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RESEARCH ARTICLE

Development of Import-Based Exports in Turkey: The ARDL Approach

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Abstract

Turkey adopted an export-dependent growth strategy after the 1980 liberalization. In later years, with the impact of this strategy, Turkey's export structure and performance became a subject of investigation. Thus, when the export structure is evaluated, dependence of the export oriented industries on capital goods, intermediate goods, and energy is remarkable. Therefore, in this study, the development of import-based exports in Turkey between 1996:1 and 2018:4 was tested by the ARDL bound test method. As a result of the analyses, the effect of intermediate goods, capital goods, and energy imports, which have a higher amount of imports than other imported goods in the short and long term in Turkey, is noteworthy. Hence, the study is important and different from other studies in that it verifies the Turkey's industrial structure tending towards the assembly industry since its recent export structure has shown an import-oriented development and the share of imports of intermediate goods in its exports is high.

Keywords

Export, Import, Energy Import, ARDL Bound Test

Introduction

Since the start of the globalization trend in the world, countries have become closer to each other in terms of having a similar economy. There have been significant changes in the structure of international trade, and the importance and volume of foreign trade have gradually increased. With the increase in foreign trade, the flow of goods and services between countries accelerated and technology began to be transferred from developed to underdeveloped countries. In addition, thanks to international trade, countries have taken advantage of economies of scale, externalities, new product development processes, division of labor, and specialization processes, and they have increased their export potential by achieving effectiveness and efficiency in production as a result of the effective use of the factors of production. Increased export potential has led to specialization in exported goods (Uçak and Arisoy, 2011: 639).

With the globalization trend, developing countries have also adopted the open economy model and tried to adapt their trade channels and economic structures to this model. As a mat-

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ter of fact, underdeveloped countries that want to increase their export potential in accordance with the open economy model, while trying to increase their production amount, product variety, and competitiveness, have also become dependent on intermediate and capital goods. Therefore, with the removal of the obstacles to international trade, their dependence on imported goods has increased because underdeveloped countries that want to complete their development and gain profit from international competition import these goods from developed countries that specialize in the production of many goods and have a say in their export. Thus, the use of significant amounts of imported inputs in the production of export products further increases the dependency level of countries (Ersungur et al., 2011: 1-3).

Another factor affecting the foreign dependency of countries is the changes in exchange rates. Decreases in the exchange rate as a result of the overvaluation of the domestic currency, increase the use of imported goods in the country and the dependence on imports (İnançlı and Konak, 2011: 344-347). Therefore, in general, when the reasons that increase the foreign dependency of developed or underdeveloped countries are evaluated, the following factors come to the fore: changes in the exchange rate, unstable economy, overvalued currency, high costs, high costs of imported inputs, and high share of use of imported goods within the country.

When the foreign trade structure of Turkey's economy is evaluated based on the statements made, it can be said that liberal economic policies were adopted between 1950 and 1960 and import substitution industrial policies between 1960 and 1980 (Gerni et al., 2008: 2). With the effect of the oil crisis in the 1970s, Turkey experienced high inflation and currency problems, and as a result of these problems, it transformed its economy in 1980 and introduced an export-oriented industrialization strategy. With this strategy, Turkey started some efforts to increase its exports and adopted an export promotion policy. With the effect of liberalization in foreign trade, the rate of exports in the country's economy gradually increased. As a result of the Customs Union Agreement made with the European Union in 1994 and the common tariff in trade with member countries, which started to be implemented in 2005, Turkey's foreign trade potential increased more than in previous periods. However, its foreign trade deficits and dependency on imports did not decrease. Also in Turkey, with increasing external funding opportunities due to increased foreign capital inflows, an increasing amount of foreign currency, and the increase in the value of the Turkish lira, an increase was observed in domestic demand and imports. Therefore, the number of imported inputs used in production increased with increasing imports, and this negatively affected the production of intermediate goods in the domestic market. As a result of this, from the 2000's to 2010's, imports of intermediate goods, including energy imports, almost doubled. As a matter of fact, it was observed that imports increased faster than exports. During this period, the ratio of exports to imports was around 65%. This situation is explained by the fact that the manufacturing industry of the country was increasingly dependent on imported inputs. While import dependency in the economy gradually increased in Turkey, the ninth and tenth development

plans were launched in 2007 and 2014, respectively, to increase the export potential, reduce the import dependency of export-oriented industries, increase the total factor productivity in exporting sectors, and enhance the international competitiveness (Çelik, 2016: 110-112). However, despite the incentive and aid policies implemented, foreign trade deficits have become a chronic problem. Therefore, the implemented policies continue to be discussed today. The reason for this debate is that exports are dependent on imports, and this dependency is gradually increasing (Yıldırım and Kesikoğlu, 2012: 137). In addition, due to the lack of qualitative depth in goods and services subject to import and export, despite the increase in foreign trade volume, the expected structural transformation could not be fully realized. In other words, while goods produced for export have a low added value, the imported goods are mostly capital- and technology-intensive goods. Therefore, importing intermediate and capital goods, which are subject to export and real sector inputs, increases foreign trade deficits and dependence on imports (Karakaş, 2017: 261-263). For this reason, based on the explanations made especially recently, identifying Turkey's level of import dependency of exports is important. The fact that Turkey has an economic growth based on exports makes it necessary to investigate the structure and components of its exports.

Literature

In Turkey, with the realized stabilization measures and liberalization policies in 1980, significant changes have been achieved in the foreign trade. As a result of this situation, Turkey tried to increase its number of exports with incentive policies. However, the increase in the number of exports has also affected the use of imported goods in the economy. Recently, the number of studies on the dependence of exports on imports has increased in the literature. But the studies differ from each other in terms of the results obtained. Esfahani (1991) analyzed the relationships between exports, intermediate imports, and economic growth in developing countries and found a positive relationship between exports and economic growth. However, it was reported that this relationship deteriorated when the intermediate imports were included in the model. As a result, a meaningful relationship was reported to be established between imports and economic growth. Lee (1995) tested whether there was a significant relationship between imports of capital goods and economic growth in developing countries. Adams (2000) examined the relationship between energy imports and economic growth in Thailand and reached the conclusion that energy imports increased rapidly during the economic growth process. Arize (2002) examined the relationship between imports and exports in 50 countries and concluded that 57% of low-income countries, 58% of developing countries, and 75% of developed countries were dependent on imports. It was also reported that as the development levels of the countries increased, the dependence of exports on imports increased. Pavlos (2004) examined the relationship between intermediate imports, capital goods imports, and economic growth in Ethiopia and reported that there was a positive cor-

relation between imports of intermediate goods and economic growth, and a negative relationship between imports of capital goods and economic growth. Bojnec and Popler (2011) tested the relationship between economic efficiency and energy consumption in their studies. As a result of the study, it was found that technology-intensive production in exports reduced energy consumption in the economy. Bojnec and Ferto (2014) examined the relationship between foreign direct investments and exports in OECD countries and concluded that there was a substitution effect between foreign direct investments and exports. According to this, it was asserted that, instead of exporting the goods of OECD countries that are members of the European Union, they followed a strategy to substitute exports by investing directly in that country. Udemba et al. (2020) tested the relationship between foreign direct investments, tourism revenues, energy consumption, and economic growth in China and concluded that there was a one-way relationship between economic growth and energy consumption. In the studies carried out outside Turkey, economic growth was often used in the analysis for testing the relationship between imports and exports.

There are also some studies in Turkey that mostly test the export-based growth hypothesis. For example, in the studies by Özcan and Özçelebi (2013), Saraç (2013), and Uçan and Koçalı (2014), the validity of export-led growth hypothesis in Turkey was tested and found to be valid. Unlike the export-led growth hypothesis, in the studies by Çeştepe (2013), Korkmaz and Aydın (2015), it was claimed that an import-driven growth hypothesis was valid. In addition, it is noteworthy that there are more specific studies where Turkey's exports based on imports were analyzed. Barışık and Demircioğlu (2006) studied the relationship between exchange rate, exports, and imports in Turkey. In their studies, they concluded that in the post-convertibility period, the effects of import and exchange rates on exports gradually decreased. In their study, Ersungur and Kızıltan (2010) used the input-output method for the sector in Turkey and measured the dependence of the manufacturing industry on imports. Accordingly, they concluded that, both in the import substitution period and liberalization period, Turkey's manufacturing industry was dependent on imports. Ersungur et al. (2011) tested the degree of dependence on imports in Turkey using the input-output analysis and found that the increases in exports increased the capacity utilization by increasing the imports of intermediate goods, rather than creating new investments, and this negatively affected the external deficit. They also found that the capacity utilization and energy dependency of the manufacturing industry were high in Turkey. In their study, İnançlı and Konak (2011) used the input-output tables prepared by the Turkish Statistical Institute (TurkStat) to examine the input dependence of the automobile industry and reported that the dependency level of exports on imports increased in the sectors linked to the automobile industry. Yildirim and Kesikoglu (2012) tested the causal relationship between import, export, and real exchange rate in Turkey. As a result of the study, a two-way causality relationship was found between total exports and total imports, total exports and intermediate goods imports, total exports and capital goods imports, total imports

and consumption goods exports, and capital goods imports and consumption goods exports. No causality relationship was found between exchange rate, import, and export. Magazzino (2016) tested the relationship between carbon dioxide emissions, economic growth, and energy consumption in South Caucasus and Turkey and concluded that there was no relationship between energy consumption and economic growth and claimed that the neutrality hypothesis was valid. Karakas (2017) examined the export and import relations between the EU countries and Turkey. As a result of the study, it was found that the consumption goods exports (around 45% of total exports) depended on total imports and intermediate goods imports. When the studies carried out in Turkey are evaluated, it is observed that, in general, there is no consensus on export-led growth strategy. The number of studies testing the dependence of exports on imports is very small. In the studies testing this relationship, no distinction was made between short and long term. It is observed that although energy consumption has an important effect on Turkey's import dependency, it has not been included in the studies or its effect has been reported to be insignificant. It is also observed that the exchange rate has been mostly used in the studies. Therefore, this study includes short and long term analysis, unlike the studies in the literature. This study differs from others in that it uses up-to-date data; the analysis includes energy imports, which have recently been included as an input in production function definitions, in which Turkey's dependency is high, and which have a positive effect on exports; and it explains import dependency more clearly.

Econometric Methodology

Various econometric methods are used to test the long and short term relationships between the variables subject to economic analysis. Among these, the delayed ARDL (Autoregressive Distributed Lag), which was recently introduced by Pesaran and Shin (1998), differs from other analysis methods. While classical cointegration tests require the variables to be stationary at the same level, according to the ARDL model, it is not important whether the variables are stationary at the level [I (0)] or [I (1)] (Sharifi-Renani, 2008: 4). However, the ARDL model cannot be applied if the variables are stationary at the level [I (0)] or difference [I (1)] and not stationary at the 2nd difference [I (2)] (Çağlayan, 2006: 427). This feature differentiates the ARDL model from other cointegration tests. The ARDL model is based on the least squares method and its application to small samples provides important advantages. Another advantage of the model is that it provides the opportunity to separate short and long term analysis. The ARDL model is shown as follows.

$$\ln Y_t = \beta_0 + \sum_{i=1}^k \beta_{1i} \Delta \ln Y_{t-i} + \sum_{i=0}^k \beta_{2i} \Delta \ln X_{t-i} + \sum_{i=0}^k \beta_{3i} \Delta \ln X_{2t-i} + \sum_{i=0}^k \beta_{4i} \Delta \ln X_{3t-i} + \varepsilon_t$$

The values of k in the model indicate the length of the delay, and Δ the difference of the variables. In order to determine the appropriate delay length in the defined equations, the most appropriate delay length is obtained by using information criteria such as Akaike and Schwarz. After determining the lag length, the following hypothesis tests are used to test the cointegration relationship between the variables.

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0 \rightarrow \text{There is no cointegration.}$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0 \rightarrow \text{There is cointegration.}$$

The hypothesis tests defined in the form are tested using the F test. (Narayan, 2005:1981). If the F test results are above the critical value, there is a cointegration relationship between the variables, that is, the H_0 hypothesis is rejected. The dynamic unconstrained error correction model can be obtained with the help of simple linear conversion from the ARDL model. Thanks to the UECM (Unrestricted Error Correction Term) used in the model, the ARDL model gives better statistical results than the Engle-Granger test (Narayan and Narayan, 2005:429). The unconstrained error correction model obtained from the ARDL model is as follows:

$$\Delta \ln Y_t = \beta_0 + \sum_{i=1}^m \ln Y_{t-i} + \sum_{i=0}^k \beta_{1i} \Delta \ln X_{t-i} + \sum_{i=0}^k \beta_{2i} \Delta \ln X_{2t-i} + \sum_{i=0}^k \beta_{3i} \Delta \ln X_{3t-i} + ECT_{t-1} + \varepsilon_t$$

In the given model, ECT_{t-1} refers to the error correction term. Accordingly, the error correction term takes a value between -1 and 0. The term error correction is important in terms of showing how much of any deviation effect occurring in the short term can be eliminated in the long term.

Data Set and Application

This study investigated the exports based on imports between 1996Q1 and 2018Q4 in Turkey. The ARDL model and Error Correction Model used in the study are given in the equations (1) and (2), respectively.

$$\ln M\dot{I}H_t = \beta_0 + \sum_{i=1}^k \beta_{1i} \Delta \ln M\dot{I}H_{t-i} + \sum_{i=0}^k \beta_{2i} \Delta \ln SER\dot{I}TH_{t-i} + \sum_{i=0}^k \beta_{3i} \Delta \ln ARA\dot{I}TH_{2t-i} + \sum_{i=0}^k \beta_{4i} \Delta \ln EN\dot{I}TH_{3t-i} + \sum_{i=0}^k \beta_{5i} \Delta \ln DK_{4t-i} + \varepsilon_t \quad (1)$$

$$\ln M\dot{I}H_t = \beta_0 + \sum_{i=1}^k \beta_{1i} \Delta \ln M\dot{I}H_{t-i} + \sum_{i=0}^k \beta_{2i} \Delta \ln SER\dot{I}TH_{t-i} + \sum_{i=0}^k \beta_{3i} \Delta \ln ARA\dot{I}TH_{2t-i} + \sum_{i=0}^k \beta_{4i} \Delta \ln EN\dot{I}TH_{3t-i} + \sum_{i=0}^k \beta_{5i} \Delta \ln DK_{4t-i} + ECT_{t-1} + \varepsilon_t \quad (2)$$

The definitions of the variables used in the model in the equation (1) are given in Table 1.

Table 1
Definitions of Variable

Abbreviations	Description	Source
LnMÍH	Exports of goods (Thousand USD dollars)	CBRT
LnSERÍTH	Capital goods import(Thousand USD dollars)	CBRT
LnARAÍTH	Import of intermediate goods (Thousand USD dollars)	CBRT
LnENÍTH	Net energy import (Thousand USD dollars)	CBRT
DK	Exchange rate (USD)	CBRT

The data used in the study were obtained from the CBRT EVDS database. The dependent and independent variables used in the model were included in the model by taking the logarithm. Descriptive statistics calculated for the variables in the model are given in Table 2.

Table 2
Exploratory data analyses

Variables	Mean	Median	SD	Skewness	Kurtosis
$\Delta \ln MÍH$	9.918656	10.18106	0.677553	-0.413532	1.516506
$\Delta \ln SERÍTH$	7.395768	7.586021	0.584379	-0.474415	1.846834
$\Delta \ln ARAÍTH$	8.829108	9.083403	0.721379	-0.389707	1.531917
$\Delta \ln ENÍTH$	8.430158	8.695251	0.833199	-0.405605	1.785858
ΔDK	1.623810	1.476277	1.111874	1.231367	5.194718

As a result of the analysis, unit root tests were applied to show the stationarity levels of the series in order to prevent the spurious regression problem. Standard unit root tests such as Augmented Dickey Fuller, Dickey-Fuller GLS (ERS), Philips Perron, and Kwiatkowski-Philips-Schmidt-Shin were used in the analysis. Accordingly, standard unit root test results are given in Table 3.

Table 3
Unit root test results

Variables	ADF		Dickey-Fuller GLS	
	Level I(0)	Difference I(1)	Level I(0)	Difference I(1)
$\Delta \ln MÍH$	-1.0663	-5.4845***	0.0962	-6.2068***
$\Delta \ln SERÍTH$	-1.2485	-4.4229***	-0.6825	-0.2059
$\Delta \ln ARAÍTH$	-1.2939	-7.9486***	0.1552	-7.8223***
$\Delta \ln ENÍTH$	-1.6747	-5.9000***	-0.7368	-5.9347***
ΔDK	-3.1971**	-----	-4.5248***	-----

Variables	PP		KPSS	
	Level I(0)	Difference I(1)	Level I(0)	Difference I(1)
$\Delta \ln MÍH$	-1.4198	-10.7447***	1.1550	0.2772***
$\Delta \ln SERÍTH$	-1.7969	-16.2129***	1.0756	0.2233***
$\Delta \ln ARAÍTH$	-1.3032	-7.8194***	1.1378	0.1472***
$\Delta \ln ENÍTH$	-1.6977	-5.6973***	1.0482	0.3547**
ΔDK	2.9044	-7.3201***	1.0554	0.5497*

***, **, * The marks represent significance at the level of 1%, 5%, and 10%, respectively.

For unit root tests in Table 3, according to the null hypothesis, variables contain unit root; and according to the alternative hypothesis, variables do not contain unit root. As a result of unit root tests, exports of goods, intermediate goods, capital goods and energy imports are stationary in difference. According to the ADF and Dickey-Fuller GLS tests, the exchange rate series is stationary in level. But according to the PP and KPSS test results, it was stationary in difference.

According to the unit root tests performed, although the stationarity degrees of the series varied in some tests, it was observed that they were stationary at the I (0) and I (1) levels, and the ARDL test, which can be used when the series are at different stationarity levels, was applied. Thus, the ARDL test results are given in Table 4.

Table 4
ARDL Bounds test results

F Statistic	15.61671***	
Significance level	Lower limit	Upper limit
1%	3.29	4.37
2.5%	2.88	3.87
5%	2.56	3.49
10%	2.20	3.09

***, **, * The marks represent significance at the level of 1%, 5%, and 10%, respectively.

As can be seen in Table 4, the obtained F statistic value (15.61671) is greater than the F critical value (4.37). According to this result, the null hypothesis (H_0 : There is no cointegration relationship between the variables) is rejected. Therefore, there is a cointegration relationship between exports and capital goods, intermediate goods, energy consumption, and exchange rate in the long and short term. However, in order for the cointegration test to be valid, the model should not have autocorrelation, heteroscedasticity, and normal distribution problems. Robustness tests for the validity of the model are included in Table 5.

Table 5
Robustness checks results

Test	F statistics	Probability
Breusch-Godfrey LM test	1.045950	0.3100
White test	0.661856	0.8208
Jarque Bera test	1.276856	0.5281
R-squared	0.507193	----

According to the results of Breusch-Godfrey, White, and Jarque Bera tests in Table 5, no problems regarding autocorrelation, heteroskedasticity and normal distribution were observed in the model. Therefore, the long and short term relationships between variables are valid. The coefficients showing the long-term relationship between variables are included in Table 6.

Table 6
ARDL Long term coefficients

Variables	Coefficients	Standard errors	T statistics
LnARAİTH	0.5147	0.1550	3.3204***
LnSERİTH	0.2306	0.0984	2.3439**
LnENİTH	0.1598	0.0796	2.0074**
DK	0.0525	0.0206	2.5412**
C	2.2516	0.2724	8.2638***

***, **, * The marks represent significance at the level of 1%, 5%, and 10%, respectively.

Coefficients showing the long-term relationship between variables are given in Table 6. According to the analysis results, the import of intermediate goods is at the significance level of 1%. Capital goods, energy imports, and exchange rate represent statistically valid results at the significance level of 5%. According to the results of long-term coefficient estimates, imports of intermediate goods and capital goods, energy imports, and changes in exchange rates affect the exports of goods. Accordingly, a 1% increase in intermediate goods imports increases the exports of goods by 0.5147. A 1% increase in capital goods imports increases the exports of goods by 0.2306. A 1% increase in energy imports increases the exports of goods by 0.1598. A 1-unit increase in the exchange rate increases the exports of goods by 0.05. The coefficients based on error correction model showing the short-term relationship between variables are included in Table 7.

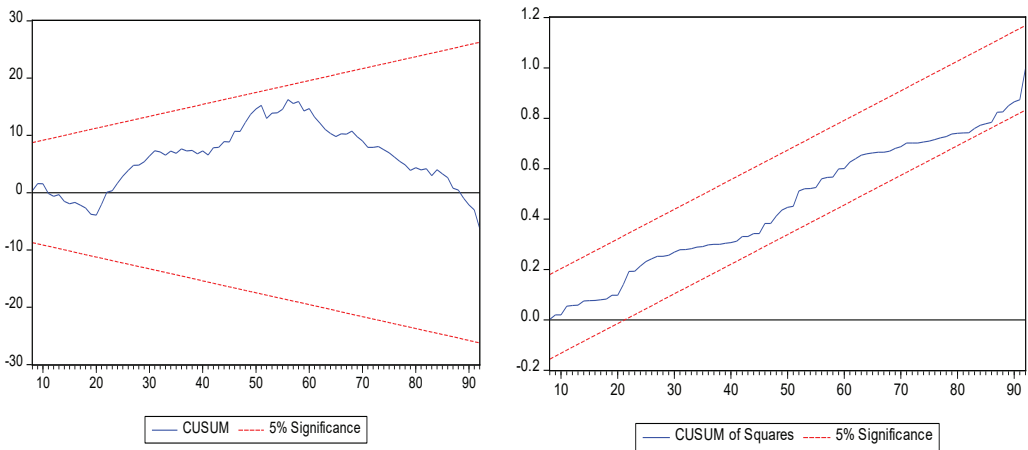
Table 7
ARDL Short term coefficients

Variables	Coefficients	Standard errors	T statistics
LMİH(-1)	-0.5003	0.0592	-8.4394***
LARAİTH	0,2575	0.0908	2.8341***
LSERİTH	0.1154	0.0465	2,4817**
LENİTH	0.0799	0.0390	2.0502**
DK	0.0262	0.0110	2.3892**
SABİT	1.1265	0.1892	5.9518***
ECT(-1)	-0.5003	0.0502	-9.9605***

***, **, * The marks represent significance at the level of 1%, 5% and 10%, respectively.

According to the short-term coefficient estimation results, imports of intermediate goods and capital goods, energy imports, and changes in exchange rates affect the exports of goods. Accordingly, a 1% increase in intermediate goods imports increases the exports of goods by 0.2575. A 1% increase in imports of capital goods increases the exports of goods by 0.1154. A 1% increase in the energy imports increases the exports of goods by 0.0799. A 1-unit increase in the exchange rate increases the exports of goods by 0.0262. Also, the error correction term indicates statistically significant results. Accordingly, 50% of the short term shocks are eliminated in the long term. The CUSUM test results obtained as a result of the ARDL test are shown in Table 8.

Table 8
CUSUM- CUSUMQ graphs



According to the CUSUM and CUSUMQ graphs, the model is observed to be stable.

Conclusion and Recommendations

In this study where the exports based on imports in Turkey were investigated using the quarterly data for 1996-2018 obtained from the database of CBRT, the long-term and short-term relationships between the imported inputs, which significantly affect the export of goods in Turkey, were tested by the ARDL method.

When the test results are evaluated, according to the long-term coefficient estimation results, the changes in the intermediate goods imports, capital goods imports, energy imports and exchange rates affect the exports of goods. Accordingly, a 1% increase in the imports of intermediate goods increases the exports of goods by 0.5147. A 1% increase in the imports of capital goods increases the goods exports by 0.2306, a 1% increase in the energy imports increases the goods exports by 0.1598, and a 1% increase in the exchange rates increases the goods exports by 0.05. A 1% increase in the imports of capital goods increases the goods exports by 0.2306, a 1% increase in the energy imports increases the goods exports by 0.1598, and a 1% increase in the exchange rates increases the goods exports by 0.05. In addition, when the short-term coefficient estimation results are evaluated, imports of intermediate goods, capital goods imports, energy imports, and changes in exchange rates affect the exports of goods. Accordingly, a 1% increase in the imports of intermediate goods increases the exports of goods by 0.2575. A 1% increase in the imports of capital goods increases the goods exports by 0.1154, a 1% increase in the energy imports increases the goods exports by 0.0799, and a 1% increase in the exchange rates increases the goods exports by 0.0262.

According to these findings, Turkey's exports of goods, intermediate goods, capital, and energy imports are affected by the changes in exchange rates in the short and long term. The reason for the higher effect of intermediate imports on exports compared to other variables used in the study may be the fact that Turkey's export sector operates mostly for the assembly industry. The short and long term coefficients obtained from the analysis show that the effect of variables on exports is more powerful in the long run. This can be interpreted as that exports consist of more capital-intensive goods than labor-intensive ones. It is noteworthy that, in the literature, the studies on the export and import in Turkey generally included the exchange rate in the analysis. However, in this study, it was observed that the effect of exchange rate on recent exports was relatively low. This can be put forward as one of the reasons for the insufficient increase in the export volumes despite the increases in exchange rates. Although the impact of energy use on economic growth is debated in the literature, considering the use of energy as input in the production of export goods and the impact of exports on economic growth, it can be inferred that energy imports indirectly contribute to economic growth.

According to this assessment, in order to close the current account deficit and the trade deficit, ensure a stable foreign trade structure, and increase its share in the international competition, Turkey should reduce its import dependency and ensure the domestic production of intermediate goods that are not produced domestically. In addition, increasing the efforts to encourage domestic capital, transfer of capital to production and exporting sectors will reduce imports of capital goods and gradually reduce the dependence on capital goods. In addition, although the effect of the exchange rate on exports is relatively low, fluctuations in trade can be prevented through a stable exchange rate policy. Thus, industries that are export-oriented but dependent on imports can have a stable production structure by avoiding cost changes and cost shocks. In order to provide cost advantages and reduce import dependency in exporting sectors, Turkey should encourage the technology-intensive production structure in industries that produce for export, and by doing so, provide competition and cost advantage in exports by reducing the amount of imported inputs and energy consumption.

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