et al. (2019). Accordingly, the time series econometric model in Equation (1) consists of the external trade balance (dto) of Türkiye as the dependent variable, and the real exchange rate of Türkiye with respect to Euro (dk), the national income of Türkiye (y), and the national income of the foreign country of EU 28 involved in foreign trade (y^F) as explanatory variables, respectively. The natural logarithm of the variables has been taken for model estimation. The external trade balance variable (dto) will be used as the dependent variable in the form of the ratio of the nominal value of exports to these countries to the nominal value of imports from these countries.

$$\ln dto_t = \beta_0 + \beta_1 \ln dk_t + \beta_2 \ln y_t + \beta_3 \ln y_t^F + \varepsilon_t \quad (1)$$

In this study the quarterly data for the periods 1999:1-2018:4 are used. Türkiye's foreign trade components, which will be used as dependent variables, were taken from the TURKSAT database. The nominal Euro rate was obtained from the Central Bank of Republic of Türkiye (CBRT) database and converted into real Euro rate with the Consumer Price Index (CPI) indices of the relevant countries and Türkiye. In addition, the Consumer Price Indexes (CPI) of the relevant countries and the Gross Domestic Product (GDP) data used instead of the income of Türkiye and the EU 28 country group were taken from the OECD database. The estimations, tests, and graphs in the econometric analysis were generated using the E-Views 9.0 software package program.

The fundamental model in Equation (1) has been transformed into the ARDL model shown in Equation (2), developed sequentially by Pesaran et al. (2001), to detect short and long-term J-curve effects. This model incorporates distributed lags in the appropriate delays of the variables.

$$\begin{aligned} \Delta \ln dto_t = & \alpha_0 + \sum_{j=1}^k \alpha_{1j} \Delta \ln dto_{t-j} + \sum_{j=0}^p \alpha_{2j} \Delta \ln dk_{t-j} + \sum_{j=0}^q \alpha_{3j} \Delta \ln y_{t-j} \\ & + \sum_{j=0}^m \alpha_{4j} \Delta \ln y_{t-j}^F + \alpha_5 \ln dto_{t-1} + \alpha_6 \ln dk_{t-1} + \alpha_7 \ln y_{t-1} + \alpha_8 \ln y_{t-1}^F + \varepsilon_t \end{aligned} \quad (2)$$

However, while the estimated coefficients in Equation (2) reveal symmetric relationships, they fail to identify any asymmetric relationship between the variables. Hence, this model should be transformed into the Nonlinear Autoregressive Distributed Lag (NARDL) model version developed by Shin et al. (2013) to capture any asymmetric relationship. For this purpose, since the asymmetrical relationship between changes in the real exchange rate and the impact on the external trade balance is examined, only this variable is added to the model by splitting it into $\ln dk_t^+$ and $\ln dk_t^-$. As shown in Equations (3) and (4), $\ln dk_t^+$ consists of a series where exchange rate changes range from zero to a positive maximum, while $\ln dk_t^-$ consists of a series where exchange rate changes range from zero to a negative minimum. Thus,

$$\ln dk_t^+ = \sum_{j=1}^t \Delta \ln dk_j^+ = \sum_{j=1}^t \max(\Delta \ln dk_j, 0) \quad (3)$$

$$\ln dk_t^- = \sum_{j=1}^t \Delta \ln dk_j^- = \sum_{j=1}^t \min(\Delta \ln dk_j, 0) \quad (4)$$

Thus, the model transforms into its form as presented in Equation (5).

$$\ln dto_t = \alpha_0 + \delta^+ \ln dk_t^+ + \delta^- \ln dk_t^- + \alpha_1 \ln y_t + \alpha_2 \ln y_t^F + \xi_t \quad (5)$$

Finally, by following Shin et al.'s (2013) original model and the related applications by Bahmani-Oskooee and Fariditavana (2015, 2016) and Nusair (2017), the NARDL model shown in Equation (6)

is constructed within the ARDL model in Equation (2) by replacing the exchange rate $Indk_t$ variable with the split version of this variable as shown in Equations (3) and (4), denoted as $Indk_t^+$ and $Indk_t^-$, respectively, which will measure the asymmetric effect.

$$\begin{aligned} \Delta Indto_t = & \gamma_0 + \sum_{j=1}^k \gamma_{1j} \Delta Indto_{t-j} + \sum_{j=0}^p \gamma_{2j}^+ \Delta Indk_{t-j}^+ + \sum_{j=0}^n \gamma_{3j}^- \Delta Indk_{t-j}^- \\ & + \sum_{j=0}^q \gamma_{4j} \Delta lny_{t-j} + \sum_{j=0}^m \gamma_{5j} \Delta lny_{t-j}^F + \rho_0 Indto_{t-1} \\ & + \eta^+ Indk_{t-1}^+ + \eta^- Indk_{t-1}^- + \rho_1 lny_{t-1} + \rho_2 lny_{t-1}^F + \omega_t \end{aligned} \quad (6)$$

In the NARDL model depicted in Equation (6) for the foreign trade balance, the asymmetric effect of exchange rate changes or devaluation on the foreign trade balance will be interpreted based on the signs of the $Indk_t^+$ and $Indk_t^-$ coefficients. The estimation results for the $Indk_t^+$ and $Indk_t^-$ variables will be respectively indicated as $Indk_t^+$ and $Indk_t^-$ in the tables and subsequent discussions. Accordingly, three types of asymmetric effects can be discussed regarding the impact of any variable on the dependent variable.

If these coefficients have different signs, for instance, if the sign of $Indk_t^+$ is positive while the sign of $Indk_t^-$ is negative (or vice versa), an asymmetric effect will be observed. Thus, it is possible to say that exchange rate changes have different effects, namely asymmetric effects, on foreign trade in the case of exchange rate increases (depreciation of the domestic currency) versus exchange rate decreases (appreciation of the domestic currency).

Additionally, even if these coefficients have the same sign, an asymmetric effect can still be present if the magnitudes of the coefficients differ. In the same example, if the positive coefficient of $Indk_t^+$ for exchange rate increase is greater than the positive coefficient of $Indk_t^-$ for exchange rate decrease, it implies that the positive effect of exchange rate increase on the foreign trade balance outweighs the negative effect of exchange rate decrease, indicating the presence of an asymmetric relationship in terms of coefficient magnitude.

Another indication of an asymmetric relationship is when one of the exchange rate increase or decrease variables is statistically significant while the other is not. For instance, if $Indk_t^+$ is estimated to be statistically significant and positive in response to exchange rate increase, whereas $Indk_t^-$ is statistically insignificant, whether negative or positive, it suggests the presence of a positive effect of exchange rate increase on the foreign trade balance but no effect of exchange rate decrease.

The model can also test for the presence of a J-curve effect. When examining the coefficients of this model to investigate the J-curve effect and make empirical interpretations, the following steps are taken: In assessing the existence of the J-curve, Equation (6) is estimated, and if a long-term relationship is identified between the variables through the cointegration test, the presence of symmetry or asymmetry in the short and long term is then determined in the third step. Accordingly, for the J-curve to be present, the coefficient γ_{2j}^+ in Equation (6) should have a positive and significant normalized ρ_0 estimate for the effect that improves the trade balance in the long term. Thus, when asymmetric effects and cointegration are achieved and if the estimates of γ_{3j}^+ are negative or insignificant and inconsequential, but the normalized ρ_0 estimate of η^+ is positive and significant, then the J-curve phenomenon can be discussed (Bahmani-Oskooee and Fariditavana, 2016, and Nusair, 2017).

4. EMPIRICAL ANALYSIS RESULTS

4.1. Unit Root and Cointegration Tests

In order to test the suitability of the non-linear ARDL (NARDL) method, firstly unit root of Augmented Dickey-Fuller test (ADF) developed by Dickey and Fuller (1979) and Zivot-Andrews (ZA) tests

proposed by Zivot ve Andrews (1992) are applied. The unit root test results are given in Table 1.

Table 1

Unit Root Test (Constant and Trend)

Variables	ADF Test Statistics			ZA Test Statistics		
	Level	1. Difference	Cointegration	t-Statistics	t-table ^a	Cointegration
lnTDO	-2.21 (0.47)	-9.48 (0.00)	I(1)	-4.00 (0.00)	4.82	I(0)
lnDK	-2.78 (0.20)	-6.49 (0.00)	I(1)	-3.30 (0.67)	4.82	I(0)
lnY	-2.45 (0.34)	-7.42 (0.00)	I(1)	-4.29 (0.00)	4.82	I(0)
lnY ^F	-3.17 (0.09)*	-3.53 (0.04)	I(1)	-5.40 (0.00)**	4.82	I(1)

a The t-table values, which are -5.57 , -5.08 and -4.82 at 1%, 5% and 10% significance levels, respectively, were taken from the table prepared according to the C model of Zivot and Andrews (1992), which takes into account the break in the constant and the trend.

4.2. Cointegration test

Önce stationarity tests of the variables were performed, whether these variables were also cointegrated is analysed. As can be seen from Table 1, since the variables are not integrated to the same degree, the Bounds Test of Pesaran et al. (2001) can be used in cases where all variables are integrated differently and results are reported in Table 2.

Table 2

F Bound Cointegration test Results

Ho: No long-term relationship among the variables				
Test Statistics	k	Critical Bound Values		Significant Level
F statistics	3	I(0)	I(1)	
4.4100		2.45	3.52	%10
		2.86	4.01	%5
		3.25	4.49	%2.5
		3.74	5.06	%1

According to the bilateral foreign trade balance model with the EU 28 countries, the cointegration relationship among the variables was investigated by testing the null hypothesis that there is no long-term relationship between the variables ($\rho_0 = \eta^+ = \eta^- = \rho_1 = \rho_2 = 0$). Accordingly, F statistics and upper critical limit values of Bound Test developed by Pesaran (2001) were compared. The found F value of 4.41 is above the critical limit value of 4.01 at the 5% significance level, and accordingly, the hypothesis that there is no cointegration relationship among the variables was rejected. Hence, it was concluded that there is a long-run cointegration relationship between the variables.

4.3. NARDL Short-Term Model Estimation Coefficients

The results based on the investigation of the existence of an asymmetric relationship in the short term between Türkiye and the EU 28 country group and the variables that make up the bilateral foreign trade model are presented in Table 3.

Table 3
NARDL (4, 4, 0, 2, 4) Error Correction Model Coefficients

Variable	Coefficient	Standard Error	<i>t</i> -statistics	<i>p</i> -value
$\Delta \ln TDO(-1)$	-0.0733	0.1505	-0.4874	[0.6279]
$\Delta \ln TDO(-2)$	-0.3296	0.1326	-2.4843	[0.0161]
$\Delta \ln TDO(-3)$	-0.3193	0.1029	-3.1007	[0.0030]
$\Delta \ln DK_POS$	-0.1165	0.2474	-0.4711	[0.6394]
$\Delta \ln DK_POS(-1)$	0.6894	0.4456	1.5471	[0.1276]
$\Delta \ln DK_POS(-2)$	-0.1968	0.4380	-0.4493	[0.6549]
$\Delta \ln DK_POS(-3)$	-0.3588	0.2622	-1.3682	[0.1768]
$\Delta \ln DK_NEG$	0.6266	0.2402	2.6080	[0.0117]
$\Delta \ln Y$	-0.8764	0.7502	-1.1681	[0.2478]
$\Delta \ln Y(-1)$	1.3143	0.7839	1.6766	[0.0993]
$\Delta \ln YF$	2.9468	4.0217	0.7327	[0.4668]
$\Delta \ln YF(-1)$	-4.4653	4.7750	-0.9351	[0.3538]
$\Delta \ln YF(-2)$	12.9820	4.4366	2.9260	[0.0050]
$\Delta \ln YF(-3)$	-10.1155	3.5010	-2.8892	[0.0055]
ECM(-1)	-0.6773	0.1831	-3.6983	[0.0005]

$$\bar{R}^2 = 0.63 \quad AIC = -1,36 \quad DW = 2.23$$

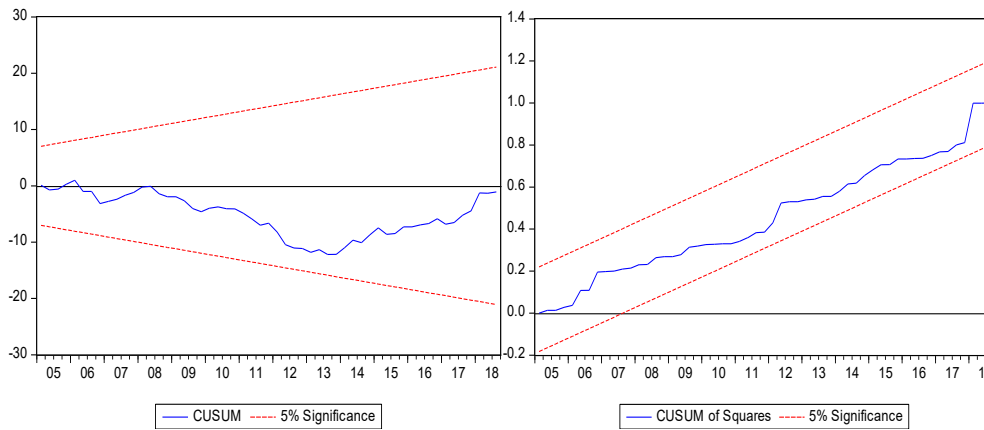
$$F_{SC}(2, 53) = 1.0548[0.3554], \quad F_{RR}(1, 54) = 0.0737[0.7870]$$

$$\chi^2_{NORM}(2) = 14.4225[0.0007], \quad F_{HET}(1, 71) = 0.0846[0.7719]$$

Note: \bar{R}^2 is the adjusted coefficient of determination of the model, F_{SC} , is the F statistics of the Breusch-Godfrey serial correlation LM test, χ^2_{NORM} , is the LM statistics of the normality test depends on the values of Skewness and Kurtosis values, F_{HET} , is the F statistics of the ARCH heteroscedasticity test and F_{RR} , is the F statistics of the Ramsey-RESET functional form test. The diagnostic tests of serial correlation, heteroscedasticity, model's functional form test results at %1 significance level indicate that there is no problem in the model in terms of autocorrelation, heteroscedasticity and functional form except normality of the disturbances. The p values are in the bracket parentheses.

When examining the short-term effects of increases in real exchange rates among the explanatory variables in the model, the results indicate that there was no significant response of the trade balance between Türkiye and the EU 28 countries to increases in real exchange rates, but rather, decreases in exchange rates, that is, the appreciation of the Turkish lira, negatively affected the trade balance during the same period, leading to a trade deficit. The discrepancy in coefficients between $\ln DK_POS$ representing increases in exchange rates and $\ln DK_NEG$ representing decreases suggests an asymmetric relationship in the trade balance between Türkiye and the group of EU 28 countries in the short term.

In this model, the error correction coefficient, ECM(-1), is found to be negative at -0.6773, as in the ARDL model, and statistically significant. The error correction coefficient indicates that in the short term, deviations in the dependent variable $\ln TDO$ or disruptions in the long-term equilibrium relationship due to any shocks occurring in the previous period will be corrected in approximately 5 months, converging to the long-term path during this period. Developed by Brown et al. (1975) and provided in Figure (1), the CUSUM values and CUSUM-Q test results indicate that the test values are within the confidence intervals, revealing that there are no structural breaks in the model during the period and that the estimation results are stable.

Figure 1*NARDL CUSUM and CUSUM-Q Test Results for EU 28 Countries***4.4. NARDL Long-Term Model Estimation Coefficients**

The long-term estimation coefficients of the NARDL foreign trade model between the EU 28 country group and Türkiye are given in Table 4.

Table 4*NARDL Long-Term Model Estimation Coefficients*

Variable	Coefficient	Standard Error	<i>t</i> -statistics	<i>p</i> -value
$\ln DK_POS$	0.4191	0.1033	4.0550	[0.0002]
$\ln DK_NEG$	0.9252	0.2602	3.5548	[0.0008]
$\ln Y$	-7.7090	2.5724	-2.9970	[0.0041]
$\ln Y^F$	21.7542	8.1960	2.6542	[0.0104]
Constant	4.3508	1.3280	3.2760	[0.0018]

According to the long-term nonlinear ARDL (NARDL) results obtained for the model given in Equation (6), there is a positive (0.4191) and significant relationship between increases in real exchange rates ($\ln DK_POS$) and the trade balance, while there is also a positive (0.9252) and significant relationship between decreases ($\ln DK_NEG$) and the trade balance. The difference in coefficient magnitudes for the depreciation and appreciation of the domestic currency, where the improvement in the trade ratio in the case of exchange rate increases is smaller than the deterioration in the trade ratio in the case of exchange rate decreases, indicates an asymmetric relationship between the two variables. Additionally, the inclusion of the control variable in the model, which represents increases in Türkiye's national income negatively (-7.70) impacting the trade balance in the long term, and changes in the national incomes of the EU 28 countries positively (21.75) affecting Türkiye's trade balance, is consistent with theoretical expectations.

Finally, an investigation was conducted to determine whether the response of the trade balance to exchange rate changes follows the J curve phenomenon. The obtained short and long-term estimated coefficients satisfy the condition specified by Bahmani-Oskooee and Fariditavana (2016), where the γ_{2j}^+ coefficients in Equation (6) are negative or insignificant, and the coefficient of η^+ is positive and significant. It can be concluded that the J curve effect is definitively observed in the interaction of the trade balance between Türkiye and the group of 28 EU countries (Bahmani-Oskooee and Fariditavana, 2016, and Nusair, 2017).

5. CONCLUSION

In this study, the short and long-term nonlinear (asymmetric) effects of the real exchange rate on Türkiye's bilateral trade balance with the group of 28 European Union countries as well as whether the appreciation of the real exchange rate in Türkiye has a positive effect on the country's foreign trade, were investigated within the framework of the J curve effect. This study employed the nonlinear ARDL method to identify the short and long-term J-curve effect of the real exchange rate on bilateral trade with the 28 EU countries. The analysis results obtained through the nonlinear ARDL method support the idea of an asymmetric relationship between the real exchange rate and trade balance, as well as a J-curve effect in Türkiye's foreign trade with the EU 28 countries.

The findings are particularly consistent with those of who support the J curve effect with different samples and particularly with the findings of Bahmani-Oskooee and Halıcıoğlu (2017). In terms of policy implications, given that exchange rate-trade balance relationships are asymmetric across different countries or country groups, attention should be paid to target countries or country groups when implementing exchange rate policies. This study also highlights the need for future research to measure not only the J-curve effect of devaluation or exchange rate increases on total bilateral trade balances but also the impact of a country's specific sector on the trade balance of another country in the same sector at the micro level.

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