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EXPORTS AND IMPORTS RELATION: PANEL CAUSALITY ANALYSIS WITH REGIONAL DATA FOR TURKEY

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ABSTRACT

Aiming to increase exports only as absolute value and not focusing on value added will not result in any other than bringing the increase in imports in a country where exports depend on imports. Turkey is one of the most important examples that are experiencing this problem. The success of the national target depends on the performance of regional and local trade strategies. This study aims to reveal in which regions export is dependent on imports by analyzing the causality relationship between exports and imports. To the best of our knowledge this is the first study using regional data. In order to analyze the causality relations, Emirmahmutoğlu &Köse (2011) panel Granger causality test is employed. The analysis is conducted with using monthly data covering the period from January 2002 to December 2019 for regions of Turkey. Individual results have showed that six regions had bidirectional causality while four regions had unidirectional causality between exports and imports. As for panel results, it has showed that there are bidirectional causality between exports and imports.

Keywords: *Exports, Imports, Panel Causality Analysis, Regional Data.*

İHRACAT VE İTHALAT İLİŞKİSİ: TÜRKİYE İÇİN BÖLGESEL VERİLER İLE PANEL NEDENSELLİK ANALİZİ

ÖZET

İhracatın, sadece mutlak değer olarak artırılması ve içerdiği katma değere odaklanılmaması, ithalata bağımlı ihracat sorunu olan bir ülkede, ithalat artışını beraberinde getirmekten başka bir sonuç vermeyecektir. Türkiye bu sorunu yaşayan en önemli örneklerden bir tanesidir. Ulusal hedefin başarısı, bölgesel ve yerel ticaret stratejilerinin performansına bağlıdır. Bu çalışma, ihracat ve ithalat arasındaki nedensellik ilişkisini analiz ederek ihracatın Türkiye'nin hangi bölgelerinde ithalata bağımlı olduğunu ortaya koymayı amaçlamaktadır. Bilinen kadarıyla bu bölgesel verileri kullanan ilk çalışmadır. Nedensellik ilişkisini analiz etmek için Emirmahmutoğlu & Köse (2011) panel Granger nedensellik testi kullanılmıştır. Analiz, Türkiye'nin bölgeleri için Ocak 2002 ile Aralık 2019 arasındaki dönemi kapsayan aylık veriler kullanılarak gerçekleştirilmiştir. Bireysel sonuçlar, altı bölgenin çift yönlü nedenselliğe sahip olduğunu, dört bölgenin ise ihracat ve ithalat arasında tek yönlü nedenselliğe sahip olduğunu göstermiştir. Panel sonuçları ise, ihracat ve ithalat arasında iki yönlü nedensellik olduğunu göstermiştir.

Anahtar Kelimeler: *İhracat, İthalat, Panel Nedensellik Analizi, Bölgesel Veri.*

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1. Introduction

Considering the export figures in the post-2002 period, it is seen that the exports of Turkey showed a successful performance. However, in the same period, excluding 2009, 2012, 2014, 2015, 2016, 2018, 2019, import figures also increased compared to the previous year. In the 2002-2011 period, the foreign trade deficit also grew steadily, excluding 2009. Although there was an improvement in the foreign trade balance in the post-2011 period, it is still negative. Beside these, the truss span between the trade balance and trade volume indicators is gradually opening up in the 2002-2019 period. One of the most important reasons for the deterioration in trade balance is the increase in external dependence of Turkey. The trade balance is an important indicator of the dependence of exports on imports as it directly shows the difference between exports and imports sizes.

The biggest factor in the dependence of exports on imports is the use of imported intermediate inputs. Therefore besides trade balance, the foreign content of value added in exports (vertical specialization-VS) is one of the most important indicators. Gündoğdu & Saracoğlu (2016) has examined VS of exports between 1995 and 2011 for Turkey at sectoral and trade partner dimensions. An 8.4 percentage point increase was found in the period of 1995-2011. This means that foreign value added in Turkish exports has increased in this period. Yılmaz (2019) has investigated VS share of exports for the period 2000-2014 in Turkey. According to the results obtained by the study, the rate of foreign intermediate input in exports increases and the manufacturing sector has the largest share in VS ratio compared to other sectors.

As a result of the increase in the foreign trade deficit and the foreign content of value added in exports, it can be predicted that exports have become dependent on imports. Inward Processing Regime is one of the most important reasons for dependence of exports on imports in Turkey. Another reason is that in the years when the exchange rate was low, the consumption of imported inputs increased and as a result many domestic suppliers remained out of the market (Sönmez, 2019). Thus, the dependence of exports on imports has increased due to the attractive imported inputs and the decrease of local suppliers.

As an export-oriented country and country with trade deficits, Turkey sought and implemented different policies while integrating and competing with the global world. Stabilization and restructuring policies in the 2000s aimed at solving trade deficit problem. Turkish Export Strategy for 2023 initiated by the Ministry of Economy and Turkish Exporters Assembly in 2009 and e-Export Strategy and Action Plan (2018-2020) prepared by the Ministry of Economy in 2018 is the most important of the latest actions. Increasing the competitiveness, enhancing the awareness of e-export, completion of technological transformation and being among the ten largest economies of the world are some examples for targets of these actions. However there are still actions to be taken in order to achieve the goals aimed in these strategies and plans. The decline in the foreign trade deficit that occurred in the years when imports decreased due to the crisis and exchange rates is not sustainable and planned. It is exactly like the situation in Turkey. The trade deficit and dependence of exports on imports should be reduced in a planned and sustainable manner.

Implementing sectoral and regional based strategies is among these actions. It can be said that sectoral and regional analyses, which can be applied separately, complement each

other. Besides sectoral analysis, in order to produce specific and effective policies for a purpose, it is necessary to make an exact determination of the region where the policy will be applied. Creating and implementing the specified strategies and plans by focusing on the relevant sectors in the regions approved to be the source of the imports dependence of exports will make it possible to reach the national targets.

Causality analysis is important to reveal whether there is a relationship between these two variables and what direction if there is a relationship. There are four conclusions that can be drawn from this analysis for the regions of Turkey. When the null hypothesis of "Granger no causality from exports to imports" is rejected, it is concluded that exports are the Granger cause of imports. This indicates that the use of imported inputs required for production is dependent on exports that provides foreign currency gains. When the null hypothesis of "Granger no causality from imports to exports" is rejected, it is concluded that imports are the Granger cause of exports. From this result, it is understood that the export performance depends on the use of imported intermediate inputs and capital goods. In regions where both null hypotheses are rejected, it can be stated that the export performance depends on the import as well as the import required for production depends on exports. The fourth and last case is that both null hypotheses cannot be rejected. Thus, it is said that there is no relationship between the two variables in these regions.

It is hypothesized that in the context of regional trade differences the relationship between exports and imports also shows regional differences. Therefore, it can be determined in which regions there is an import-dependent export. It will also contribute indirectly to the solution of the trade balance problem by determining the region(s) where the problem originates and by focusing on reducing this dependency. So, with this motivation, fundamentally, the answer to the question of which regions have import-dependent exports is sought. In regions where there is a causality from import to export or bidirectional causality between two variables, import-dependent export can be mentioned. Although there is a lot of research in the literature, to the best of our knowledge, there are no studies for Turkey conducted regionally on causality of export and import. The main purposes of this article are to examine whether causality exists between the two variables and, if causality exists, determine its direction by regions with using monthly data covering the period from January 2002 to December 2019 for Turkey. This study also aims to fill the gap in the literature by investigating the causality between export and import at the regional level for Turkey. By this way, the dynamics and structures of relationship between exports and imports of the regions will be revealed. In addition, the determination of the exact source of the import dependency of exports that should be reduced in order to reduce the foreign trade deficit can be conducted. Thus this type of analysis provide to establish region-specific policies. Therefore, it can be said that the other aim of this study is to guide policymakers who develop regional policy. Research and publication ethics were followed in this study.

2. Theoretical Background and Literature Review

The statistical analysis pursued in this paper involves testing for the presence of a "causality relationship" between the Turkey's exports and imports. Husted (1992) study provides a basis for research on whether there is a theoretical reason to investigate such a relationship. It starts out with the assumption of a small and open economy, where a single

good is produced and exported, and there is no government. The current budget constraint of an individual in this economy is as follows: $C_0 = Y_0 + B_0 - I_0 - (1 + r_0)B_{-1}$.

In this equation C_0, Y_0, I_0, r_0, B_0 and $(1 + r_0)B_{-1}$ respectively denotes current consumption, output, investment, one period world interest rate, international barrowing and initial debt of the agent corresponding to country's external debt. Equation 1 is rewritten to obtain a testable empirical model with assuming that the world interest rate is stationary. After a few solving and assumptions, Husted (1992) reached a testable model as follows: $X_t = \alpha + \beta.M_t + \in_t$ where X_t is the exports, M_t is the imports and is error term. Arize (2002) presented the alternative equation: $M_t = \partial + \varphi.X_t + u_t$.

There are many studies in the literature that examine the relations between import, export and various macroeconomic indicators such as gross domestic product (GDP), GDP growth rate , exchange rate , foreign direct investment for different purposes. However, there are relatively few studies that directly examine the relationship between exports and imports. The causality relations between these variables have been analyzed by using different causality and cointegration approaches for different levels of data such as a country (C), group of countries (GC) and region (R). Table 1 summarizes some of these fundamental studies.

Table 1: Literature Review

Study	**Variables***	**Period****	**Method**	**C/ GC/ R**	**Result*****
Ramos (2001)	X, M and G	1865-1998	Granger causality test	C: Portugal	No causality
Çetintaş & Barişik (2009)	X, M and G	1995:02Q - 2006:04Q	Panel cointegration test, Panel causality test	GC: 13 transition economies	X↔M
Taştan (2010)	X, M and G	1985:01M - 2009:05M	Spectral Granger causality test	C: Turkey	1) M→X in the short-run. 2) No causality in the long-run
Hye (2012)	X, M and G	1978 - 2009	ARDL analysis, Granger causality test	C: China	X↔M
Yıldırım & Kesikoğlu (2012)	X, M and ER	2003:01M - 2011:09M	Bootstrap-Corrected Causality Test	C: Turkey	X↔M
Çamurdan (2013)	X, M and G	1999 - 2013	Cointegration test, Granger causality test	C: Turkey	M→X
Tapşın & Karabulut (2013)	X, M and ER	1980 - 2011	Toda & Yamamoto causality test	C: Turkey	M→X
El Alaoui (2015)	X, M and G	1980 - 2013	Cointegration test, Granger causality test	C: Morocco	X→M in the short-run

Table 1 continued

Acet et al. (2016)	X, M and G	1998:01Q - 2013:?Q	Granger causality test	C: Turkey	X↔M
Tunçsiper & Rençber (2017)	X, M and Y	2002:01Q - 2016:02Q	Granger causality test	C: Turkey	M→X
Petek & Çelik (2017)	X, M, ER, I	1990:01M - 2015:12M	Cointegration test, Granger causality test	C: Turkey	X↔M
Altın & Süslü (2017)	X, M and ER	2001:01Q - 2016:03Q	Toda & Yamamoto causality test	C: Turkey	No causality
Bozdan et al. (2018)	X, M and ER	2010:01M - 2017:10M	ARDL analysis, Granger causality test	C: Turkey	No causality
Bakari & Mabrouki (2019)	X, M and G	1960 - 2015	Cointegration test, Granger causality test	C: Morocco	No causality
Raghutla & Chittedi (2019)	X, M and G	1979 - 2018	Cointegration test, Granger causality test	GC: BRICS	X→M in the long-run
Kotil (2019)	X, M and ER	2004 - 2017	Causality test	C: Turkey	M→X
Fannoun & Hassouneh (2019)	X, M and G	2000:01Q - 2018:01Q	Cointegration test, Granger causality test	C: Palestine	X↔M
Herzer & Nowak-Lehmann (2006)	X and M	1975 - 2004	Cointegration test	C: Chile	X→M in the long-run
Dumitriu et al. (2009)	X and M	2005:01M - 2009:03M	Cointegration test, Granger causality test	C: Romania	X↔M
Uddin (2009)	X and M	1972-1973 to 2007-2008	Cointegration test	C: Bangladesh	X↔M
Jiranyakul (2012)	X and M	2000:01M - 2011:07M	Cointegration test, Granger causality test	C: Thailand	X↔M
Mohamed et al. (2014)	X and M	2005:01M - 2013:08M	Granger causality test, Toda & Yamamoto causality test	C: Tunisia	X↔M
Hopoğlu (2019)	X and M	1967 - 2016	Panel causality tests	GC: 18 emerging economies	M→X

*The import, export, GDP, economic growth series, exchange rate, inflation are symbolized by X, M, Y,G, ER,I respectively. **The quarter and month are symbolized by Q and M, respectively. *** Only the relationship between export and import is given as a result. Please see the study for detailed information.

There are three different conclusions to be drawn from the Table 1, which includes the summary of the literature. First, to best of our knowledge, there is no study that analyzes the causality relations between exports and imports in the regions (or states) within a country. Studies mostly used country-level or country-group level data. Second, only the Hopoğlu (2019) used the Emirmahmutoğlu & Köse (2011)[1] method. Third, mostly, the direction of causal relation in studies is determined as unidirectional or bidirectional. Herzer & Nowak-Lehmann (2006) and Raghutla & Chittedi (2019) identified unidirectional causality from exports to imports in the long-run while El Alaoui (2015) also found same results in the short-run. Unlike these, Çamurdan (2013), Tapşın & Karabulut (2013), Tunçsiper & Rençber (2017) and Kotil (2019) identified unidirectional causality from imports to exports. The findings of Taştan (2010) suggest that there is unidirectional causality from imports to exports in the short-run, but no causality in the long-run. Türkyılmaz et al. (2007), Çetintaş & Barişik (2009), Uddin (2009), Dumitriu et al. (2009), Yıldırım & Kesikoğlu (2012), Jiranyakul (2012), Hye (2012), Mohamed et al. (2014), Acet et al. (2016) and Fannoun & Hassouneh (2019) identified bidirectional causality between the two variables. In addition to studies that determined whether the causality between two variables is unidirectional or bidirectional, Ramos (2001), Bakari & Mabrouki (2019), Altın & Süslü (2017) and Bozdan et al. (2018) indicates that there is no causal relationship between exports and imports.

It is clear that there is no consensus in the literature on the direction of causality between the two variables. From the results obtained for Turkey it can be reached similar conclusions above when relatively new studies are examined. Sekmen & Saribas (2007) revealed that bidirectional causality relations among these variables for the 1998-2006 period. Acet et al (2016) determined bi-directional causality between exports and imports in its analysis with using quarterly data from 1998-2013. Karabulut (2020) reached the same results for the 1992-2019 period and concluded that there are also causality both from imports to exports and exports to imports and exports is highly dependent on imports. Tunçsiper & Rençber (2017) found unidirectional causality from imports to exports by using quarterly data for 2002-2016 period. Kotil (2019) also indicated that the casual relationship between two variables is unidirectional for the 2004-2017 period and the direction of this relationship is from imports to exports. In a similar manner, Hopoğlu (2019), a study on emerging economies and using also the E-K (2011) method, has identified that there is unidirectional causality from imports to exports for the 1967-2016 period in Turkey. Another study that determined a unidirectional causality relationship from imports to exports is Çatalbaş (2016) and Çatalbaş (2021) analyzing the 1998-2015 period. However, Altın & Süslü (2017) concluded that there was no causal relationship between the variables in the 1989-2016 period.

In addition to these studies that directly focus on the causality relationship, there are also studies that indirectly investigate the relationship between exports and imports while testing different hypotheses. Uslu (2018) examined effects of real effective exchange rate, domestic national income and world national income on Turkey's exports, imports and foreign trade balance within the frame of Marshall-Lerner condition. While doing this, the study also investigates the causality relationship between the variables using the Toda & Yamamoto (1995) method. According to the results obtained from the analysis, no causal relationship was found between exports and imports. However, the test statistics obtained were not statistically

1 From here on, it will be abbreviated as E-K (2011).

significant. There are unidirectional short-run causality relationships from real effective exchange rate to exports and from domestic national income to imports. Petek & Çelik (2017) using monthly data for the 1990-2015 period of Turkey showed that there is a statistically significant causal relationship both from export to import and imports to exports. Like Altın & Süslü (2017), Uslu (2018), Bozdan et al. (2018) found that there was no causal relationship between the variables. İnançlı & Konak (2011) determined that the dependency level of exports to imports increased between 1995-2002 in automobiles and related sectors, and this increase continued between 2003-2007. In 2008, it was observed that dependency decreased compared to 2007 due to the global crisis. In 2009 and 2010, due to the stagnation in foreign trade, the import-dependency level also followed a stagnant course.

The results obtained from the studies show that the direction of the relationship between the two variables differs due to the countries and periods covered and the method of analysis used in a study. In the literature, the causality between exports and imports analyzed using various methods in Turkey, but, to best of our knowledge, it has not been explored with both data at the regional level and E-K (2011) method. Therefore, the answer to the question in which regions of Turkey the causality relations differ has not been given yet. In this study, it is aimed to reveal regional differences. So this study is planned to fill this gap in the literature by investigating causality relationships at the regional level and, consistent with our purpose, using panel causality analysis that also gives results at the regional level as well as the panel results.

3. Data and Methodology

The aim of the study is to examine whether there is causality between exports and imports at regional level. Since the regional data published by Turkish Statistical Institute (TurkStat) are annual data covering the short period of 2007-2017, provincial data were aggregated to obtain regional level data according to the Nomenclature of Territorial Units for Statistics (NUTS) definitions. The monthly data of exports and imports by provinces of Turkey for period 2002-2019 are sourced from TurkStat. Detailed information about the data is given in Table 2.

Table 2: Data Sources

Variables	Definition	Unit	Period	Frequency	Source
XP	Exports by province	Thousand US $	2002-2019	Monthly	TurkStat
MP	Imports by province	Thousand US $	2002-2019	Monthly	TurkStat

After the provinces with missing data were excluded[2], 65 provinces remained from 81 provinces. In the first step, XP and MP were aggregated under the definition of NUTS1[3] in order to generate regional level export (XR) and import (MR) variables. The 12 regions created according to the NUTS1 definition are ranked from large to small according to the foreign trade volume consisting of the total of exports and imports, and the id number of regions is defined.

In the second step, the natural logarithms of the XR and MR are computed and the series are seasonally adjusted. The import and export series obtained are symbolized by X and M, respectively.

Table 3: Descriptive Statistics

	Mean	Median	Max	Min	Std Dev	Obs.
X	12.24974	12.15421	15.87153	5.898615	1.883542	2592
M	12.16678	12.33146	16.47033	6.167653	2.085622	2592

In Table 3, fundamental descriptive statistics are presented. The largest values of the X and Y variables belong to Istanbul while the smallest values belong to the Northeastern Anatolia. As a result of the 216-month data obtained for 12 regions, there are 2592 observation values to be used in analysis.

In this study, in order to analyze the causality relation between X and M, E-K (2011) panel Granger causality test is employed. This method is a version of LA-VAR approach of Toda & Yamamoto (1995) developed to investigate causality in heterogeneous mixed panels.

E-K (2011: 871) estimated heterogeneous panel VAR(k_1, k_1) model with p variables:

$$z_{i,t} = \mu_i + A_{i1} z_{i,t-1} + ... + A_{ik_i} z_{i,t-k_i} + u_{i,t}$$
$$i = 1,2,...,N, \quad t = 1,2,...,T..... \tag{1}$$

In equation (1), ***i*** denotes individual cross-sectional units, ***t*** denotes time periods, μ_i is a p dimensional vector of fixed effects. $A_{i1},...,A_{ik_i}$ are fixed (pxp) matrices of parameters allowed to vary across units. k_i is the lag structure and $u_{i,t}$ is a column vector of p error terms.

Besides, α_i is a vector of all VAR coefficients.

$\alpha_i = vec[\mu_i, A_{i1},...,A_{ik_i}]$ for $i = 1,2,...,N$

E-K (2011: 871) stated that in VAR process if the variables are stationary, OLS estimators and Wald statistics are valid. Otherwise, Granger causality test is not valid for non-stationary variables. This problem has been overcome by the simple approach of Toda & Yamamoto (1995) which propose overfit the level VAR model by extra $d_{\max}$ lags:

$$z_{i,t} = \mu_i + A_{i1} z_{i,t-1} + A_{ik_i} z_{i,t-k_i} + \sum_{l=k_i+1}^{k_i+d\max_i} A_{il} z_{i,t-1} + u_{i,t}$$
$$i = 1,2,...,N, \quad t = 1,2,...,T \tag{2}$$

In heterogeneous panels, Fisher test statistic is used to test the Granger non-causality hypothesis. However, if there are cross correlations among cross sectional units, test statistic is not valid. E-K (2011) use the bootstrap method. The finite sample properties of causality test are investigated via Monte Carlo experiments.

In the E-K (2011) method, which overcome the severe pre-test assumptions required in the Granger non-causality test, the only information needed priorly is the maximum order of integration of variables ($d_{\max}$).

Dickey & Fuller (1981) unit root test is used to determine, $d_{\max}$ value. The test of stationarity and cointegration are not required because of that four different data generating processes involving I(0), I(1), cointegrated and non-cointegrated series are considered in each Monte Carlo experiment.

The E-K (2011) gives separate results for both individual units and the panel. For each individual unit, Wald statistics and lags are calculated. After that, Fisher test statistics are obtained for the overall panel. The null hypothesis of "there is Granger no causality from A to B" is tested against the alternative hypothesis of "there is Granger causality from A to B".

4. Empirical Findings

Testing the cross-sectional dependence and homogeneity is the first step in any panel causality analysis. LM, CD_{LM}, CD and LM_{adj} tests that measure the cross-sectional dependency developed by Breusch & Pagan (1980), Pesaran (2004), Pesaran (2004) and Pesaran et al. (2008), respectively. In order to testing slope homogeneity, Pesaran & Yamagata (2008) proposed delta ($\tilde{\Delta}$) test for large samples and bias-adjusted delta ($\tilde{\Delta}_{adj}$) test for small samples.

Table 4: Cross-Section Dependency and Homogeneity Tests

Model	Test	Statistic	p-value
Model 1 Dependent variable: X Independent variable: M	LM	1278.320*	0.000
	CD_{LM}	105.519*	0.000
	CD	26.856*	0.000
	LM_{adj}	107.876*	0.000
	$\tilde{\Delta}$	74.789*	0.000
	$\tilde{\Delta}_{adj}$	75.311*	0.000
Model 2 Dependent variable: M Independent variable: X	LM	986.191*	0.000
	CD_{LM}	80.092*	0.000
	CD	21.635*	0.000
	LM_{adj}	107.786*	0.000
	$\tilde{\Delta}$	110.103*	0.000
	$\tilde{\Delta}_{adj}$	110.872*	0.000

Note: * denotes statistical significance at 1%.

The results of the tests developed in the different studies mentioned above are shown in Table 4. The results indicate that the null hypothesis of no cross-sectional dependence and the null hypothesis of slope homogeneity are rejected at 1% level of significance. A shock that occurs in a region of Turkey may be transmitted to other regions according to the results of cross-section dependency tests. The homogeneity test results reveals region specific heterogeneity.

In the second step, maximal order of integration of variables for each cross section unit was determined by Dickey & Fuller unit root test and presented in the Table 5.

Table 5: ADF Test Results (with Intercept and Trend)

Regions	X		M		$dmax_i$
	Level	1st differences	Level	1st differences	
Istanbul	0.2001	0.0000*	0.1915	0.0000*	1
Eastern Marmara	0.2565	0.0000*	0.4717	0.0000*	1
Aegean Region	0.6212	0.0000*	0.7784	0.0000*	1
Western Anatolia	0.8512	0.0000*	0.4833	0.0000*	1
Mediterranean Region	0.2565	0.0000*	0.4398	0.0000*	1
Southeastern Anatolia	0.8270	0.0000*	0.2081	0.0000*	1
Western Black Sea	0.1551	0.0000*	0.0181**	-	1
Central Anatolia	0.4063	0.0000*	0.2956	0.0000*	1
Western Marmara	0.3198	0.0000*	0.1326	0.0000*	1
Eastern Black Sea	0.3665	0.0000*	0.3665	0.0000*	1
Central Eastern Anatolia	0.0049*	-	0.0049*	-	0
Northeastern Anatolia	0.1509	0.0000*	0.1509	0.0000*	1

Note: MacKinnon (1996) one-sided p values are reported in this table.* and ** indicate rejecting the null hypothesis of unit root at %1 and %5 significance level, respectively.

X and M are found to be non-stationary at their levels but stationary at their first differences in all regions except Central Eastern Anatolia. In consequence of ADF test results, $d_{\max_i}$ for the variables is determined as one for the other regions excluding Central Eastern Anatolia. Beside this, $d_{\max}$ in the system is determined as one.

In the third step, the null hypothesis is tested by performing LA-VAR approach. The results are given in Table 6.

Table 6: E-K (2011) Test Results

		X→M		M→X	
Regions	**Lag(p)**	**Wald**	**p-value**	**Wald**	**p-value**
Istanbul	4	16.738*	0.002	13.391*	0.010
Eastern Marmara	3	9.320**	0.025	34.089*	0.000
Aegean Region	5	16.611*	0.005	48.250*	0.000
Western Anatolia	3	5.718	0.126	3.190	0.363
Mediterranean Region	4	11.077**	0.026	8.457***	0.076
Southeastern Anatolia	4	13.072*	0.011	18.434*	0.001
Western Black Sea	3	3.650	0.302	11.308*	0.010
Central Anatolia	4	11.093**	0.026	2.915	0.572
Western Marmara	3	11.119*	0.011	1.556	0.669
Eastern Black Sea	3	3.537	0.316	4.938	0.176
Central Eastern Anatolia	3	13.939*	0.003	3.025	0.388
Northeastern Anatolia	2	7.905**	0.019	6.647**	0.036
		Fisher Test Stat.		**Fisher Test Stat.**	
Panel Results	-	91.158*		123.480*	
Critical Values	-	1%	5% 10%	1%	5% 10%
	-	48.192	38.823 34.922	47.806	39.276 35.081

Note: *, ** and *** indicate significance at the 1%, 5% and 10% levels, respectively. Maximum number of lag is set to 12 and lag orders are selected by minimizing the Akaike information criteria as suggested by E-K (2011).

Individual test results in Table 6 suggest that there are ten regions where at least one of the two null hypotheses Granger no causality from X to M and M to X is rejected at the different level of significance. It was found that six regions had bidirectional causality, four regions had unidirectional causality between X and M. As for Western Anatolia and Eastern Black Sea we found the null hypotheses of Granger no causality from X to M and M to X are not rejected at 10% significance level. However, it should not be overlooked that there is causality from X to M at 13% significance level in Western Anatolia.

Fisher test statistic value for assessing an overall hypothesis for twelve regions is also given in Table 6. According to stated by E-K (2011: 875), since the limit distribution of the Fisher statistic is not valid in case of cross-section dependence, the bootstrap method should be used for generating the empirical distribution of Fisher test. The critical values obtained at the 1%, 5% and 10% levels are given in the last row of Table 6. Empirical findings indicate that there are bidirectional causality between X and M at the 1% significance level.

5. Conclusions

The purpose of this research is to investigate the causality between exports and imports regionally with monthly data of 2002-2019 period in Turkey. For five of the top six regions in the highest foreign trade volume ranking, bidirectional causality has been concluded. The results of these regions consisting of Istanbul, Eastern Marmara, Aegean region, Mediterranean region and Southeastern Anatolia, which constitute approximately ninety five percent of the foreign trade volume, support the panel result. In addition to these regions, bidirectional causality has been also found in Northeastern Anatolia, which is the last in the ranking of foreign trade volume. The bidirectional causality relationship obtained from both the panel and the individual results is consistent with the literature, considering that most studies in the literature also obtained bidirectional causality. In the literature, as in bidirectional causality, the causality from import to export is interpreted as import-based export and it has been determined in the Western Black Sea Region.

Causality found from exports to imports at the significance level of 10% for three regions and 13% for one region suggests that an increase in imports is caused by increase of exports. In other words, the import capacity in these regions consisting of Central Anatolia, Western Marmara, Central Eastern Anatolia and Western Anatolia is explained by export.

The foreign trade balance, which gives the difference between exports and imports, is one of the most important factors in terms of domestic income. The relationship between export and import, the direction of causality between them and the problem of dependency are also important issues on this occasion. Especially, the bidirectional causality relationship between the two variables means that the foreign trade balance enters a vicious circle, which is undesirable for a country with a foreign trade deficit. At the beginning of this study, it was assumed that the relationship between export and import in the context of regional trade differences also showed regional differences. The findings confirmed this and showed which regions have the import-dependent export feature. Thus, it indirectly shows which regions are the source of foreign trade deficit. In this context, the regions to focus on are as follows: Istanbul, Eastern Marmara, Aegean region, Mediterranean region, Southeastern Anatolia, Northeastern Anatolia and Western Black Sea Region.

The determination of regional foreign trade performances is very important for reaching national targets and it is guiding in terms of the targets prepared by developing a special strategy map, such as Turkish Export Strategy for 2023. As a matter of fact, the success of the national target also depends on the performance of regional and local export strategies.

In this case, the relationship between the two variables should be turned in favor of exports with various policies to be followed. At this point, both foreign trade policies and a set of policies for the production sector have to come into play. However, it is imperative that these discussions go beyond narrowly defined foreign trade policies (such as tariffs, quotas, export subsidies).

Rather than the regions where export-based imports are determined as a result of analysis, setting target for the regions as priority where import-based exports are determined will contribute positively to the trade balance. In these regions, it is essential to reduce the import dependency of exports and to achieve import substitution, at least to the quality of the

imported goods. Aiming to increase exports only as absolute value and not focusing on value added will not result in any other than bringing the increase in imports due to import dependent exports. Therefore, it should be aimed not only to increase the export as an absolute value, but also to increase the domestic value added of exports. Likewise, the reduction of imports should be realized in a planned manner and should not be focused only on absolute value.

According to the export figures of sectors by regions in 2019 and 2020 of Turkish Exporters Assembly, the leading sectors in exports in regions with import-based export are as follows, respectively: Ready-made clothing and apparel, chemicals and products, steel, automotive industry, electrical and electronics in Istanbul; electrical and electronics, chemicals and products and Ready-made clothing and apparel, steel in Aegean region; automotive industry and chemicals and products in Eastern Marmara; steel, fresh fruit and vegetable and cereals, pulses, oilseeds and products in Mediterranean Region; steel and automotive industry in Western Black Sea; chemicals and products and automotive industry in Northeastern Anatolia; cereals, pulses, oilseeds and products, chemicals and products, carpet, textiles and raw materials in Southeastern Anatolia. The share of industrial products in Turkey's 2020 exports is approximately 63%. In terms of industries, the leader is the automotive industry. The automotive industry is followed by steel, agro-processed products and electrical and electronics. According to the foreign trade data in 2019 of TurkStat by regions, the regions with the highest share in total imports are respectively: Istanbul, Eastern Marmara, Aegean Region, Western Anatolia, Mediterranean Region, Southeastern Anatolia, Western Black Sea. In all regions, the import of manufacturing industry products is by far ahead.

Precisely in this regard, it is necessary to provide the appropriate environment and incentives for the domestic production of expensive imported intermediate inputs in automotive industry, steel, electrical and electronics. Secondly, imports for consumption and investment purposes should be shifted to domestic goods by increasing the variety of domestic production, increasing its quality and creating opportunities to produce non-existent products. Thirdly, it is also important to support R&D activities and to expand and strengthen technoparks and to support them with incentives and tax benefits.

Finally, in particular, the process, in which global trade has begun to transform, can be considered as an opportunity for change; otherwise, the consequences may be severe. For example, one of the most important of this transformation is the Carbon Border Adjustment Mechanism (CBAM), which is one of the main measures within the scope of the European Green Deal and proposes a levy on specific products' imports (such as steel, iron, electricity, cement) with concerns about carbon leakage and climate change. The EU's CBAM measure, which has a share of approximately 50% in our total exports, may have bad results in terms of exports because of unilateral actions of EU if Turkey cannot achieve transformation. In this respect, it is necessary to ensure the transition to a low-carbon economic model in export sectors; especially in terms of steel, which has a high share in our exports. According to the result obtained from the analysis, we reach the conclusion that especially Istanbul, Aegean, Mediterranean, western Black Sea regions should be focused in terms of transformation. Besides, ensuring this transformation is also important for our sustainable development goals.

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Author's Contribution Statement

The same author contributed to all phases of the study.

Conflicts of Interest Statement

The author certify that she have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

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