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Are Investments and Imports Associated in the Long-term?: Evidence from Turkey

Yatırım ve İthalat Uzun Dönemde İlişkilendirilebilir Mi?: Türkiye'den Kanıt

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ÖZ

Bu çalışmanın amacı 1980-2019 periyodu için Türkiye'de ARDL tahmin tekniği kullanılarak yatırımlar ve ithalat arasındaki uzun dönem ilişkisini analiz etmektir. Türkiye'nin gelişmekte olan bir ülke olmasının yanında ekonomik büyümesinin hammadde ve ara malı ithalatına bağlı olması nedeniyle, bu çalışmanın temel hipotezi; Türkiye'de uzun dönemde yatırımlardaki bir artışın ithalatta bir artışa yol açacağının iddia edilmesidir. ARDL sınır aracılığıyla uygulanan eş-bütünleşme test sonuçları; yatırım ve ithalat serilerinin eş-bütünleşik olduğunu göstermektedir. Buna ek olarak; Türkiye'de uzun dönem katsayı tahminleri ise yatırım ve ithalat arasında istatistiksel olarak anlamlı ve pozitif bir ilişki olduğu sonucunu göstermekte olup yatırım seviyesindeki %1'lik bir artışın ithalat seviyesinde %0.1673 kadarlık bir artışa neden olduğunu göstermektedir. Aynı zamanda tanı test sonuçları incelendiğinde tahmin edilen modellerin oto korelasyon, değişen varyans, normalite ve model tanımlama açısından herhangi bir soruna sahip olmadığını sonucunu ifade etmektedir..

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ABSTRACT

In this paper we investigate the long-running association between investments and imports in Turkey using a dataset covering the 1980–2019 period, and employing the ARDL estimation technique. As a developing country, Turkey's economic growth relies on the import of raw materials and intermediate goods, and so the main hypothesis of this study claims that increases in investments lead to increases in imports in the long term in Turkey. The results of co-integration ARDL bounds tests show the series of imports and investments to be co-integrated, while long-term coefficient estimations reveal a positive and statistically significant relationship between import and investment series, and that a 1% increase in investments leads to a 0.1673% increase in imports in the long term in Turkey. Furthermore, diagnostic tests reveal the estimated model to have problems in terms of autocorrelation, heteroscedasticity, normality and model specification.

1. Introduction

There have been several studies reporting that trade openness has a positive impact on firm survival in the export market due to the increase in productivity. However, time planning relating to exports is very important, as different time effects have different outcomes. For example, at the time of a company's first entry into the exporting market, they may face greater hazards than non-exporters associated with the increasing costs. Over time, however, as their export volume increases, the hazards they face will be lower than those of non-exporters firms (Dzhumashev et al., 2016: 2). Liu and Lu (2015) argued in their study that the investments made by exporting firms may be more productive than those of non-

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exporting firms, and their results reveal that the investments of exporting firms may contribute to the probability of exporting through firm productivity, in that exporting firms tend to operate in more competitive industries. Rho and Rodrigue (2016), on the other hand, analyzed the link between exports and investment in terms of physical firm-level capital, and found that their results supported the effectiveness of investments in physical capital on exports. In the mechanism they identified, new investments were found to foster faster growth among young exporters, who hence survive longer in the export markets. It is thus expected that investments will lead to an increase in export activities in the exporting country. The impact of investments on exports has been addressed in several empirical papers (Tekin, 2012; Boly et al., 2014). However, there is a wide empirical challenge to explore the relationship between foreign direct investment and export (Zhang and Felmingham, 2001; Cavallari, 2010; Anwar and Sun, 2018).

Investments may contribute considerably to a country's export figures, and may increase the import dependency of economies, which is known as the import dependency of production. Thus, investments can help enhance imports through the production effect, in that economic growth requires the wide use of imported inputs in domestic economic activities for production, especially in developing countries with restricted capital. For example, in the Turkish economy, a large proportion of the total imports is taken up by intermediate goods that are used in the manufacturing process.

On the issue of import dependency, one important contribution highlighted by Erduman et al. (2020) is the causes of increased import of intermediate goods for Turkey's industrial sector. First explanation is correlated that Turkey has experienced a strong globalization process and has faced competition in attracting FDI over the past two decades. In this process, a significant proportion of FDI is attracted. Under these circumstances, the entry of foreign-owned firms into the Turkish domestic market has made communication with global suppliers easier as a result of the increasing trade ties, thus increasing the import of intermediate goods for the domestic industrial sector. The second potential explanation relates to the shortage of inputs for production in Turkey, as a major reason for the import dependency for intermediate goods, as Turkey is unable to domestically produce the necessary inputs for production. There have been several papers providing compatible evidence for import dependency in Turkish economy (Senesen and Senesen, 2001; Senesen and Senesen, 2003; Sözen, 2009; Mıhcı and Bolatoğlu, 2018).

This paper investigates the long-term association between investments and import levels, making use of the widest and latest annual data available in Turkey, and using the ARDL estimation technique. To this end, this paper has concentrated the role of gross fixed capital formation to the total imports. In this regard, investments are related to exports and energy consumption, as two determinants of economic growth that rely on the import of raw materials and intermediate goods. Thus, the main hypothesis of the study claims that increases in investments lead to increases in imports in the long term in Turkey, as it is expected that the probable channel through which an increase in investment causes an increase in import are the import goods demanded for the determinants of economic growth.

In Çulha et al.'s (2019) examination of the import demand function for Turkey, it was indicated that a 1 percent increase in Turkey's investment expenditures increased total imports by 0.33 percent. This positive effect is statistically significant. With the exception of this paper, to the best of our knowledge, ours is the first paper to identify the direct effect of investments on total imports, based on macro-data from Turkey from 1980–2019. In the present study, the long-term coefficient estimations reveal there to be a positive and statistically significant relationship between imports and investment series, and that a 1% increase in investments induces a 0.1673% increase in import levels in the long term in Turkey.

The study is organized as follows. In the following section, we introduce a literature review. In Section 3, the data and methodological framework used in the paper are presented. Section 4 reports on empirical findings of modelling and analyses, and Section 5 concludes the study.

2. Literature Review

According to the neo-classical growth approach, capital formation and investment are considered theoretically to be important sources of economic growth. Many papers in economic growth literature, however, have been guided with an opinion to understanding how investments relates to economic growth (Yu, 1998; Jun, 2003; Qin et al., 2006).

Solarin and Shahbaz (2015) explored the impact of capital formation on economic growth in Malaysia using ARDL bound testing method for the 1971–2012 period, and found that capital formation has significant positive impact on economic growth. Anwer and Sampath (1999) used the Granger causality test for the 1960–1992 period in their investigation of the causal relationship between GDP and investment in 90 economies, revealing a causality in the short-run for 15 economies and in the long-run for 23 economies. They further identified the existence of bi-directional causality in 10 countries, and unidirectional causality from GDP to investment in 18 countries, and from investment to GDP for 10 countries. The study also revealed the coefficient of causality from GDP to investment for 11, from investment to GDP for 6 is positive. However, the results for bi-directional causality between the variables were also positive. Hao et al. (2018) carried out a causality study of the association between rural investment and economic growth in China in the 1995–2010 period. For forecasting the short- and long-term causal relationship, they used the vector error correction model (VECM) and fully modified ordinary least squares (FMOLS). In their findings, a bidirectional causal

association in the long-term was found empirically between rural investment and economic growth. The paper also found that rural investment increased the economic growth and GDP variables in long term. In a study focusing on how financial integration boosts economic growth through the standard neo-classical growth model, Schularick and Steger (2010) reported that investment could be an important channel for economic growth. The investment channel suggests that increasing the domestic investments from net inflows of international financial capital enhance economic growth in the open economy approach of the neo-classical growth model. In their study, it was empirically explored that there is the presence of a positive relationship between investment and economic growth, and financial integration was observed to have a positive effect on investment levels. De Long and Summers (1991) investigated the driving power behind economic growth through an analysis of the association between equipment investments and GDP growth for the 1960–1985 period. In their empirically interpretation of the results, they found that the greater the equipment investment, the faster the economic growth, although this relationship was found to be causal.

In addition to the papers discussed above, there has been growing interest in literature in the impact of different forms of investment on economic growth, and these impacts have been classified in empirical literature as public or private, foreign direct, and fixed capital investments.

Firstly, the impact of public investments (capital) on economic growth depends on how increase in public investments is financed. For example, if the source of this financing is higher taxes, the increase in public investments reduces economic growth. On the other hand, if the increase in productivity through public investments is higher than the decrease in income through higher taxes, economic growth will be enhanced by public investments (Romp and De Haan, 2005: 44). According to economy theory, public investments are positively linked with economic growth, with the relative magnitude being determined by the level of the crowding out and the specific nature of the investment. In this regard, the main aim of governments is to make public investments that have greater social contributions than private contributions, providing positive externalities. Furthermore, public investments raise both private investments and the degree of productivity, and are referred to as productive public expenditures (Masten and Gnip, 2019: 1182). In literature, the contribution of public investments to labor productivity has been addressed in many studies (Aschauer, 1989; Ramirez, 2002). For example, Ramirez (1998), investigating the link between public investments and the growth of labor productivity in Chile in the 1960–1993 period. It was concluded from the results that increasing public investments has a statistically significant and positive effect on labor productivity. In addition to labor productivity, literature contains empirical studies examining whether public investments contribute distinctly to economic growth (Cullison, 1993; Lachler and Aschauer, 1998; Ghani and Din, 2006). On the other hand, Bayraktar (2019) examined the effectiveness of public investment on economic growth in sub-Saharan Africa for the 1980–2014 period, and found that public investments can reduce economic growth significantly in the lower per-capita income level from a threshold if its volatility is high and its effectiveness is weak. In addition, Ramirez and Nazmi (2003) revealed that both public and private investments is positively and significantly related to economic growth in nine Latin American countries in the 1983–1993 period. In contrast, Phetsavong and Ichihashi (2012), focusing on the impacts of public investment and private domestic investment on economic growth using panel data for 15 developing economies in Asia in the 1984–2009 period, concluded that private domestic investments made important contributions to economic growth, while public investments led to a reduction in the positive impact of the private domestic investments on economic growth.

Secondly, although many papers in economic growth literature have paid considerable attention to the impact of FDI on economic growth, it is widely accepted that the relationship between variables is ambiguous. The different effects of the openness level of a country play an important role in this variety of findings. Earlier papers generally report the effect of FDI on economic growth to be positive, but that FDI may reduce economic growth due to the crowding-out effect on domestic investment. For instance, Adams (2009) reported economic growth to be driven by FDI when using an OLS estimation approach in a study of Sub-Saharan Africa over the period 1990–2003. To describe the negative effect of FDI on economic growth, Alfaro (2003) found that FDI played a significant role in diminishing the level of economic growth in the 1981–1999 period. Using a panel VAR method and Impulse Response Functions in an analysis of the annual data of 65 economies from 1980 to 2010, Abbes et al. (2015) attempted to examine the presence of a Granger causality running from FDI to economic growth, but actually reported a unidirectional causality relationship from FDI to economic growth.

Thirdly, there have been empirical studies of the determinants of economic growth that draw upon the larger body of literature to investigate the impact of fixed capital investments, and many such papers have made major contributions to literature on the association between fixed investment and economic growth, especially in less developed countries (Blomström et al., 1993; Tvaronavičius and Tvaronavičiene, 2008). Much of the existing literature in this area has focused the impact of fixed capital investment on economic growth, and have generally reported that fixed capital investments boost economic growth (Wen, 2001; Madsen, 2002). On the other hand, there have been other studies reporting a robust and negative relationship between fixed capital investment and economic growth. For example, Podrecca and Carmeci (2001) re-examined the causal relationship between fixed investment and economic growth, and found that, contrary to the existing findings in literature, identified a bidirectional causal relation among the variables

through the application of Granger causality tests, suggesting strongly that the Granger causality from fixed investment rates to economic growth is negative. This finding comes as no surprise within the Solow growth models of exogenous savings, but is inconsistent with the "capital fundamentalist" approach in which long-term economic growth depends on fixed capital investments.

In addition to the many papers focusing on the impacts of different kinds of investments on economic growth, there are only limited papers investigating the effects of economic growth on imports, while there are a number of papers in the related literature analyzing the effect of imports on economic growth (Marwah and Tavakoli, 2004; Dulleck and Foster, 2008; Chen and Dong, 2012). When looking at the effect of economic growth on imports, there is a single theoretical explanation for this effect that suggests that GDP growth creates urban classes in which the wealth transfers brought by public expenditures support import growth (Ramos, 2001: 620). Another explanation for this relationship is the likely industrial effect of economic growth on import growth. Liberal policy reforms, as promoters of industrial growth, can lead to higher openness levels in the raw material and capital goods markets, which enhances industrial growth and thus promotes import growth and export-led growth (Sharma and Paramati, 2021: 141). An analysis of the studies in this body of literature reveals significant evidence of the existence of a causality relationship between economic growth and imports. While focusing on causality, the empirical results of Ghosh (2009) indicated the existence of a one-way long-term causality from economic growth to crude oil import. Kırca et al., (2020) could identify no causal link between oil-gas price and economic growth. In addition, in Cetintas and Barisik's (2009) investigation of the relationship between exports, imports and economic growth, when subjected to a panel Granger causality test based on the error correction model (ECM), quarterly data from 1995–2006 for 13 transition countries revealed a bidirectional causal association between imports and economic growth. Awokuse (2007) focused on the causality of direction between trade and economic growth for the three transition economies of Bulgaria, the Czech Republic and Poland within an integrated framework, using Granger causality tests based on the ECMs, and in the case of Bulgaria, a Granger causality was found from GDP to import. In Uğur's (2008) study of the Turkish economy within the 1994–2005 period, the causal link between GDP and investment goods imports and raw material imports were examined, and the empirical results confirmed a bidirectional causality between the variables, indicating that changes in economic growth would affect the import in the investment good and raw materials.

3. Data and Methodological Framework

In this paper we explore the long-term nexus of investments-imports in Turkey based on a yearly dataset from 1980 to 2019, employing the ARDL estimation technique. Given the fact that Turkey is a developing country, and that its economic growth relies on the import of raw materials and intermediate goods, we put forward the hypothesis that increases in investments augment imports in the long-term in Turkey. The gross fixed capital formation (current US$) gathered from the WDI is utilized as a proxy for investment levels (INVEST) in Turkey. The imports of goods and services (% of GDP) (IMPORT) collected from the WDI are used as an indicator of import levels in Turkey. The logarithmic forms of all variables are employed in the analyses.

We began by conducting an ARDL boundary test to identify any co-integrating relationships between investments and imports due to the well-known comparative advantage it offers to conventional co-integration tests. Hence, we estimated the following ARDL model:

$$\Delta IMPORT_t = \beta_0 + \gamma_0 IMPORT_{t-1} + \gamma_1 INVEST_{t-1} + \sum_{i=1}^{p} \delta_i \Delta IMPORT_{t-i} + \sum_{i=0}^{q} \phi_i \Delta INVEST_{t-i} + \varepsilon_t \quad \ldots\ldots(1)$$

In Equation 1, γ_0 and γ_1 represent long-term coefficients; δ_i and ϕ_i stand for short-term coefficients. In addition, other symbols in the equation can be stated in three styles: first degree difference operator is showed by Δ; constant term of the models is symbolized by β_0, and white noise error term is implied by ε_t.

In ARDL bound test, the null hypothesis of $H_0 : \gamma_0 = \gamma_1 = 0$ (i.e., there exists no co-integrating relation between investments and imports) is tested against to the alternative hypothesis of $H_1 : \gamma_0 \neq \gamma_1 \neq 0$ (i.e., there exists co-integrating relation between investments and imports). If the F-statistic value of ARDL boundary test exceeds the upper limit at a particular significance level, then H_1 hypothesis is valid. Otherwise, if the F-statistic value is below the lower limit at a particular significance level, then H_0 hypothesis is valid. Moreover, if F-statistic value is between the lower and upper limits then we are in indecisive zone and thus we cannot make decision.

Secondly, to gather both short and long-run coefficients, we implemented the following error correction model:

$$IMPORT_t = \beta_0 + \eta ECM_{t-1} + \sum_{i=1}^{p} \delta_i \Delta IMPORT_{t-i} + \sum_{i=0}^{q} \phi_i \Delta INVEST_{t-i} + \varepsilon_t \ldots(2)$$

In Equation 2, δ_i and ϕ_i stand for the dynamic short-term coefficients which brings the model to the

adaptation in the long-run; error correction term is implied by ECM; η is the speed of adjustment at which the series return back to long-run path in response to a shock happened in short run. Statistically significant and negative results should be given by the speed of adjustment term η.

4. Empirical Analysis Results

To examine the stationarity of series, Augmented Dickey-Fuller (ADF) stationary analysis is conducted. The null hypothesis of the ADF test asserts the non-stationarity of series whereas the alternative hypothesis asserts stationary of series. Table 1 displays the findings of ADF unit root tests for the cases of "none", "constant", and "Constant&Trend".

ADF unit root test results which gives the stationary features of variables, as seen in Table 1, indicate that both variables are stationary at first differences while they are not stationary at levels. In other words both IMPORT and INVEST variables are integrated order one (i.e., I(1)). Since ARDL boundary test allows any level of integration lower than I(2) and our variables are I(1), ARDL boundary test can be implemented for co-integration analysis between IMPORT and INVEST variables.

We employed Akaike criterion to identify the optimum leg lengths for the model in Equation 1. Figure 1 depicts the results for twenty different ARDL models and implies that the best model in terms of optimal lag length is ARDL (2,4) for the model in Equation 1.

Table 1: Augmented Dickey Fuller Unit Root Test

Variable	Model	Test Statistic
IMPORT	None	*1.099037(0.9265)*
	Constant	*-2.383642(0.1528)*
	Constant& Trend	*-4.693844(0.0029)*
Δ IMPORT	None	*-5.701493(0.0000)*
	Constant	*-5.705184(0.0000)*
	Constant& Trend	*-5.666952(0.0002)*
INVEST	None	*2.077845(0.9897)*
	Constant	*-1.088357(0.7108)*
	Constant& Trend	*-1.842724(0.6645)*
Δ INVEST	None	*-5.452997(0.0000)*
	Constant	*-6.026304(0.0000)*
	Constant& Trend	*-6.038130(0.0001)*

Note: The values in parenthesis dedicate the p-values.

Figure 1: Optimal Lag Length Selection for the Model in Equation 1

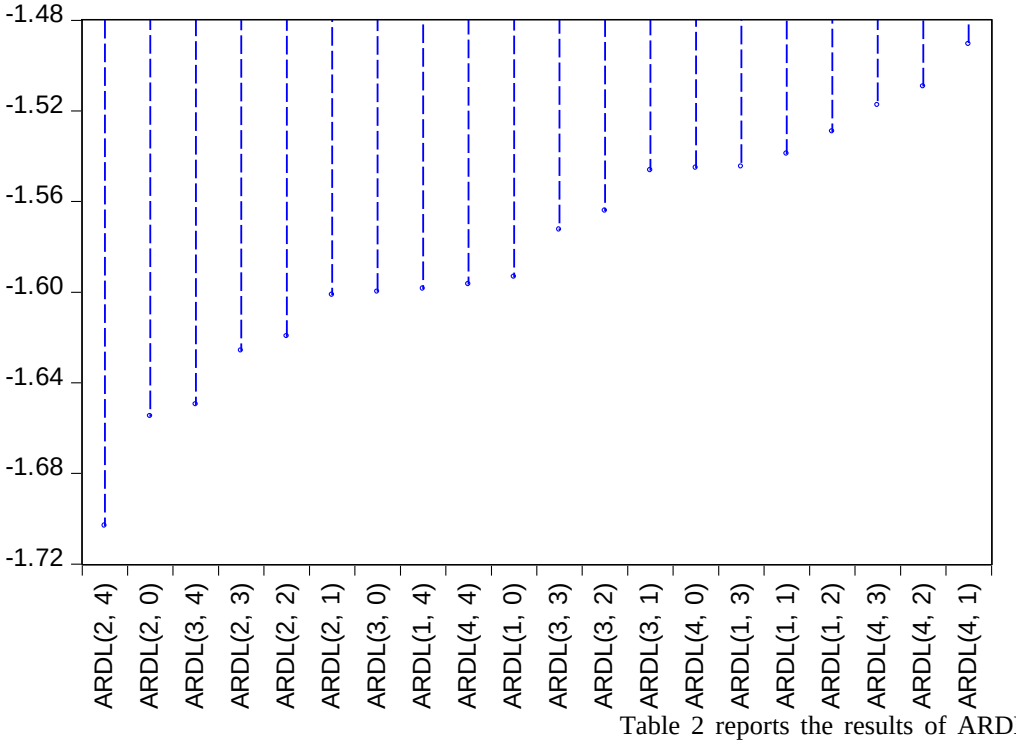


Table 2 reports the results of ARDL bound test. Since F-statistic value of 8.071330 in Table 2 is above all

upper bound critical values we can reach a decision that there is a long-term association between IMPORT and INVEST. In other words, IMPORT and INVEST variables move together in the long-term.

Table 2: ARDL Bounds Test

F-statistic *8.071330*	**Critical Values**	
Significance	$I(0)$ ***Lower Bound***	$I(1)$ ***Upper Bound***
10%	3.02	3.51
5%	3.62	4.16
2.5%	4.18	4.79
1%	4.94	5.58

We tabulated the estimation results of long-run coefficients in Table 3 and the findings reveal that INVEST variable is positively linked with IMPORT and it is statistically significant at 1% level. This finding is consistent with the co-integration test results obtained in Table 2. According to the estimation results, an increase in investment level by 1% induces to a rise in import level by 0.1673%. Therefore, it can be said that increases in investment level require importing more raw materials and intermediate good in the long-term in Turkish economy.

Table 3: Long-run Coefficients of ARDL (2,4) Model

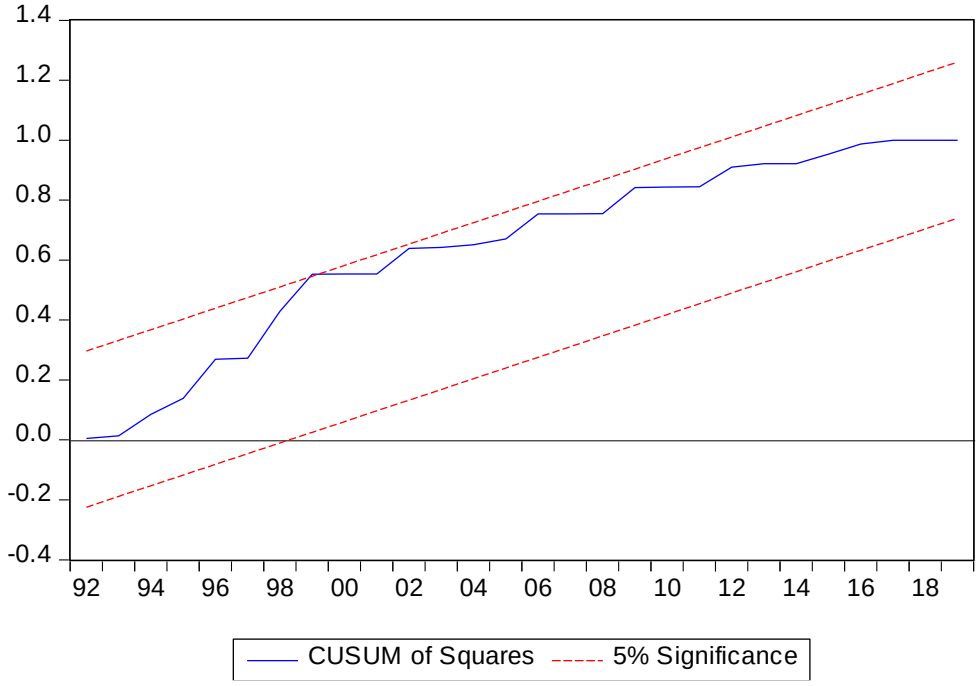
Variable	*Coefficient*	*t-statistic*	*Prob.*
INVEST	0.167394	8.330771	0.0000
Constant	-1.010366	-2.007437	0.0544

As indicated by Table 4, the coefficient of IMPORT variable is statistically significant and positive in short-run. In addition, it can be seen that the first short-run coefficient of INVEST is positive and statistically significant while the last two short-run coefficients of INVEST have significant negative impact. Moreover, as it was expected, the ECM coefficient is negative and has significance at 1% level. As can be deducted from the diagnostic test results in Table 4 and CUSUM-square stability test in Figure 2, ARDL (2,4) model does not suffer from any problem including autocorrelation, heteroscedasticity, normality, and model specification.

Table 4: Short-run Coefficients of ARDL (2,4) Model

	Coefficient	*t-Statistic*	*Prob.*
$\Delta IMPORT_{t-1}$	0.359686	2.443077	0.0211
$\Delta INVEST_{t}$	0.139089	2.070821	0.0477
$\Delta INVEST_{t-1}$	-0.105842	-1.540094	0.1348
$\Delta INVEST_{t-2}$	-0.123771	-1.776030	0.0866
$\Delta INVEST_{t-3}$	-0.153978	-2.124965	0.0426
ECM_{t-1}	-0.777729	-5.093482	0.0000
ECM = IMPORT - (0.1674*INVEST –1.0104)			
Diagnostic Tests			
Tests			Test Value (Prob.)
Breusch-Godfrey Serial Correlation LM Test			*0.410417 (0.6676)*
Glejser Heteroskedasticity Test			*1.217651 (0.3261)*
Ramsey RESET Test			*0.526504 (0.4743)*
Jarque-Bera Test			*0.019610 (0.990243)*

Figure 2: CUSUM-square stability test



5. Conclusion

This study investigates the long-run association between investments and imports for Turkey over the period 1980-2019 by employing ARDL estimation technique. Since Turkey is a developing country and Turkey's economic growth depends on imports of raw materials and intermediate goods, our hypothesis asserts that raises in investments produces raises in imports in the long-term in Turkey.

Given the stationarity of IMPORT and INVEST variables at first differences based on ADF unit root test, we conducted co-integration test via ARDL boundary test and the test results disclose that IMPORT and INVEST variables are co-integrated. Therefore, IMPORT and INVEST variables have a co-movement in the long-term.

The long-run coefficient estimations point out that INVEST is positively and significantly linked with IMPORT and an increase in investment level by 1% cause to an increase in import level by 0.1673% in Turkey. Hence, we can state that increases in investment level require importing more raw materials and intermediate good in the long-term in Turkey. In addition to that the estimated model doesn't indicate any trouble in terms of autocorrelation, heteroscedasticity, normality, and model specification.

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