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The Long-run Nexus Between Openness and Productivity in Turkey

Türkiye'de Dışa Açıklık ve Verimlilik Arasındaki Uzun Vadeli Bağlantı

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ÖZ

Bu çalışma, Türkiye'de dışa açıklık ve verimlilik arasındaki uzun vadeli ilişkiyi bulmayı amaçlamaktadır. Bu amaçla analizlerde ARDL yöntemi kullanılmıştır. GSYİH yüzdesi olarak ticaret, dışa, açıklığın bir göstergesi olarak kullanılır. İşgücü verimliliği, ise üretkenliğin bir göstergesi olarak kabul edilmiştir. Ampirik bulgular, dışa açıklık ve verimlilik arasındaki ilişkinin 1960 ile 2019 arasındaki verilere göre pozitif olduğunu ortaya koymaktadır. Ancak, bu uzun vadeli pozitif ilişki kısa vadede istatistiksel olarak anlamlı değildir. Modelleme ve bulguların kabul edilebilirliğinden emin olmak için analizler tanısal testler ile de desteklenmiştir..

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ABSTRACT

This study aims to find the long-run relationship between openness and productivity in Turkey. For this aim Autoregressive Distributed Lag (ARDL) method is utilized in the anlyses. Trade as percentage of GDP is used as an indicator of openness. And labor productivity is considered as an indicator of productivity. Empirical findings reveal that the association between openness and productivity is positive based on the data between 1960 and 2019. However, this long-run positive relationship is not statistically significant in the short-run. Diagnostic tests are also used to ensure that the modeling and analyses are acceptable.

1. Introduction

There are variety of studies about the impact of trade openness on the performance of the economy. These studies especially focus on the economic growth or the fluctuations in the GDP to measure the economic performance. Although there is no consensus on the sign of the association between openness and economic performance, an important amount of research (Harrison, 1996; Karras, 2003; McGrattan & Prescott, 2009; Paudel & Perera, 2009; Yeboah et al., 2012; Keho, 2017; Ajayi & Araoye, 2019) shows the positive co-movement. To what extent and through which mechanisms trade openness boosts economy is not fully discovered, however. Yet, Shahbaz (2012) emphasizes that one of the economic features that guarantee sustainable economic growth is openness in the long run.

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If openness to trade is high in an economy, resources may be allocated more efficiently. Even, the market size enlargement may provide the economy necessary tools to grow. International input markets may become the sources of raw materials and intermediate goods. Learning the techniques and new technology from abroad can increase productivity. That is, when an economy opens its doors to international trade, it may face many factors that possibly increase its economic performance. So, liberal trade policies may become beneficial to economy in many ways. However, which one is the transmission mechanism remains as one of the many questions that need to be answered in this process. For instance, Din et al. (2003) claim that productivity is only one of many channels through which trade liberalization improves economic growth. Whether openness affects developed and undeveloped economies alike, for example, is another question that needs to be answered.

Dowrick and Golley (2004) seek for a proper explanation for the differential effect of trade openness on the economy of different country groups. And they emphasize that not only the characteristics of the economy but also the world conjuncture is an important factor in the direction and content of this impact. For instance, trade openness from the 1960s to the 1970s is associated with the convergence between rich and poor economies. From 1980s onwards developed economies benefit from liberal trade policies more compared to less developed ones. According to Kim et al. (2011), while development level is improved by trade openness in rich economies, low-income countries' income is negatively affected by openness. Madsen 's (2009) work on industrialized economies from 1870's, on the other hand, shows no relationship between openness and economic growth. But when foreign knowledge is also included as an interacting factor with openness into analyses, total factor productivity is positively affected by open trade policies. Miller and Upadhyay (2000) study the effects of openness on total factor productivity based on a pooled sample composed of developing and developed economies. They detect a positive relationship between openness and productivity. But the positive impact of openness on productivity is experienced more in countries which have higher openness initially. Compared to average negative total factor productivity growth of the 1970's, India experienced high productivity in 1980's with the implementation of external economic reforms towards trade openness (Saha, 2012).

The short-run and long-run effects of trade openness are not necessarily the same in different economies. For instance, Diao et al. (1999) demonstrate that trade openness causes welfare losses in the long-run compared to short-run gains in Japan. For, trade liberalization results in industrial expansion in the short-run, but foreign spillovers are eliminated in time. Yet, according to Rauch (1997), Chile experiences decline in growth rate due to trade openness in short-run. In contrast with Japan case, Chile gains in the long-run. Trade liberalization gives stimulus to productivity growth in Chile as time passes.

As it is seen from different country experiences, impact of trade liberalization is not standard on the economic performance when the features of the economy under investigation are not same. Even in different sectors within the same economy, it can be said that trade openness does not produce the same results. Wong's (2009) findings using the data from Ecuador between 1997 and 2003 show that trade openness results in a positive impact on the export-oriented sector of the Ecuadorian manufacturing industry. But, economic distress in 2000s causes a negative and significant decline in the overall productivity. How much of this decrease is caused by labor productivity and how much is related to capital productivity is not apparent. Further, it is highly difficult to isolate the effect of trade openness considering the economic fluctuations as of the era examined.

The number of studies showing the positive effect of openness to trade on total factor productivity, which enables the economy to grow faster, is substantial. For Edwards (1998), more open countries face a higher and faster total factor productivity growth. When the trade openness raises productivity growth, increase in economic growth seems to be a standard byproduct. For Ramzan et al. (2019), total factor productivity is an important factor as a step between trade openness and economic growth. Panel data of 82 countries in the 1980-2014 period is an evidence on how productivity is an important intermediary mechanism in the effect of trade openness on economic growth. If the total factor productivity is below a threshold level, trade openness may negatively affect economy. If it is above the threshold level, trade openness is a desirable external contribution on the economy.

Diao et al. (2005) focuses on the economic growth path of Thailand that had persisted from 1960's to 2000's. They find that foreign technology spillover is an integral part of trade. And it is the pivot of the increasing productivity. Export expansion causes productivity to increase. This guarantees the existence of transition growth that took place in Thailand case. Alcalá and Ciccone (2004) show that the positive effect of trade openness on economic growth can only be through the total factor productivity channel. For Umer (2014), an important source of long run economic growth is total factor productivity increase which can be attained by trade openness. In the study focusing on the short and long-run impact of trade openness on economic growth of Pakistan, Umer suggests that especially intermediate goods and raw materials were imported after the tariff reduction from 1980 onwards in Pakistan. This raised labor productivity, therefore economic growth. Hence, to boost economic growth, factor productivity needs to be enhanced. Haouas and Yagoubi (2005) measure how the openness affects productivity. Their findings are valid for MENA countries in the 1965-2000 period. When openness level is doubled then technical progress of that economy increase

0.6% annually. The improvement in technical progress is 0.8% according to Söderbom and Teal (2003) by using a sample composed of 93 economies in the period between 1970 and 2000.

Abizadeh and Pandey (2009) also point out the differential effect of trade openness on the total factor productivity growth in three main sectors of the economy. Their findings reveal that the effect is positive when the aggregate economy is thought. But it is not considerable in agriculture and industry sectors. That is so because the effect of openness on productivity in the service sector is significant and positive. The reason why service sector effect dominates the effect in the remaining two sectors lies in the sample of the study. Abizadeh and Pandey's research focuses on the OECD countries for the period between 1980 and 2000. Neoliberal policies were conducted within this period in most of the developed and developing countries. These are the years financial and trade liberalization took place. And the spatial distribution structure of the production has shifted from developed countries to developing and undeveloped economies. Therefore, in most OECD countries, the service sector has naturally started to fill the gap arising from the outward migrating agriculture and manufacturing sectors. So, it is not surprising to find that the effect of openness to trade on productivity in the service sector suppresses neutral behavior in manufacturing and agriculture. The results of another study conducted by Wang (2012) on a similar sample in a similar period are consistent with the findings of Abizadeh and Pandey (2009) on the whole economy.

Determining the existence of trade openness alone is not enough to express what effect it has on productivity. Damijan et al. (2009) study on firm-level data of six transition economies for the period spanning from 1995 to 2002. Exporting goods to markets with advanced competition positively affect productivity growth in most of the economies in the sample. But export to less advanced markets decrease productivity growth. Empirical findings are similar when import of goods are considered. So besides the existence of a trade relationship, the structure of the relationship and the characteristics of the parties are important for the productivity changes.

Bekaert et al. (2011) especially focus on the financial openness and its impact on productivity. The impact of openness on productivity growth is higher conditional on a high institutional quality and financial development. That is, countries desire to boost the positive effect on productivity need to develop first financial sector and institutions.

Cameron et al. (1998) assert that the primary effect of international openness is on the rate of productivity convergence based on the data on the productivity gap between UK and US economies from 1970 to 1992. Jiang (2012) reaches a similar conclusion on the productivity convergence in Chinese provinces from 1984 to 2008. Yet rather than total factor productivity, Jiang emphasizes the rise of labor productivity convergence among provinces when regional openness takes place. Ozyurt (2008) also points out province-level labor productivity in China for a longer period spanning 1979-2006. Foreign trade has a positive impact on labor productivity in Chinese provinces. And FDI and foreign trade trigger productivity spillovers among regions. Neighboring regions have an absolute influence on the productivity of a certain region. Higher the surrounding regions' productivity, higher the productivity of the region inspected. Jiang (2011) examines the hypothesis that openness in China boosts economic growth. Jiang finds that regional productivity growth is positively related to regional openness and it is negatively associated with the current regional productivity level. The study is significant in that it supports the cross-country findings of the literature with similar findings on domestic, cross-province dynamics.

There are a lot of studies showing that trade openness has a positive effect on total factor productivity and in this way positively affects the economic performance of the country. But the findings are controversial in the long-run and short-run. Föllmi et al. (2018) analyze the relationship between trade openness and labor productivity in a sophisticated way. The first finding is that aggregate level analysis shows no relationship between labor productivity and trade openness. But when the disaggregate research is conducted, there is a positive and causal effect of exports on labor productivity in a few segments of manufacturing sector of the Swiss economy. That is, the results may not be same in different sectors within the economy as well. We examine in this study the effect of trade openness on the economy through labor productivity, which we think is easier to observe. Rest of the paper is designed as follows. Second part is for data and the methodology. Third part summarizes the empirical findings of the analyses. Last part concludes the study.

2. Data and Methodology

There are two main variables utilized in the study for the period spanning the years between 1960 and 2019. First one is trade (TRADE) which is the sum of all imports and exports of goods and services. It is measured as percentage of GDP. Data are retrieved from World Development Indicators database of the World Bank (2021). Second variable is labor productivity (PROD) per person employed in 2018 US$. The data are retrieved from Total Economy Database of The Conference Board (2021). Using logarithmic transformations of the indicators are preferred due to more intuitive interpretation and to follow the change over years. Labor productivity is utilized as an indicator of productivity. Rather than technological improvements, adjustment in the labor force is quicker. So, observing the change over labor productivity is more convenient.

ARDL method is used for the analyses. As a first step stationarity of the series is checked. To this end, unit root tests are conducted. Phillips-Perron test statistics are listed to decide on the stationarity. Then the proper ARDL model is selected based on the chosen information criteria. We use Akaike information criterion. ARDL bounds test shows if

there exists a long-term relationship between variables. An F-statistics lower than the I(0) lower bound of critical value, we fail to reject null hypothesis. If F-statistics is in between lower I(0) and upper I(1) bounds of critical value, test is inconclusive. If the statistics is over I(1) upper bound for critical value, we reject null hypothesis of that there is no long-run relationship. Only if bounds test shows that there is a long-run relationship between the variables, long-run coefficients and cointegrating form are estimated. Diagnostic checks for heteroscedasticity, serial correlation, model specification and normality are conducted alongside CUSUM stability test to ensure the validity of the model.

3. Empirical Findings

To begin with, unit root tests are conducted to check the stationarity of the series. Results of the unit root tests are listed in Table 1. The null hypothesis for each test is that the variable has unit root. Unit root tests at the levels of the variables show that we cannot reject the null hypotheses. That is, the TRADE and PROD variables are non-stationary. However, for unit root tests at the first differences of the variables, null hypotheses are rejected. In other words, series are stationary after the first differences. Therefore, both variables are integrated of order 1, i.e. I(1). Results are robust even if exogenous are determined as none, constant, or constant and linear trend.

Table 1. Unit Root Tests (Phillips-Perron)

Null: log variable has a unit root.

Variables	Exogenous	Adj. t-Stat	Prob.	1% Critical Value
log TRADE	None	1.543805	0.9686	-2.604746
	Constant	-2.019799	0.2778	-3.546099
	Constant, Linear Trend	-3.316501	0.0736	-4.121303
log PROD	None	5.891683	1.0000	-2.604746
	Constant	-2.196631	0.2097	-3.546099
	Constant, Linear Trend	-2.285939	0.4347	-4.121303

Null: First Difference of log variable has a unit root.

Variables	Exogenous	Adj. t-Stat	Prob.	1% Critical Value
log TRADE	None	-7.531621***	0.0000	-2.605442
	Constant	-7.705725***	0.0000	-3.548208
	Constant, Linear Trend	-7.550179***	0.0000	-4.124265
log PROD	None	-6.438986***	0.0000	-2.605442
	Constant	-8.797984***	0.0000	-3.548208
	Constant, Linear Trend	-9.342866***	0.0000	-4.124265

*** indicates 1% level of significance.

Table 2 shows 20 of the ARDL models that are tested based on the Akaike information criterion. The minimum value of the Akaike information criterion, -3.469148, is reached at model 14. And the model specification is ARDL(2,1).

Table 2. Model Selection Criteria

Dependent Variable: log PROD

Model	LogL	AIC*	Adj. R-sq	Specification
14	102.136142	-3.46915	0.992333	ARDL(2, 1)
15	101.102602	-3.46795	0.992198	ARDL(2, 0)
20	99.817997	-3.45779	0.991986	ARDL(1, 0)
19	100.613418	-3.45048	0.992060	ARDL(1, 1)
9	102.484286	-3.44587	0.992277	ARDL(3, 1)
10	101.232381	-3.43687	0.992082	ARDL(3, 0)
13	102.187314	-3.43526	0.992194	ARDL(2, 2)
18	100.720070	-3.41857	0.991936	ARDL(1, 2)
4	102.546232	-3.41237	0.992136	ARDL(4, 1)
8	102.518955	-3.41139	0.992129	ARDL(3, 2)
5	101.504113	-3.41086	0.992001	ARDL(4, 0)
12	102.304996	-3.40375	0.992068	ARDL(2, 3)
17	100.993141	-3.39261	0.991854	ARDL(1, 3)
7	102.669530	-3.38106	0.992008	ARDL(3, 3)
3	102.590828	-3.37824	0.991985	ARDL(4, 2)
11	102.314054	-3.36836	0.991906	ARDL(2, 4)
16	100.994776	-3.35696	0.991688	ARDL(1, 4)
2	102.723667	-3.34727	0.991853	ARDL(4, 3)
6	102.711055	-3.34682	0.991850	ARDL(3, 4)
1	102.777958	-3.3135	0.991693	ARDL(4, 4)

ARDL bounds test results are in Table 3. F statistics, 13.29053, belongs to ARDL(2,1) model. It is larger than the upper critical value bound I(1), 5.58 at 1% level of significance. So, we reject the null hypothesis stating that no long-run relationship exists. So, there is a cointegration between the series. That is, there exists a long run relationship between trade and labor productivity in Turkey over the period from 1960 to 2019.

Table 3. ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

	Value	k
F-statistic	13.29053	1

Critical Value Bounds

Significance	I(0) Bound	I(1) Bound
10%	3.02	3.51

5%	3.62	4.16
2.50%	4.18	4.79
1%	4.94	5.58

Cointegration form and long run coefficients are listed in Table 4. As expected, cointegration term has a negative sign. As the results of the ARDL bounds test, it is statistically significant. When it comes to the long-run, 1% increase in Trade causes 0.55% rise in the labor productivity. Although, short-run coefficient of -0.018457 for the TRADE is negative, it is not statistically significant. Therefore, we can conclude that there is a long-run relationship between openness and productivity, but not in the short-run. It takes 14.21 years to totally clear the effects of a one-time shock caused by a deviation from the long-run equilibrium. Only 7% of the error is corrected per year.

Table 4. ARDL Cointegrating And Long Run Form

Dependent Variable: log PROD

Cointegrating Form

Variable	Coefficient	Prob.
$\Delta LOGPROD_{t-1}$	-0.214878* (0.121314)	0.0823
Δlog TRADE	-0.018457 (0.035552)	0.6058
CointEq(-1)	-0.070353*** (0.010937)	0

Cointeq = LOG(PROD) - (0.5472*LOG(TRADE) + 9.2520)

Long Run Coefficients

Variable	Coefficient	Prob.
LOGTRADE	0.54719*** (0.142597)	0.0003
Constant	9.252029*** (0.623035)	0

Standard Errors are in parantheses.
***,**,* indicate significance at 1%, 5%, and 10% respectively.

Diagnostic tests such as heteroscedasticity, serial correlation, normality and functional form are conducted to see the validity of the model in Table 5. Results of the Breusch-Godfrey Serial Correlation LM test show that there is not any autocorrelation problem because we fail to reject the no serial correlation null hypothesis. According to, Breusch-Pagan-Godfrey Heteroskedasticity test results, there is no heteroskedasticity problem as well. As we fail to reject the Ramsey RESET test's null hypothesis stating that the model has the correct specification, functional form of the model has no problem. Functional form of the model has no omitted variables.

Table 5. Diagnostic Tests

Breusch-Godfrey Serial Correlation LM Test

F-statistic	Prob. F(2,51)
0.295154	0.7457

Breusch-Pagan-Godfrey Heteroskedasticity Test

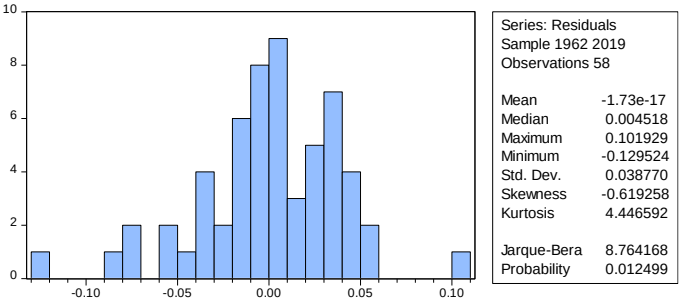
F-statistic	Prob. F(4,53)
2.045325	0.1012

Ramsey RESET Test

F-statistic	Prob. F(1,52)
0.254400	0.6161

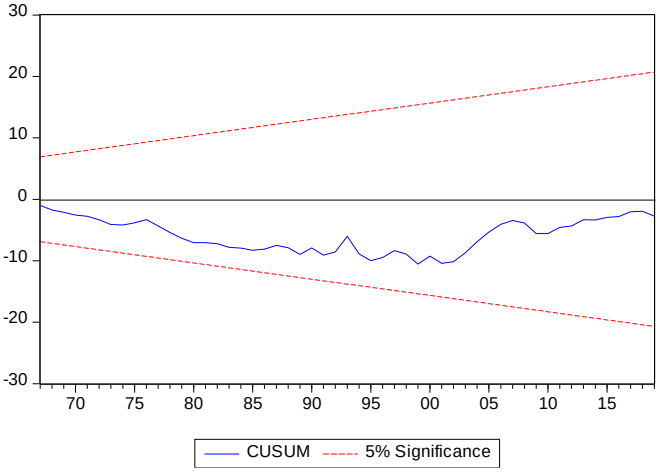
As it is seen at first sight from the shape of the histogram in Figure 2, Jarque- Bera normality test reveals the normal distribution. Probability, 0.0125, is lower than 5% level of significance so we cannot reject null hypothesis stating the normality of residuals. Thus, the data is normally distributed.

Figure 1. Jarque-Bera Normality Test



Stability parameters are tested as well. Cumulative sum of residuals is in between the critical bounds at 5% significance level. This imply that the coefficients are stable.

Figure 2. CUSUM Coefficient Stability Test



4. Conclusion

In this research, we study the long-run relationship between openness to trade (TRADE) and labor productivity (PROD) in Turkey for the period covering the years between 1960 and 2019. Findings from ARL bounds test show that there exists a cointegrating association between TRADE and PROD variables. That is, there is a long-run relationship between TRADE and PROD variables in the long-run. Although, this positive relationship is statistically significant in the long-run, it does not keep its validity in the short-run. Diagnostic checks ensure the acceptability of the model.

As the literature has not reached a unique conclusion about the effects of openness on productivity, there is a need for more studies. For the external validity of the empirical findings of our research, it would be seminal to compare our results with another developed or developing economy. Turkish economy, as an economy located directly on the border separating developed and developing countries, could play a key role in such an analysis.

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