Balkan Journal of Social Sciences

BJSS

Derginin ana sayfası: https://dergipark.org.tr/bsbd

Araştırma Makalesi ● Research Article

Long-run Asymmetric Association between Imports and Economic Growth in Turkey

Türkiye'de İthalat ve Ekonomik Büyüme Arasındaki Uzun Dönem Asimetrik İlişki

Julide Yalcinkaya Koyuncu[a], Mustafa Unver[b,*]

[a] Prof. Dr., Bilecik Şeyh Edebali Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İktisat Bölümü, Bilecik/Türkiye
ORCID: 0000-0001-7930-4901
[b] Doç. Dr., Kırıkkale Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Maliye Bölümü, Kırıkkale/Türkiye
ORCID: 0000-0002-0491-3080

MAKALE BİLGİSİ

Makale Geçmişi:
Başvuru tarihi: 10 Kasım 2020
Düzeltme tarihi: 1 Aralık 2020
Kabul tarihi: 18 Aralık 2020

Anahtar Kelimeler:
Ekonomik Büyüme
İthalat
NARDL

ÖZ

Bu çalışmanın amacı 1988-2019 dönemi için Türkiye'de NARDL modeli ve iki farklı ekonomik büyüme indikatörü kullanarak ekonomik büyüme oranı ve ithal edilen mal ve hizmetlerin büyüme oranı arasındaki asimetrik ilişkiyi analiz etmektir. Çalışmanın analiz sonuçlarına göre; ekonomik büyüme ve ithalat büyüme oranı arasında lineer olmayan eşbütünleşme ilişkisine ulaşılmıştır. Çalışmada; kısa dönem/uzun dönemde herhangi asimetrik ilişkinin varlığını belirlemek için NARDL (2,2) modeli tahmin edilmiştir. Seriler arasındaki asimetrik ilişkiye kısa dönemde ulaşılmazken uzun dönemde tanımlanmıştır. İlk modelin tahmin bulgularına göre; ithalat büyüme oranındaki %1'lik bir azalış ekonomik büyümede % 0.565 kadar bir düşüşe yol açarken, ithalat büyüme oranındaki %1'lik bir artış ekonomik büyüme oranında % 0.606 kadar bir artışa neden olmaktadır. Diğer taraftan, ikinci modelin tahmin sonuçlarına göre; ithalat büyüme oranındaki %1'lik bir yükseliş ekonomik büyümede % 0.574 kadar bir artışa neden olurken, ithalat büyüme oranındaki bir azalış ekonomik büyüme oranında % 0.535 kadar bir azalışa yol açmaktadır. Aynı zamanda model tanısal sınava testleri; modelin oto korelasyon, farklı korelasyon, modelin yanlış belirginleştirilmesi ve normal dışılık problemlerini içermediğini ima etmektedir.

ARTICLE INFO

Article history:
Received November 10, 2020
Received in revised form December 1, 2020
Accepted December 18, 2020

Keywords:
Economic Growth
Imports
NARDL

ABSTRACT

This study aims to analyze asymmetric association between economic growth rate and growth rate of imported goods and services in Turkey for the periods of 1988-2019 by using the Nonlinear Autoregressive Distributed Lag (NARDL) model and two distinct indicators of economic growth rate. According to the estimation results, there exists a nonlinear cointegration relationship between economic growth rate and growth rate of imports. NARDL (2,2) model is estimated to determine the presence of any asymmetric link in short-run/long-run. We identified an asymmetric relationship between the series in the long-run but not in the short-run. Estimation findings of the first model disclose that a rise in growth rate of imports by 1% causes a rise in economic growth rate by 0.606% while a decrease in growth rate of imports by 1% leads to a drop in economic growth rate by 0.565%. On the other hand, according to the estimation results of the second model, a jump in growth rate of imports by 1% causes to an increase in economic growth rate by 0.574% whereas a drop in growth rate of imports by 1% leads to a decrease in economic growth rate by 0.535%. Also model diagnostic tests imply that the model do not contain autocorrelation, heteroscedasticity, model misspecification and non-normality problems.

1. Introduction

The high and stable economic growth of countries is the dominant contributor to a better quality of life, higher income level, and lower unemployment level in developing countries. The vast majority of literature has focused this topics due to the benefits of economic growth (Barro, 1991; Mankiw, Romer, and Weil, 1992; Grossman and Krueger, 1995; Croes, Ridderstaat, Bak, and Zientara, 2020). On the other hand, previous economic growth literature has

* *Sorumlu yazar/Corresponding author*.
e-posta: mustafaunver@kku.edu.tr

e-ISSN: 2149-4622.

addressed the determinants of economic growth in terms of a large diversity of economic variables. Tsaurai and Ndou (2019) argues the effects of infrastructure and human capital development on economic growth using panel data for 15 transitional economies over the period from 2000 to 2014. The results for these transitional countries support that interaction between infrastructure and human capital development promote economic growth (see also Ranis, Stewart, and Ramirez, 2000; Fahimi, Akadiri, Seraj, and Akadiri, 2018). In the paper of Agasisti and Bertoletti (2020), an increase in number of universities in 248 European regions between 2000 and 2017 will positively affect economic growth and development if there are the higher quality of researchers in the universities. Also, the effects of foreign direct investment (FDI) on economic growth have been widely argued in the existing literature of economic growth. For example, Gui-Diby (2014) addresses how FDI affects economic growth in 50 African economies for the period 1980-2009. The paper finds that FDI has a negative impact on economic growth during the period 1980-1994 and positive for the period 1995-2009 (see also Su and Liu, 2016; Asongu and Odhiambo, 2020).

In addition, theoretical and empirical papers have suggested that there exists the evidence of relationship between foreign trade and economic growth. More specifically, this literature also presents evidences on the relationship between trade openness and economic growth. Generally, based on our reading in the literature, liberalization policies in the trade can be expected to promote the economic growth in developing economies. For example, Manwa, Wijeweera, and Kortt (2019) use fixed-effect regression models to discover the possible relationship between trade liberalization and economic growth 5 African countries over the period of 1980-2011. Their estimation models include four different trade liberalization variables as independent variable. They find that main coefficient on the impact of trade liberalization on economic growth is positive and statistically significant. In particular, many papers have looked at the causality relationship between trade openness and economic growth. Omri, Daly, Rault, and Chaibi (2015), analyzing causality relationship between trade openness and economic growth for a panel of 12 MENA countries during the 1990-2011 period, indicates that there is a bidirectional causality relationship between trade openness and economic growth. This findings have suggested that trade openness is an important source of economic growth by increasing the size of the pie from trade partners because it provides advance technologies and accumulation of knowledge from the technologically advanced economies in which the total factor productivity is higher (Shahbaz, 2012: 2325).

More specifically, based on our main focus, previous empirical papers tried to explain the relationship between imports and economic growth. These papers have employed data from developing countries. In this chapter, we will review a selected empirical papers from import and economic growth literature. Awokuse (2007) found statistically significant empirical evidence in support of long-run causal link from imports to economic growth for Czech Republic. Thus, this empirical finding means that higher imports in this economy stimulates economic growth in the long-run. Chen and Dong (2012) have specifically examined the impact of imports growth on economic growth in China from 1997-2008. According to their results, increasing import trade has a positive and statistically significant effect on economic growth (see also Herrerias and Orts, 2011; Adegboyega, 2017; Koyuncu and Unver, 2019; Aluko and Adeyeye, 2020).

The aim of this paper is to provide asymmetric association between economic growth rate and growth rate of imported goods and services in Turkey for the periods of 1988-2019 by using the Nonlinear Autoregressive Distributed Lag (NARDL) model and two distinct indicators of economic growth rate. The contribution of this paper is to investigate the long-run asymmetric cointegration association between economic growth and import levels in Turkey.

The rest of the paper is organized as follows. In the following section, we depict our data and the methodology. Section 3 presents our empirical results. Section 4 concludes the paper.

2. Data and the Methodology

In this paper we tried to find out the long/short term asymmetric association between the series of economic growth and growth rate of imports in Turkey for the period covering the years between 1988 and 2019. Analyses are conducted by utilizing two distinct measures of economic growth (i.e. GROWTH1: GDP growth (annual %) and GROWTH2: GDP per capita growth (annual %)). Growth rate of imports (IMPORTS) are represented by imports of goods and services (annual % growth). All data are retrieved from WDI database of World Bank. We have two models as shown below:

Model 1: $GROWTH1 = f(IMPORTS)$ (1)

Model 2: $GROWTH2 = f(IMPORTS)$ (2)

Recently in the literature, researchers have started to use ARDL approach for cointegration analysis instead of conventional cointegration tests due to the fact that ARDL approach is less restrictive for integration order of variables and it allows variables to integrated in any order no more than integrated order one. One of disadvantages of ARDL approach is its linearity (symmetry) assumption between regressor and regressand. In other words impact of increases and decreases in regressor on regressand may be nonlinear (asymmetric). In presence of such an asymmetry, if we insist on using ARDL method then we will be committing model misspecification error. Therefore we employ nonlinear ARDL (NARDL) approach in our analyses in order to avoid the potential model misspecification error since NARDL

method take into account asymmetric association between regressor and regressand.

Asymmetric effects of increases and the decreases in regressor are simultaneously considered in the same model in NARDL approach. In NARDL approach, IMPORTS variable is decomposed into its positive and negative partial sums as follows:

$$IMPORTS_t^+ = \sum_{j=1}^{t} \Delta IMPORTS_t^+ = \sum_{j=1}^{t} \max(\Delta IMPORTS_j, 0) \quad (3)$$

$$IMPORTS_t^- = \sum_{j=1}^{t} \Delta IMPORTS_t^- = \sum_{j=1}^{t} \min(\Delta IMPORTS_j, 0) \quad (4)$$

Analyses are conducted by using following NARDL model:

$$\Delta GROWTH_t = \mu + \eta GROWTH_{t-1} + \delta^+ IMPOTRS_{t-1}^+ + \delta^- IMPOTRS_{t-1}^- + \sum_{i=1}^{s-1} \beta_i \Delta GROWTH_{t-i} + \sum_{i=0}^{j-1} (\alpha_i^+ IMPOTRS_{t-i}^+ + \alpha_i^- IMPOTRS_{t-i}^-) + \varepsilon_t \quad (5)$$

The null hypothesis used to test presence of long term asymmetry is given by $H_0: \delta^+ = \delta^-$ which claims the absence of long term asymmetry, and the null hypothesis used to test existence of short term asymmetry is given by $H_0: \alpha^+ = \alpha^-$ which claims the absence of short term asymmetry. On the other hand alternative hypothesis in the first case claims the presence of long term asymmetry and in the second case claims the existence of short term asymmetry. In the case of accepting both null hypotheses we conclude that there is no asymmetry in long and short run and thus using ARDL rather than NARDL is more appropriate.

3. Estimation Results

As mentioned before, NARDL method allows series to be integrated order zero (i.e., I(0)) or order one (i.e., I(1)) or mixed. Hence we first conduct Augmented Dickey Fuller (ADF) unit root test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test to check the stationarity of series. ADF and KPSS unit test results4 are presented in Table 1. According to the ADF and KPSS test findings, GROWTH1, GROWTH2, and IMPORTS variable are stationary at levels and hence they are integrated order one.

Table 1: ADF and KPSS Unit Root Tests (Model: Constant& Trend)

	H_0: Variable has unit root		H_0: Variable is stationary	
Variable	ADF test statistic	Critical Value	KPSS test statistic	Critical value
GROWTH1	-6.084***	-4.273	0.085***	0.216
GROWTH2	-6.10***	-4.273	0.089***	0.216
IMPORTS	-4.540***	-4.356	0.048***	0.216

*** indicates statistical significance at 1% level. Lag length and bandwidth were automatically selected.

We constructed and estimated a NARDL(2,2) model to implement our analyses. Table 2 displays nonlinear cointegration test results. Since F-statistics gathered for Model 1 and 2 are higher than the upper bound 10% critical value of 4.78, we conclude that there is a nonlinear cointegration between economic growth and imports of Turkey.

Table 2: Nonlinear Cointegration Tests (H_0: No cointegration)

F-statistic for Model 1: 5.192*

F-statistic for Model 2: 5.522*

* indicates statistical significance at 10% level. The critical values are checked from Pesaran et al. (2001) Case III.

Table 3 and 4 summarize short-run and long-run symmetry test results. As can be deducted from Table 3, there is asymmetry for the long run at 10% significance level but not for the short run. We get the same result for Model 2 for which there exists asymmetry for the long run at 5% significance level but not for the short run.

Table 3: Short-run & Long-run Symmetry Tests for Model 1 (H_0: Symmetry exists)

	F-statistic	P-value
Long-run	4.329*	0.050
Short-run	1.322	0.263

* indicates statistical significance at 10% level.

Table 4: Short-run & Long-run Symmetry Tests for Model 2 (H_0: Symmetry exists)

	F-statistic	P-value
Long-run	5.09**	0.035
Short-run	1.161	0.293

** indicates statistical significance at 5% level.

Table 5 and 6 display NARDL (2,2) estimation results and model diagnostic test results for Model 1. The coefficient of long run increases (LR^+) in growth rate of imports is positive and statistically significant at 5% level whereas the coefficient of long run decreases (LR^-) in growth rate of imports is negative and statistically significant at 1% level. More explicitly, the long-run estimation findings reveal that an increase in growth rate of imports by 1% leads to a rise in economic growth rate by 0.606% while a decrease in growth rate of imports by 1% leads to a drop in economic growth rate by 0.565% in Turkey for the period of 1988-2019. The coefficient of GROWTH1 $_{(t-1)}$ is error correction (ECM) term and shows the convergence speed of returning back to the long-run equilibrium in case of deviation from long-run path in the short-run. The coefficient of ECM term indicates that 61.7% of a shock will be absorbed in a year. In other words, it will take approximately 20 months to have the effects of a shock on economic growth fully disappeared.

Table 5: NARDL (2,2) Estimation Results for Model 1

Variable	Coefficient	p-value
Constant	-6.829**	
	(2.753)	0.022
GROWTH1 $_{(t-1)}$	-0.617**	
	(0.262)	0.029
IMPORTS$^{+}_{(t-1)}$	0.374***	
	(0.096)	0.001
IMPORTS$^{-}_{(t-1)}$	0.348***	
	(0.091)	0.001
Δ GROWTH1 $_{(t-1)}$	-0.122	
	(0.218)	0.584
Δ IMPORTS$^{+}_{(t)}$	0.384***	
	(0.059)	0.000
Δ IMPORTS$^{+}_{(t-1)}$	-0.008	
	(0.072)	0.913
Δ IMPORTS$^{-}_{(t)}$	0.278***	
	(0.033)	0.000
Δ IMPORTS$^{-}_{(t-1)}$	-0.007	
	(0.054)	0.898
LR^+	0.606**	0.010
LR^-	-0.565***	0.009

*** and ** indicate statistical significance at 1% and 5% level respectively. Standard errors are given in the parentheses.

The diagnostic test results for Model 1 are given in Table 6 and four types of diagnostics test are provided. Since test statistics of all four tests are statistically insignificant at conventional significance levels, we can assert that there is

no autocorrelation, heteroscedasticity, model misspecification and non-normality problems in NARDL (2,2) model.

Table 6: Diagnostic Tests for Model 1

Tests	Test Statistic	p-value
Portmanteau test up to lag 13 (Chi-Square)	13.01	0.4472
Breusch/Pagan heteroskedasticity test (Chi-Square)	0.173	0.6772
Ramsey RESET test (F)	0.532	0.6661
Jarque-Bera test on normality (Chi-Square)	0.577	0.7494

Table 7 and 8 obtain NARDL (2,2) estimation findings and model diagnostic test findings for Model 2. The coefficient of long run rises (LR^+) in growth rate of imports takes a positive sign and is statistically significant at 1% level while the coefficient of long run drops (LR^-) in growth rate of imports takes a negative sign and is statistically significant at 1% level. According to the long-term estimation results, a jump in growth rate of imports by 1% causes to an increase in economic growth rate by 0.574% whereas a drop in growth rate of imports by 1% leads to a decrease in economic growth rate by 0.535% in Turkey for the period of 1988-2019. The coefficient of ECM term of Model 2 implies that 66.1% of the effect of a shock will be compensated in a year. In other words, it will last approximately 18 months to have the effects of a shock on economic growth fully vanished.

Table 7: NARDL (2,2) Estimation Results for Model 2

Variable	Coefficient	p-value
Constant	-7.717***	
	(2.586)	0.007
$GROWTH1_{(t-1)}$	-0.661**	
	(0.266)	0.021
$IMPORTS^{+}_{(t-1)}$	0.379***	
	(0.094)	0.001
$IMPORTS^{-}_{(t-1)}$	0.354***	
	(0.089)	0.001
$\Delta\ GROWTH1_{(t-1)}$	-0.107	
	(0.217)	0.627
$\Delta\ IMPORTS^{+}_{(t)}$	0.373***	
	(.057)	0.000
$\Delta\ IMPORTS^{+}_{(t-1)}$	-0.015	
	(0.070)	0.837
$\Delta\ IMPORTS^{-}_{(t)}$	0.275***	
	(0.032)	0.000
$\Delta\ IMPORTS^{-}_{(t-1)}$	-0.012	
	(0.053)	0.827
LR^+	0.574***	0.006
LR^-	-0.535***	0.006

*** and ** indicate statistical significance at 1% and 5% level respectively. Standard errors are given in the parentheses.

The diagnostic test results for Model 2 are reported in Table 8. Since test statistics for the all tests are statistically insignificant at conventional significance levels, it can be claimed that Model 2 do not possess autocorrelation, heteroscedasticity, model misspecification and non-normality problems.

Table 8: Diagnostic Tests for Model 2

Tests	Test Statistic	p-value
Portmanteau test up to lag 13 (Chi-Square)	13.9	0.3812

Breusch/Pagan heteroskedasticity test (Chi-Square)	0.117	0.7329
Ramsey RESET test (F)	0.532	0.6664
Jarque-Bera test on normality (Chi-Square)	0.578	0.7489

4. Conclusion

In this study we try to examine if there is an asymmetric linkage between economic growth rate and growth rate of imports in Turkey for the periods of 1988-2019. According to the empirical results gathered from NARDL (2,2) model, a nonlinear cointegration relationship between economic growth rate and growth rate of imports exists and there is an asymmetric association between the series in the long-run but not in the short-run. Estimation findings of the first model shows that an increase in growth rate of imports by 1% leads to a rise in economic growth rate by 0.606% while a decrease in growth rate of imports by 1% leads to a drop in economic growth rate by 0.565%. On the other hand, according to the estimation results of the second model, a jump in growth rate of imports by 1% causes to an increase in economic growth rate by 0.574% whereas a drop in growth rate of imports by 1% leads to a decrease in economic growth rate by 0.535%. In regard to diagnostic check of each model, we did not identify autocorrelation, heteroscedasticity, model misspecification and non-normality problems in our two models.

References

Adegboyega, R. R. (2017). The Impact of Export and Import on Economic Growth in Nigeria: Evidence from VAR Approach. *Journal of Management and Social Sciences*, *6*, 364-349.

Agasisti, T., & Bertoletti, A. (2020). Higher education and economic growth: A longitudinal study of European regions 2000–2017. *Socio-Economic Planning Sciences*, 100940.

Aluko, O. A., & Adeyeye, P. O. (2020). Imports and economic growth in Africa: Testing for granger causality in the frequency domain. *The Journal of International Trade & Economic Development*, 1-15.

Asongu, S. A., & Odhiambo, N. M. (2020). Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa. *Telecommunications Policy*, *44*(1), 101838.

Awokuse, T. O. (2007). Causality between exports, imports, and economic growth: Evidence from transition economies. *Economics letters*, *94*(3), 389-395.

Barro, R. J. (1991). Economic growth in a cross section of countries. *The quarterly journal of economics*, *106*(2), 407-443.

Chen, J., & Dong, B. (2012). A nonparametric estimation on the effects of import and export trade to economic growth in China. *Procedia Engineering*, *29*, 952-956.

Croes, R., Ridderstaat, J., Bąk, M., & Zientara, P. (2020). Tourism specialization, economic growth, human development and transition economies: The case of Poland. *Tourism Management*, *82*, 104181.

Fahimi, A., Saint Akadiri, S., Seraj, M., & Akadiri, A. C. (2018). Testing the role of tourism and human capital development in economic growth. A panel causality study of micro states. *Tourism management perspectives*, *28*, 62-70.

Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. *The quarterly journal of economics*, *110*(2), 353-377.

Gui-Diby, S. L. (2014). Impact of foreign direct investments on economic growth in Africa: Evidence from three decades of panel data analyses. *Research in economics*, *68*(3), 248-256.

Herrerias, M. J., & Orts, V. (2011). Imports and growth in China. *Economic modelling*, *28*(6), 2811-2819.

Koyuncu, C., Unver, M. (2019), An Empirical Analysis of a Long-Term Relationship between Energy Imports and Economic Growth in Turkey. Tekirdağ, Turkey. XI. International Balkan and Near Eastern Social Sciences Congress Series

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, *107*(2), 407-437.

Manwa, F., Wijeweera, A., & Kortt, M. A. (2019). Trade and growth in SACU countries: A panel data analysis. *Economic Analysis and Policy*, *63*, 107-118.

Omri, A., Daly, S., Rault, C., & Chaibi, A. (2015). Financial development, environmental quality, trade and economic growth: What causes what in MENA countries. *Energy Economics*, *48*, 242-252.

*Pes*aran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

Ranis, G., Stewart, F., & Ramirez, A. (2000). Economic growth and human development. *World development*, *28*(2), 197-219.

Shahbaz, M. (2012). Does trade openness affect long run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan. *Economic Modelling*, *29*(6), 2325-2339.

Su, Y., & Liu, Z. (2016). The impact of foreign direct investment and human capital on economic growth: Evidence from Chinese cities. *China Economic Review*, *37*, 97-109.

Tsaurai, K., & Ndou, A. (2019). Infrastructure, human capital development and economic growth in transitional countries. *Comparative Economic Research*, *22*(1), 33-52.