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BILATERAL J-CURVE BETWEEN TURKEY AND THE EUROZONE*

TÜRKİYE VE AVRO BÖLGESİ ARASINDAKİ İKİLİ TİCARETTE J EĞRİSİ

Salih ÖZDEMİR[1], Mert TOPCU[2], Furkan EMİRMAHMUTOĞLU[3]

1. 100/2000 YÖK Doktora Bursiyeri, Kayseri Üniversitesi Lisansüstü Eğitim Enstitüsü, sozdemir.salih@gmail.com, https://orcid.org/0000-0002-9583-4379
2. Doç. Dr., Alanya Alaaddin Keykubat Üniversitesi, İktisadi, İdari ve Sosyal Bilimler Fakültesi, İktisat Bölümü, mert.topcu@alanya.edu.tr, https://orcid.org/0000-0001-8236-9810
3. Doç. Dr., Ankara Hacı Bayram Veli Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Ekonometri Bölümü, f.emirmahmutoglu@hbv.edu.tr, https://orcid.org/0000-0001-7358-3567

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Abstract

A large body of the literature use aggregate data to investigate the validity of the J-curve hypothesis. Recent studies, however, address the importance of disaggregated data in order to prevent aggregation bias. In the case of Turkey where foreign trade volume is largely dominated by the Eurozone countries, one set of studies examines the J-curve phenomenon using total trade data while the second set of studies investigates the validity of the bilateral J-curve within a time-series framework. This study intends to investigate the validity of the bilateral J-curve between Turkey and the Eurozone over the period 2002:Q1-2019:Q4 within a dynamic panel data framework robust to heterogeneity and cross-section dependence. Results obtained from the Dynamic Common Correlated Effects estimator reveal that the J-Curve hypothesis does not hold given the short-run results.

Keywords: J-Curve, Bilateral Trade, Panel Data, Eurozone.

Öz

J-eğrisi hipotezinin geçerliliği araştıran çalışmalar genellikle toplam ticaret verileri ile analiz yapmaktadır. Ancak son dönemde yapılan çalışmalar toplamın yanlılığı sorununu göz önüne alarak toplulaştırılmamış veri ile çalışmanın önemine vurgu yapmaktadır. En önemli ticaret partneri Avro Bölgesi ülkeleri olan Türkiye'de, yapılan çalışmaların bir kısmı analizi toplam ticaret verileri ile gerçekleştirirken bir kısmı ise zaman serisi çerçevesinde analiz yapmaktadır. Bu çalışmada ise 2002:Q1-2019:Q4 döneminde Avro Bölgesi ülkeleriyle yapılan ikili ticarette J-eğrisi hipotezinin geçerliliği, heterojenite ve yatay kesit bağımlılığına karşı güçlendirilmiş dinamik panel veri analizi çerçevesinde ele alınacaktır. Dinamik Ortak İlişkili Etkiler tahmincisinden elde edilen bulgular, kısa dönemli sonuçlar göz önüne alındığında J Eğrisi hipotezinin geçerli olmadığına işaret etmektedir.

Keywords: J-Eğrisi, İkili Ticaret, Panel Veri, Avro Bölgesi.

GENİŞLETİLMİŞ ÖZET

Çalışmanın Amacı

Bu çalışmanın temel amacı, 2002: Q1-2019: Q4 döneminde Türkiye ile Avro Bölgesi arasındaki J-Eğrisi hipotezinin geçerliliğini incelemektir. Literatürde J-Eğrisi hipotezinin Türkiye'deki geçerliliği konusunda çok sayıda çalışma olsa da Türkiye ile Avro Bölgesi arasındaki ikili ticaret dikkate alınarak yapılan bilgimiz dahilinde bir çalışma bulunmamaktadır. Avro Bölgesi ülkelerinin Türkiye dış ticaret hacminde sahip olduğu büyük pay göz önüne alındığında, bu çalışma ikili ticaret verilerini kullanarak bu açığı kapatmayı amaçlamaktadır.

Araştırma Soruları

Türkiye ekonomisinde J-eğrisi hipotezinin geçerliliğine ilişkin önceki literatür ya toplamın yanlılığının tamamen göz ardı edildiği toplulaştırılmış veriler içeren çalışmalardan ya da ikili ticaret dinamiklerini gözlemlemek için zaman serisi yaklaşımlarını kullanan çalışmalardan oluşmaktadır. Bu kapsamda mevcut çalışmada 2002-2019 döneminde Türkiye ve Avro Bölgesi arasındaki ikili ticarette J-Eğrisi hipotezinin geçerli olup olmadığı, heterojenite ve yatay kesit bağımlılığına duyarlı dinamik panel veri analizi kullanılarak araştırılacaktır.

Literatür Araştırması

Türkiye ekonomisinde J-eğrisi hipotezine ilişkin önceki literatür temelde iki grup çalışmadan oluşmaktadır. İlk grup, toplamın yanlılığının tamamen göz ardı edildiği toplu veriler içeren çalışmaları içerirken, ikinci grup çalışmalarda ise ikili ticaret dinamiklerini gözlemlemek için zaman serisi yaklaşımları kullanılmaktadır. İkili ticaret verileri kullanılarak Türkiye için yapılan çalışmalarda, J-Eğrisi hipotezinin geçerliliğini test etmek için genellikle gecikmesi dağıtılmış otoregresif sınır testi (ARDL), etki-tepki fonksiyonları (IR) ve hata düzeltme modeli (ECM) kullandığı tespit edilmiştir. Panel veri kullanılarak modellenen bilgimiz dahilindeki çalışmaların ise heterojenite ve yatay kesit bağımlılığına duyarlı teknikler kullanılmadan tahmin edildiği tespit edilmiştir.

Yöntem

Bu çalışmada Goldstein ve Khan'ın (1985) eksik ikame modeline dayanarak Rose ve Yellen (1989) tarafından sunulan ticaret dengesi fonksiyonunun azalan formundan yararlanılmaktadır. Mevcut çalışma, Türkiye ve Avro bölgesi ülkeleri arasındaki ikili ticareti araştırmak için heterojen panellerdeki kısa ve uzun dönem ilişkileri inceleyen dinamik ortak ilişkili etkiler ortalama grup (DCCEMG) tahmincisi kullanmaktadır.

Sonuç ve Değerlendirme

DCCEMG tahmincisinden elde edilen sonuçlara göre Türkiye ile Avro bölgesi arasındaki ikili ticarette J Eğrisi hipotezi geçerli değildir. Sonuçlar uzun dönemde kur artışlarının ticaret dengesini iyileştirdiğine ancak kısa dönemde ticaret dengesi üzerinde anlamlı bir etkisi olmadığına işaret etmektedir.

1. INTRODUCTION

Achieving rapid economic growth is among the priority targets for every single country. Experiencing rapid growth rates causes an increase in household and government income through multiplier effects, as well as improving the balance of payments (Chou, 2013). Given this achievement, countries can choose to devaluate their currency to tackle the trade deficit problem. In particular, currency devaluation (or depreciation) has been used to enhance competitiveness, improve exports and eliminate the deficit in the trade balance. As a result of the devaluation or depreciation of the national currency, the prices of the domestic goods of the country become cheaper compared to the prices of foreign goods. This leads to an increase in exports and a decrease in imports, which, in turn, helps decline the deficit in the balance of payments. Devaluation, however, does not increase net exports instantly. A currency depreciation effect in the short-run is expected to be different than that in the long-run (Dash, 2013).

The J-Curve hypothesis, introduced by (Magee, 1973), postulates that devaluating the national currency does not help increase the net exports right on the spot and takes some time. Deprecation in national currency may worsen a country's trade balance in the short-run and is expected to improve it in the consequent periods, resulting in the so-called J-Curve phenomenon (Wang et al., 2012). Soon after this issue is empirically tested (Bahmani-Oskooee, 1985), there exists a large number of studies examining the validity of the J-Curve hypothesis and the results of these studies are very volatile across countries.

If the J-curve effect is valid, an increase in the exchange rate in the short-run leads to a rise in the trade deficit. Moreover, if the dependency of exports on imported goods is high, or if the increase in the exchange rate leads to an increase in domestic market prices, the appreciation of the foreign currency, in the long-run, cannot have a positive effect on the trade deficit. Therefore, the J-Curve hypothesis has to be analyzed to better understand the implications of how exchange rate movements affect the trade deficit.

A great number of studies testing the J-Curve hypothesis basically follow two different empirical paths. The first set of studies focuses on the two-country format using the total trade approach (see, for example: (Bahmani-Oskooee 1985; Himarios 1989; Bahmani-Oskooee and Alse 1994; Brada et al. 1997; Boyd et al. 2001; Hacker and Hatemi-J 2003; among others). However, using total trade data may cause aggregation bias (Rose and Yellen 1989; Kyophilavong et al. 2013). Hence, the second set of studies analyzes the J-Curve hypothesis using bilateral trade data (see, for example: Rose and Yellen 1989; Arora et al. 2003; Bahmani-Oskooee et al. 2006; Bahmani-Oskooee and Ratha 2007; Halicioglu 2008a; Hsing 2009; Wang et al. 2012; among others) considering trade flows between a country and her trading partners. These studies suggest that real depreciation or devaluation provides more empirical support for improving the trade balance in the long term (Bahmani-Oskooee and Ratha

2004). In addition, Halicioglu (2007) argues that a positive effect of devaluation against one country might be offset by its negative effect against another country.

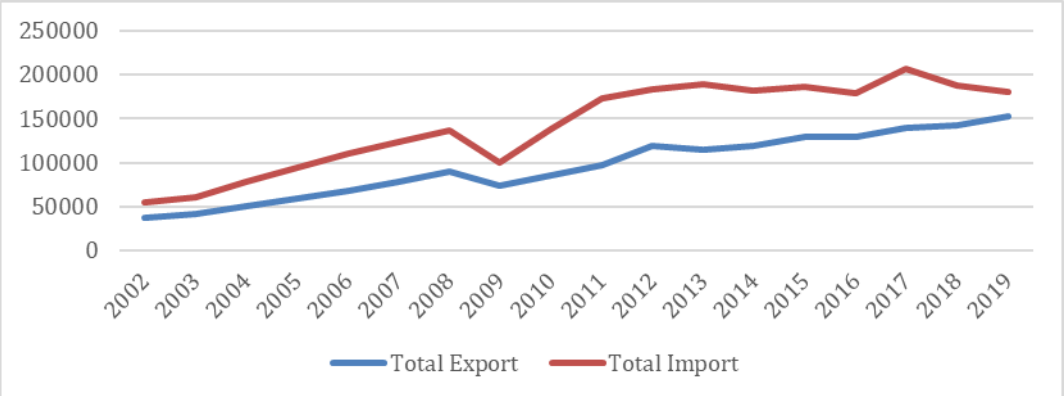
The main purpose of this study is to investigate the J-Curve hypothesis between Turkey and Eurozone for the period 2002-2019. Although the literature provides a plethora of studies on the validity of the J-Curve hypothesis in Turkey, no previous attempt has been done considering the bilateral trade between Turkey and Eurozone, to the best of our knowledge. Note that the closest attempt to this study is Topcu and Özdemir (2019) which merely investigates the validity of the Marshall-Lerner condition using the bilateral trade data considering Turkey and the Eurozone. Given the major role that Eurozone countries play in Turkish trade volume, this study aims to fulfill this gap by using bilateral trade data. In addition, this study intends to contribute to the literature in terms of empirical framework. Previous literature commonly employs the Autoregressive Distributed Lag (ARDL), Impulse Response (IR) functions, and Error-correction model (ECM) to test the validity of the J-Curve hypothesis. Unlike these studies, the existing study utilizes the dynamic common correlated effects mean group (DCCEMG) estimator alongside the pooled mean group (PMG) estimator in order to differentiate the long- and short-run dynamics within a heterogeneous panel framework.

The remainder of this study is structured as follows: section 2 provides information about the trade volume in Turkey, section 3 reviews related literature, section 4 describes the model and data, section 5 presents the empirical approach and results, and finally, section 6 gives concluding remarks.

2. STYLIZED FACTS ABOUT TURKISH FOREIGN TRADE

Trade volume has been increasing dramatically across the globe while it has been also rising in the Turkish economy as well. Figure 1 displays Turkish foreign trade volume over the period 2002-2019. According to the figure, both exports and imports tend to increase over this period except for the 2008 global financial crisis.

Figure 1. Total Trade Volume of Turkey (Billion Euro)



The Eurozone is an interesting area to study because it is composed of Turkey's major trading partners such as Germany, Spain, Portugal, Italy, and France. Figure 2 shows the bilateral trade between

Turkey and Eurozone countries as well as total export and import in Turkey over the period 2002-2019. It can be inferred from the figure that 35% of Turkish total trade volume has been traded with the Eurozone countries in this period around, emphasizing the dominance of the Eurozone economies in her trade volume.

Figure 2. Trade between Turkey and Eurozone Countries (Billion Euro)

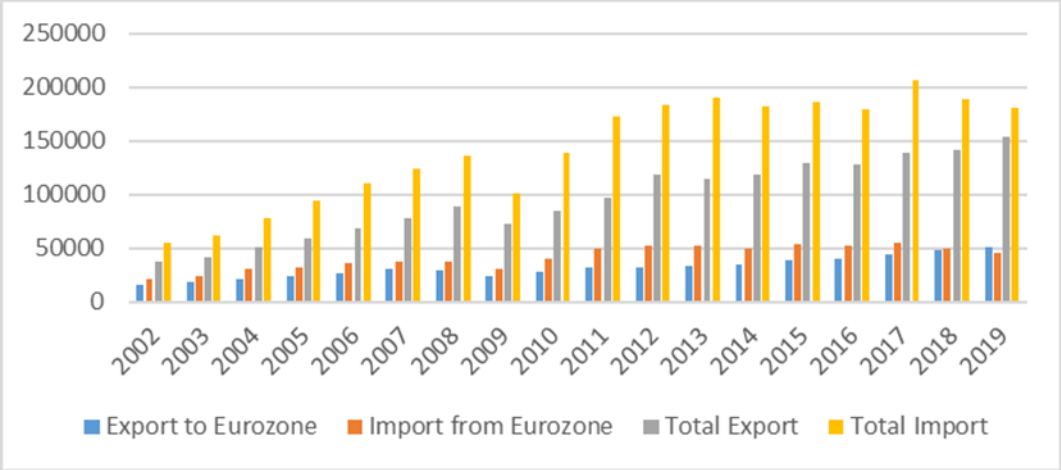
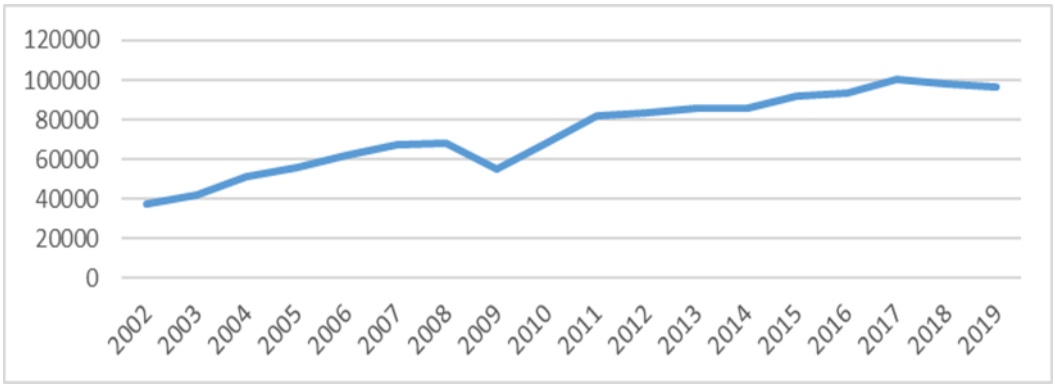


Figure 3 shows the trade volume between Turkey and Eurozone countries over the period 2002-2019. The figure shows that trade volume increased rapidly until 2008 and reached 68 billion euros. Despite a 27% decrease, it reached 96 billion euros in 2019. Therefore, it is obvious that trade volume between Turkey and Eurozone increased by 159% during the 2002-2019 period.

Figure 3. Trade Volume between Turkey and Eurozone (Billion Euro)



Sources: Turkish Statistical Institute Trade Statistics (2019)

3. LITERATURE SURVEY: THE TURKISH CASE

Bahmani-Oskooee and Malixi (1992) analyze the exchange rate effects on trade balance for 13 developing countries by using ordinary least squares over the period 1973:1-1985:4 and find no empirical evidence in favor of the validity of the J-Curve hypothesis in Turkey. Akbostanci (2004) investigates the J-Curve hypothesis over 1987-2000 quarterly data considering the bilateral trade between Turkey and her trading partners (USA and Germany) by using ECM and generalized (IR) function and finds no evidence of the J-Curve. Halicioglu (2007) examines the validity of the J-Curve

hypothesis for Turkey and her 9 trading partners by using aggregate bilateral trade data with generalized (IR) analysis ranging from 1960 to 2000. Findings indicate no evidence of the validity of the J-Curve hypothesis. Halicioglu (2008a) analyzes the J-Curve hypothesis between Turkey and her 13 major trading partners by using bilateral trade data over the period 1985-2005 by employing bound cointegration testing and ECM. Empirical results reveal no evidence of the validity of the J-Curve hypothesis in the short-run while in the long-run there is a favorable effect on the trade balance in the case of some countries. Bahmani-Oskooee and Kutan (2009) examine the existence of the J-Curve phenomenon for 11 developing countries over the period 1990:1-2005:4 employing a bound testing approach and find no evidence for Turkey. Celik and Kaya (2010) investigate bilateral trade between Turkey and her seven trading partners by using panel cointegration techniques over the period 1985:1-2006:4 and find no evidence of the J-Curve hypothesis. Karamelikli (2016) investigate the J-Curve hypothesis in Turkey with world trade data using both monthly and quarterly data within a NARDL model over the period 2003-2015. Results reveal a symmetric relationship in the short-run as well as an asymmetric relationship in the long-run whereas it indicates no J-Curve effect. Vergil and Erdogan (2009) investigate the nexus between the real exchange rate and trade balance in Turkey using the ARDL model over the period 1989-2005. Empirical findings reveal the validity of the J-curve hypothesis. Halicioglu (2008b) investigates the issue within the ARDL framework over the period 1980-2005 and finds evidence of the validity of the J-Curve. Koseyahyaoglu and Karatasli (2018) examine the validity of the J-curve hypothesis between Turkey and the EU over the period 1994-2016 by using VECM and find the validity of the J-Curve in the short-run but there is no evidence for J-Curve in the long-run.

Studies summarized above address that the existing literature generally employs the ARDL, IR functions, and ECM to test the validity of the J-Curve hypothesis, and the majority of these studies reject the validity of the J-Curve hypothesis, irrespective of the trading partners.

4. MODEL AND DATA

This study investigates the validity of the J-curve hypothesis between Turkey and the Eurozone using bilateral trade data. 18 Eurozone countries in the analysis include, Germany, Portugal, Spain, France, Italy, Austria, Latvia, Greece, Belgium, Estonia, Finland, Ireland, Netherlands, Malta, Lithuania, Luxembourg, Slovakia, and Slovenia. Notice that we omit Cyprus due to the availability of data. The time frame includes quarterly observations spanning from 2002: Q1 to 2019: Q4. For this purpose, the study utilizes the decreasing form of trade balance function introduced by Rose and Yellen (1989) based on the missing substitution model of Goldstein and Khan (1985):

$$TB = f[Y^*, Y, R] \quad and \quad R = \left(\frac{P^*}{P}\right) E \tag{1}$$

In this function, TB represents trade balance, Y^* is the foreign income, Y is the domestic income, P represents domestic price level, P^* represents foreign price level, E is the nominal exchange rate and

R is the real exchange rate. Table 1 summarizes variable definitions and data sources. To interpret the coefficient estimates as elasticities, all variables are converted to natural logarithms.

Table 1. Proxies and Data Sources

Variable	Proxy	Source
$X_{i,t}$	Turkey's nominal exports to trading partner i (nominal prices in Euro)	The Turkish Statistical Institute (Special Trade System)
$M_{i,t}$	Turkey's nominal imports from trading partner i (nominal prices in Euro)	The Turkish Statistical Institute (Special Trade System)
$lnTB_{i,t}$	X/M	own calculation
lnY_t	Gross Domestic Product in Turkey (2010 chain linked volumes, national currency)	Eurostat
$lnY^*_{i,t}$	Gross Domestic Product in Eurozone country i (2010 chain linked volumes, Euro)	Eurostat
P_t	Consumer Price Index in Turkey (2010=100)	International Monetary Fund International Financial Statistics
$P^*_{i,t}$	Consumer Price Index in Eurozone country i (2010=100)	International Monetary Fund International Financial Statistics
E_t	The value of Turkish lira per unit of Euro	Central Bank of the Turkish Republic Electronic Data Delivery System
$lnR_{i,t}$	$(P^*E)/P$	own calculation

Note: Income variables are seasonally adjusted using TRAMO/SEATS.

Table 2 presents the descriptive statistics of the data. Notice that the highest standard deviation is the foreign income variable. On the other hand, the single currency in the Monetary Union potentially explains the lowest standard deviation coming from the exchange rate variable.

Table 2. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
$lnTB$	1296	-0.1064	1.0018	-3.7853	5.4841
lnY^*	1296	10.6069	1.7239	7.2289	13.5286
lnY	1296	12.6606	0.2733	12.1391	13.0870
lnR	1296	0.8565	0.1329	0.5481	1.3217

Table 3 shows the correlation matrix among the variables under investigation. Notice that correlation signs are not uni-formed and almost equally distributed. According to the table, all coefficients are less than 0.33 in terms of absolute values so that it is not likely to face a variable-based specification issue associated with a potential multicollinearity problem. The highest correlation among

the variable set is between the trade balance variable and foreign income variable. On the other hand, the domestic income variable shows the lowest correlation with the trade balance variable.

Table 3. Correlation for the Panel Data Set

	$lnTB$	lnY^*	lnY	lnR
$lnTB$	1.0000	-	-	-
lnY^*	-0.3235	1.0000	-	-
lnY	-0.0103	0.0504	1.0000	-
lnR	-0.0667	0.1054	0.2822	1.0000

5. METHODOLOGY AND FINDINGS

As a preliminary step, we test whether the variables in the system are cross sectionally dependent. To this end, we use cross section dependence (CD) test proposed by Pesaran (2004).

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \tag{2}$$

Table 4. Cross Sectional Dependence Results

Variable	$lnTB$	lnY^*	lnR
CD-Test	20.32[a]	67.90[a]	96.10[a]

Note: "a" denotes significance at 1%.

Cross-section dependence results reported in Table 4 reveal that cross section dependence cannot be ignored once determining the testing procedure.

Granger and Newbold (1974) assert that examining the stationary condition is of great interest prior to estimation. In order to check whether series contain a unit root, we utilize the cross sectionally augmented IPS (CIPS) test proposed by Pesaran (2007). Pesaran's (2007) test depends on the pioneer version of the IPS test developed by Im et al. (2003). The CIPS test statistic is the mean of cross-sectionally augmented Dickey–Fuller (CADF) statistics obtained regression given follows:

$$\Delta y_{i,t} = a_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + \sum_{j=1}^{p} d_{ij}\bar{\Delta} y_{t-j} + \sum_{j=1}^{p} \delta_{ij}\Delta y_{i,t-j} + \varepsilon_{i,t} \tag{3}$$

where $\bar{y}_t$ denotes the cross-section mean of $y_{i,t}$. The $CIPS$ statistic is a simple cross-section average of t_i defined by

$$CIPS(N,T) = N^{-1}\sum_{i=1}^{N} t_i \tag{4}$$

where t_i is the OLS t – ratio of b_i in the CADF regression (3).

Panel unit root results, reported in Table 5, indicate that all series are integrated of order one. On the other hand, since lnY is a unit-invariant variable, we apply the ADF unit root test to this series. The ADF test result shows that lnY series is $I(1)$.

Table 5. Unit Root Test Results

	Unit-variant variables		Unit-invariant variables	
Variable	Level	First Difference	Level	First Difference
$lnTB$	-1.151	-20.560[a]	-	-
lnY^*	2.845	-20.110[a]	-	-
lnR	-0.647	-19.675[a]	-	-
lnY	-	-	-1.222	-5.075[a]

Note: Test equation includes an intercept. Optimum lag length is determined considering SIC. "a" denotes significance at 1%.

Unlike the panel data set-up utilized from previous literature on bilateral trade, this study employs the DCCEMG estimator proposed by Chudik and Pesaran (2015) to test the validity of the J Curve hypothesis. Because this test is robust to cross section dependence as well as heterogeneity, this study is expected to open a new venue in the validity of the hypothesis. The following ARDL(p, q_1, q_2, q_3) equation is

$$lnTB_{i,t} = \sum_{I=1}^{p} \alpha_{il} lnTB_{i,t-l} + \sum_{I=0}^{q_1} \beta_{il} lnY_{t-l} + \sum_{I=0}^{q_2} \gamma_{il} lnY^*_{i,t-l} + \sum_{I=0}^{q_3} \delta_{il} lnR_{i,t-l} + \sum_{I=0}^{p_T} \boldsymbol{\gamma}'_{il} \bar{\boldsymbol{z}}_{t-l} + \varepsilon_{i,t} \tag{5}$$

where $\bar{\boldsymbol{z}}_t = \left(\overline{lnTB}_t, \overline{lnY}^*_t, \overline{lnR}_t\right)'$ and p, q_1, q_2 and q_3 are lag lengths. Equation (6) describes the augmented version of equation (5) as error correction model:

$$\Delta lnTB_{i,t} = \emptyset_i lnTB_{i,t-1} + \theta_{1i} lnY_t + \theta_{2i} Y^*_{i,t} + \theta_{3i} lnR_{i,t} + \sum_{I=1}^{p} \alpha^*_{il} \Delta lnTB_{i,t-l} + \sum_{I=0}^{q_1-1} \beta^*_{il} \Delta lnY_{t-l} + \sum_{I=0}^{q_2-1} \gamma^*_{il} \Delta lnY^*_{i,t-l} + \sum_{I=0}^{q_3-1} \delta^*_{il} \Delta lnR_{i,t-l} + \sum_{I=0}^{p_T} \boldsymbol{\gamma}'_{il} \bar{\boldsymbol{z}}_{t-l} + \varepsilon_{i,t} \quad (6)$$

where $\emptyset_i = -\left(1 - \sum_{I=1}^{p_1} \alpha_{I,i}\right)$ is error correction speed of adjustment parameter. Also, $\theta_{1i} = \sum_{I=0}^{p_2} \beta_{I,i}$, $\theta_{2i} = \sum_{I=0}^{p_3} \gamma_{I,i}$ and $\theta_{3i} = \sum_{I=0}^{p_4} \delta_{I,i}$ are the long-run coefficients on the variables lnY, $lnY^*$and lnR, respectively. On the other hand, the short run coefficients are defined as follows:

$$\alpha^*_{il} = -\sum_{m=l+1}^{p} \alpha_{im}, \quad l = 1,2,\dots,p-1 \qquad \beta^*_{il} = -\sum_{m=l+1}^{q_1} \beta_{im}, \quad l = 1,2,\dots,q_1-1$$

$$\gamma^*_{il} = -\sum_{m=l+1}^{q_2} \gamma_{im}, \quad l = 1,2,\dots,q_2-1 \qquad \delta^*_{il} = -\sum_{m=l+1}^{q_3} \delta_{im}, \quad l = 1,2,\dots,q_3-1$$

Table 6. DCCEMG Results

Variables	Long-run coefficients	Short-run coefficients
lnY^*	1.835 [a]	0.755
lnY	-0.663[c]	-0.299
lnR	0.641[c]	0.479

Note. The estimation includes an intercept. Lagged values of the dependent variable are not reported. "a" and "c" denote significance at 1% and 10%, respectively.

Table 6 reports the results obtained from the DCCEMG estimator. Empirical results show that none of the explanatory variables affect trade balance significantly in the short-run. In the long-run, however, each of the variables has a statistically significant impact on the trade balance. A 1% increase in foreign income and exchange rate improve trade balance whereas a 1% increase in domestic income deteriorates trade balance in the long-run.

6. CONCLUSION

The bilateral trade model proposed by Rose and Yellen (1980) tackles the aggregation bias which does not consider the fact that the depreciation of a national currency can worsen the trade balance with a country while improving the trade balance with another country. Therefore, testing the validity

of the J-curve hypothesis requires a heterogeneous panel data framework. However, the difficulty of using bilateral trade data within a panel framework rests with estimating the short- and long-run dynamics.

Previous literature on the J-curve phenomenon in the case of the Turkish economy involves two sets of studies as well. The first group includes the studies with aggregate data in which aggregation bias is completely ignored. The second set of studies, on the other hand, use time series approaches to observe the bilateral trade dynamics. Unlike these studies, the existing study is probably the first attempt to investigate the validity of the bilateral J-curve hypothesis between Turkey and the Eurozone area over the period 2002-2019 within a dynamic panel data framework. To this end, the DCCEMG estimator is utilized to separate the short- and long-run dynamics. Empirical findings obtained from the DCCEMG estimator do not provide empirical support for the validity of the J-curve hypothesis, given the findings obtained from the short-run dynamics. Once these results are compared with those obtained from the previous literature in the case of Turkey, it is noteworthy that cross-section dependence, as well as heterogeneity, may produce biased results, even in the short-run. Therefore, determining a convenient estimation technique is very crucial to developing appropriate trade policies.

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