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Analysis of the Relationship Between Trade Openness and Inflation: Evidence from MIKTA Countries

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Ticari Açıklık ve Enflasyon İlişkisinin Analizi: MIKTA Ülkelerinden Kanıtlar

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Abstract

Foreign trade plays a key role in the development of a country's economy and international social relations. Accordingly, the increase and decrease in a country's trade openness directly and indirectly affects macroeconomic indicators. In short, it is important to know the expected relationship between trade openness and inflation for a country's economy. Investigating the relationship between trade openness and inflation is important in keeping inflation under control, along with foreign trade policy practices. On the other hand, the theoretical basis of the association between trade openness and inflation is known with the Romer (1993) Hypothesis. According to the Romer Hypothesis, it is argued that an increase in trade openness will negatively affect inflation. However, although there are findings supporting this theory for the studies done so far, there are empirical studies expressing the opposite. This study has investigated this relationship in MIKTA countries. Kónya (2006) panel causality test was used in the study using annual data between 1960 and 2020. In result of the paper, it is found that there is no causal linkage between trade openness and inflation in countries. These results do not coincide with the Romer (1993) Hypothesis.

Keywords: Trade openness, inflation, Kónya (2006) panel causality test.

Makale Bilgileri

Makale Türü: Araştırma Makalesi

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Öz

Dış ticaret, bir ülkenin ekonomisi ve uluslararası sosyal ilişkilerin gelişiminde kilit rol almaktadır. Buna bağlı olarak bir ülkenin ticari açıklığının artması ve azalması makroekonomik göstergeleri doğrudan veya dolaylı olarak etkilemektedir. Kısaca bir ülke ekonomisi için ticari açıklık ve enflasyon arasında gerçekleşmesi beklenen ilişkininin bilinmesi önemlidir. Ticari açıklık ile enflasyon ilişkisinin araştırılması, dış ticaret politikası uygulamaları ile birlikte, ayrıca enflasyonun da kontrol altına alınması için önemlidir. Diğer bir taraftan da ticari açıklık ve enflasyon ilişkisinin teorik temeli Romer (1993) Hipotezi ile bilinmektedir. Romer Hipotezi'ne göre ticari açıklıkta artışın enflasyonu negatif yönde etkileyeceği savunulur. Fakat bu zamana kadar yapılan çalışmalar için bu teoriyi destekler nitelikte bulgular olsa da tam tersini ifade eden ampirik çalışmalar da mevcuttur. Bu çalışma ise MIKTA ülkelerinde bu ilişkiyi araştırmıştır. 1960-2020 dönemi yıllık veriler kullanılarak yapılan bu çalışmada, Kónya (2006) panel nedensellik testi uygulanmıştır. Çalışma sonucunda ülkelerde ticari açıklık ve enflasyon arasında bir nedensellik ilişkisinin olmadığı yönünde bulgulara erişilmiştir. Erişilen bu sonuçlar Romer (1993) Hipotezi ile örtüşmemektedir.

Anahtar Kelimeler: Ticari açıklık, enflasyon, Kónya (2006) panel nedensellik testi.

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1. Introduction

Trade openness is roughly the degree of freedom of the policies implemented by the world countries in parallel with their trade relations with one another. With a different definition, trade openness is the liberalization of the flows of goods and services by national and transnational actors around the world (Özyıldız et al., 2018: 337). The absence of barriers such as tariffs, quotas, licenses and currency controls in foreign commence is an indicator of liberalization of trade (Barutçu and Arslan, 2016: 404). Trade openness, which is obtained by dividing the sum of a country's export and import in a given period to its gross domestic product, provides an important framework for the integration of countries into the world economy (Özçağ and Bölükbaş, 2018: 113).

Global economic developments have increased the interdependence and interaction power of national economies. International economic relations have intensified with the liberalization policies that have accelerated in developed and developing countries since the 1980s. The economic dependency that has increased with the globalization process has made itself felt strongly in the foreign trade sector as well as in the capital and finance sectors (Barutçu and Arslan, 2016: 404). The expansion of import and export volume and opening of countries to foreign trade increase foreign exchange earnings and foreign exchange outlays. As the increases in import and export items occur, the share of foreign trade in national product will also be positively affected (Demir, 2021: 326).

The prevailing view among economists is that economies without trade barriers and restrictions generally grow and develop faster. Reducing restrictions on import and export attracts foreign investments to economies and thus contributes to the expansion of the competitive environment. It is known that trade openness has positive effects on national output, employment and consumption level as well as its contribution to economic growth. Trade liberalization increases the demand for a country's output, leading to an increase in consumption, employment and GDP (Çoban, 2020: 652). It is also known that trade openness positively affects economic efficiency. Increased productivity generates new investments, resulting in an increase in employment and an improvement in real wages. Trade openness is considered to be a significant tool for economic growth for developed and developing countries (Idris et al., 2016: 282).

Trade integration will enable the efficient allocation of resources in the economy through economies of scale and economies of scope. The increase in international trade facilitates knowledge diffusion and technology transfer between countries. Importing goods and services produced with advanced technology will reduce costs and increase total factor productivity (Silajdzic and Mehic, 2017: 582).

In the economics literature, the first study examining the relationship between trade openness and inflation belongs to Romer (1993). In Romer's study, it was stated that the controlled implementation of expansionary monetary policies and the proper management of foreign trade policies in countries open to foreign trade can reduce inflation. Romer (1993) investigated the relationship between the ratio of import to GDP, which he chose as a measure of openness in trade, and average inflation rates for 114 countries. Romer's conclusion was that international specialization and economies of scale slow down the rate of increase in prices provided that costs are reduced, and that the increase in the degree of trade openness of countries will make it difficult to implement expansionary monetary policies. For these reasons, he suggested that countries would experience lower inflation rates (Demir, 2021: 326).

2. Theoretical Framework

The Keynesian demand function states that export increases aggregate demand while import decreases it. Accordingly, an increase in export in open economies will increase domestic income and thus aggregate demand. Increased aggregate demand will cause to increase in the general level

of domestic prices, that is inflation. On the other hand, an increase in import will cause a part of the national income to leak abroad, thus reducing aggregate demand and inflation (Şahin, 2018: 127).

The growth of export will increase the demand for goods and services at the global level. At the same time, if the goods and services produced are not offered for domestic consumption, the quantity supplied in the country will decrease and prices will increase in both cases. On the other hand, increases in output will lead to a decrease in production costs thanks to economies of scale, and thus more goods and services to be produced. This, in turn, will affect the general level of prices to decrease (Göçer and Gerede, 2016: 28).

The relationship between import and inflation can be revealed relatively more clearly. In countries that produce in large quantities and have the capacity to produce cheap goods such as China, price competition among firms producing in domestic markets accelerates. In such a case, production costs are decreased and firms engage in research and development activities in order to increase productivity in manufacture. On the other hand, cheap intermediate and final goods obtained through importation play a role in reducing market prices. The demand for cheap imported goods increases when demand-pull inflation and cost-push inflation occur in the country. Consumers demand cheap final goods and producers demand cheap intermediate commodities, leading to an increase in import. In addition, high domestic inflation rates will reduce the competitiveness of exporting companies and reduce the countries' export (Göçer and Gerede, 2016: 29).

The adverse effect of the increase in the degree of openness to foreign trade on inflation is explained by the discretionary monetary policy implementations of the central banks. Discretionary policies are policies that are formed by not preventing the policy authority from using unanticipated inflation to obtain short-term production gains. As the economy opens to foreign trade, unforeseen monetary expansions will increase inflation costs, and as a result, production gains will decrease. Therefore, the willingness of the policy authority to create monetary expansion through unforeseen inflation will decrease in a discretionary monetary policy environment. Thus, the average inflation rate will decrease as the openness to foreign trade increases (Gür, 2021: 37). According to Romer (1993), an increase in TO will reduce INF as a result of the development of domestic production, but increasing the degree of openness will require a higher increase in domestic prices to achieve certain output growth. For this reason, policy makers have less incentives for monetary expansion in open economies.

When monetary expansion is made in open economies, the real value of the national currency falls. As a result, the inflationist pressure increases as imported goods become relatively expensive and exported goods relatively cheap. The real depreciation of the national currency due to unforeseen increases in the money supply boosts the demand for exported goods that have become cheaper and domestically produced substitutes for imported goods. On the one hand, the increase in the prices of imported goods causes the prices of imported goods to be included in the price index; on the other hand, it increases the demand for domestically produced substitute goods due to the decreasing amount of imported products. This situation directly or indirectly creates inflationist pressure. The increase in the demand for exported goods which have become relatively cheaper as a result of monetary expansion may also increase INF. In closed economies, excess demand resulting from monetary expansion occurs only for domestic goods. In economies open to foreign trade, the transformation of excess demand into demand for imported goods can alleviate the pressure of monetary expansion on INF (Araç, 2013: 30).

Romer (1993) emphasizes that international specialization and economies of scale reduce costs, which causes international trade to eliminate inflationary effects. Besides, he argues that it will become increasingly difficult to implement expansionary monetary policies as the degree of countries' trade openness increases. Because devaluation will rapidly increase domestic prices, open economies will be more careful in their monetary policy implementations. For these reasons, the countries' INF values will be at lower levels. However, it is essential for governments to implement

expansionary monetary policies in a controlled manner and to manage foreign trade policies properly in order to keep INF at low levels (Demir, 2021: 326; Gür, 2021: 37; Özçağ and Bölükbaş, 2018: 115).

According to Lane (1997), imperfect markets and constant nominal prices in non-tradable sectors are the cause of the inverse relation between TO and INF. Moreover, he defends the view that TO will make the Phillips curve steeper, and in this context he states that the increase in TO is effective in achieving lower INF rates. Terra (1998) emphasizes that the indebtedness levels of countries should be taken into account in the relationship between INF and TO. According to him, both unanticipated monetary expansions and debt crises can be determinants of INF. The lack of foresight in monetary policy reveals a negative bond between TO and INF in heavily indebted countries, and debt crises strengthen this relationship. The nexus between the two variables will be negative for countries with excessive debt burden and positive for other countries. Rogoff (2003) states that globalization increases the competitiveness of nations and results in anti-inflationary effects for countries by accelerating the deregulation and privatization process. Evans (2007) associates the inflationary effect that can be caused by TO with the increase in the prices of imported intermediate goods and the monopoly power of monetary authorities in international markets. Cooke (2010) explains that the terms of trade are associated with monopolistic price increases, which will make policy makers in open economies rely more on the short-term Phillips curve relation, frankly, TO will increase INF.

In the New Growth Theory, it is asserted that trade liberalization in small open economies will reduce INF by promoting economic growth, competition and optimum resource allocation. TO lowers INF by enhancing competition in the domestic market and diminishing the pricing power of firms (Mukhtar et al., 2019:48). According to this theory, changes in the composition of domestic and foreign inputs, cost decreasing productivity increases, the best and most effective allocation of resources, increasing the rate of capacity utilization, and increasing the foreign investment that can boost production are effective in alleviating the pressures on prices (Munir et al., 2015: 25-26).

3. Literature Review

When the literature on the relationship between TO and INF is examined, it is seen that there is no consensus both theoretically and empirically. While some studies have revealed that TO has a positive effect on INF, most of the studies have concluded that TO negatively affects it. On the other hand, there are studies suggesting that there is no correlation between these two variables. The reason why the causality relations between these variables investigated are different in studies can be explained by the dissimilar econometric techniques used, different country groups examined and the periodic differences. Some of the empirical researches in the literature are as follows:

Iyoha (1973) investigates the TO-INF nexus for 33 less developed countries with the OLS method. The results of the study reveal that TO affects INF negatively. Bayraktutan and Arslan (2003) examine the relation of exchange rate, import volume and INF for Turkey by using the data of 1980-2000 period. The results of OLS, cointegration and granger causality analyzes show that there is a negative relationship between the import volume and INF rate. Gruben and Mcleod (2004) examine the relationship between TO and INF for developing countries with the data of the years 1971-2000. The authors conclude that there is a negative link between INF and TO, and that the INF rate is less volatile in open economies. They also determine that TO creates stronger disinflationary effects in countries with floating exchange rate regime. Alfaro (2005), in his article prepared with panel data analysis on developed and developing economies through data on the years of 1973-1998, emphasizes that TO does not have a role in reducing INF in the short-term, on the other hand, the fixed exchange rate regime plays an essential role. Daniels et al. (2006) carry out a theoretical study on seventeen countries within the framework of the 1970-1999 period and examine the relationship between TO, centralized wage bargaining and INF. The indications of the study show that an increase in TO is

more likely to reduce INF in economies with low centralized wage bargaining. Lin (2010) finds that there is an inverse relationship between TO and INF in her study for 106 countries for the period 1970-2007. She concludes that the negative nexus between TO and INF is stronger during periods of high INF. Samimi et al. (2011) suggest that there is an existence of a long-term relationship between the variables on the Iranian economy using the ARDL bound test. Besides, they determine that TO has a negative and statistically significant effect on INF in the short-term while it does not have a statistically significant effect on price level in the long-term. Güneş and Konur (2013) apply the Granger causality test for Turkey using the data for the period of 2000-2011. They emphasize that there is a negative causality relationship from TO to INF in the short-term while there is a bidirectional relationship between the variables in the long-term. Özyıldız et al. (2018) test the relationship between TO and INF with panel data method for 19 emerging market economies. Panel cointegration test results reveal that when TO increases by 1%, INF decreases by 0.6%. On the other hand, panel causality test results show that INF is the determinant of TO. Gür (2021) tests the short-term and long-term connections between TO and INF with the LM Bootstrap panel cointegration test and VECM model for the BRICS-T countries within the framework of the 2010-2020 period. The results of the analysis show that TO reduces INF both in the short-term and long-term. Atgür (2021) examines the relationship between TO and INF in Turkey using the Johansen cointegration test and Full Modified OLS estimation methods. The results of the Johansen cointegration test show that TO and the INF rate are related to each other in the long-term. Full Modified Least Squares estimate results reveal that TO has a negative impact on INF. The findings make the Romer hypothesis valid for the Turkish economy.

Jin (2006) uses the seven-variable VAR model for Korea and Japan and reveals the effects of changes in TO with impulse-response functions. According to the results of the study, no significant relationship is found in Japan while there is an inverse relationship between TO and INF in Korea. Özçağ and Bölükbaş (2018) examine the TO-INF nexus in the Turkish economy with symmetric and asymmetric cointegration and causality tests. According to the results of the Johansen cointegration test and Hacker and Hatemi-J (2006) causality test applied to reveal symmetrical relations, no cointegration and causality link is found between the series. According to the results of Hatemi-J and Irandoust (2012) hidden cointegration test and Hatemi-J (2012) hidden causality tests applied to determine the existence of asymmetrical relations among the mentioned variables, there is no causality relationship between the series, but it is observed that there is a long-term hidden cointegration relationship between TO and INF in the 1980-2015 period in Turkey. Şimşek and Hepaktan (2019) investigate the association between TO and INF in Turkey with time series. The impulse-response and variance decomposition analysis results of the VAR model show that there is an inverse relationship between TO and INF. On the other hand, the results of the Granger causality test show that there is no causal linkage between those two variables. Köse and Turan (2020) examine the relationship between TO and INF for emerging market economies such as South Africa, Mexico and Turkey with the NARDL model. Empirical findings show that while there is a relationship between TO and INF in all countries in the short-term, TO significantly affects INF only in Mexico in the long-term. Besides, it is concluded that there are asymmetric effects in the short-term and long-term.

Considering the studies suggesting that there is a positive correlation between the two variables, Taşçı et al. (2009) determine that TO has a positive effect on INF in Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Mexico, Paraguay, Peru, Uruguay and Turkey in their studies with panel data method. In another study conducted by Zakaria (2010) for the relationship between TO and INF for Pakistan economy with time series, it is indicated that the flexible exchange rate regime and the increase in the level of development reveal the existence of a positive connection between TO and INF. Thomas (2012) finds a positive relationship between TO and INF in her analysis of eight Caribbean countries. She concludes that international trade makes these countries vulnerable to external shocks, thus leads to instability. Lotfalipour et al. (2013) assert that MENA countries are exposed to higher INF as the degree of TO increases in their analyzes for the period of 1990-2010.

Göçer and Gerede (2016) analyze the effect of foreign trade on INF in Turkey with time series and conclude that increases in export and import step up INF. Babatunde (2017) finds that there is a positive nexus between TO and INF in the long-term in the study he conducts for Nigeria via NARDL model. Indications also show that TO affects INF in an asymmetric and non-linear manner. Chhabra and Alam (2020) find a positive relationship between INF and TO in their studies for India for the 1974-1975 and 2015-2016 periods using the ARDL model. Çoban (2020) investigates whether there is a bond between TO and INF in the Next 11 countries with the panel ARDL model. He finds a positive link between both variables in both the short-term and long-term. Demir (2021) examines the effect of TO on INF in D-8 countries with a panel cointegration test based on the 2000-2019 period. According to the results of the analysis, TO has a statistically significant and positive effect on INF.

In the literature, it is obvious that studies on the TO-INF relationship have reached contradictory results. Although many different models are used in applied studies, it is seen that there is no study with Kónya (2006) panel causality test. In this regard, the gap in the literature on the subject has been tried to be resolved through the Kónya (2006) panel causality test. Therefore, it is hoped that this study will contribute to the literature in this respect.

4. Method

In panel data analysis, it is first necessary to determine whether there is a dependency between the cross-section units in the panel. If the cross-section units in the panel are dependent on each other, it significantly affects the results to be obtained (Breusch and Pagan, 1980). In addition, this analysis provides information that first-generation panel unit root tests will be used in the absence of cross-section dependence regarding the assumptions of panel unit root tests, and secondary-generation unit root tests will be used in the presence of cross-section dependence. Breusch-Pagan (1980) LM, Pesaran (2008) CD_{LM} and Pesaran (2004) CD tests are used to investigate cross-section dependence in the literature.

Breusch-Pagan (1980) Lagrange Multiplier (LM) test is used when N is constant, T→∞ and T>N. The equation for the Breusch-Pagan (1980) LM test is as follows:

$$LM = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} Tij\, \hat{p}_{ij}^2 \sim x^2{}_{(N-1)/2} \tag{1}$$

$\hat{p}_{ij}^2$ specified in the equation, shows the square of the correlation between the residuals of i. and j. units. $\hat{p}_{ij}^2$ is calculated as:

$$\hat{p}_{ij}^2 = \hat{p}_{ij}^2 = \frac{\sum_{t=1}^{T} u_{it}\, u_{jt}}{(\sum_{t=1}^{T} u_{it})^{1/2} \left(\sum_{t=1}^{T} u_{jt}\right)^{1/2}} \qquad u_{it} = y_{it} - \hat{\beta}_i' x_{it} \tag{2}$$

Pesaran (2008) cross-section dependent lagrange multiplier (CD_{LM}) test is used in case of N→∞ and T→∞. The Pesaran (2008) CD_{LM} test is as follows:

$$LM = \sqrt{2/N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left[(T-R)\hat{p}_{ij} - M_{Tij})/\sigma_{Tij}\right] \tag{3}$$

R in the equation is the number of independent variable.

$$M_{Tij} = \frac{1}{(T-R)} izM_iM_j \tag{4}$$

$$\sigma_{Tij}^2 = \left[iz\left(M_iM_j\right)^2\right]\alpha_{iT} + 2iz\left(M_iM_j\right)^2\alpha_{iT} \tag{5}$$

$$\alpha_{iT}=\alpha_{2T}-\frac{1}{(T-R)^2} \quad (6)$$

$$\alpha_{2T}=3\left[\frac{(T-R-8)(T-R+2)+24}{(T-R+2)(T-R-2)+(T-R-4)}\right]^2 \quad (7)$$

$$M_i=1-x_i(x_i'x_i)^{-1}x_i' \quad (8)$$

$$x_i=(x_{i1},\dots,x_{iT})' \quad (9)$$

The Pesaran (2004) cross-section dependent (CD) test was developed after the Breusch-Pagan (1980) LM test statistic was insufficient when N was large.

Pesaran (2004) CD test statistic was created for balanced and unbalanced panels.

Pesaran (2004) CD test statistic for balanced panels:

$$CD=\sqrt{2T/(N-1)N}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}_{ij}^2 \qquad Tij = min(Ti, Tj) \quad (10)$$

Pesaran (2004) CD test statistic for unbalanced panels:

$$CD=\sqrt{2T/(N-1)N}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\sqrt{T_{ij}}\,\hat{p}_{ij}^2 \qquad Tij = min(Ti, Tj) \quad (11)$$

The basic hypothesis of the cross-section dependence is 'H_0: There is no cross-section dependence ($cov(u_{it}, u_{jt})=0$)', and the alternative hypothesis is 'H_1: There is a cross-section dependence ($cov(u_{it}, u_{jt})\neq 0$)'. If the statistical values reached in the case of the application of the tests are smaller than the probability values at different significance levels, the cross-section dependence between the units is determined.

Although the slope coefficients are heterogeneous in the panel data models, if they are assumed to be homogeneous, the coefficients obtained as a result of the least squares (OLS) method estimation become biased (Baltagi, 2005). Therefore, the homogeneity of the slope coefficients of the cross-section units should be investigated in order for the estimations to be consistent in panel data analysis. In the literature, the delta test of Pesaran and Yamagata (2008) is mostly used for testing homogeneity.

The equation for the delta test of Pesaran and Yamagata (2008) is as follows:

$$Y_{it}=\alpha+\beta_i x_{it}+\varepsilon_{it} \quad (12)$$

In Pesaran and Yamagata's (2008) delta test, the test statistics are calculated by first estimating with the panel OLS method and then with the weighted fixed effects model. The statistics for this test are calculated differently for small and large samples:

In large samples; $\tilde{\Delta}=\sqrt{N}\,(N^{-1}\tilde{S}-k)/\sqrt{2k}$ (13)

In small samples; $\tilde{\Delta}_{adj}=\sqrt{N}\,(N^{-1}\tilde{S}-k)/\sqrt{Var(t,k)}$ (14)

$\tilde{S}$ Swamy test statistic and $Var_{(t,k)}$ indicate the standard error shown in the equations.

Pesaran and Yamagata's (2008) delta test's basic hypothesis is 'H_0: Slope coefficients are homogeneous ($\beta i=\beta$)', and the alternative hypothesis is 'H_1: Slope coefficients are not homogeneous ($\beta i\neq\beta$)'. If the statistical value obtained as a result of the test is smaller than the probability values at different significance levels, it is reached that the slope coefficients of the units are not homogeneous.

Kónya (2006) causality test uses bootstrap critical values calculated for cross-section units and Zellner's (1962) apparently unrelated regression estimator. While there is a cross-section dependency

in panel data analysis, more reliable results are obtained when using apparently unrelated regression estimators compared to OLS estimators. The advantages of the test are that it allows series containing unit roots and assumes no homogeneity.

The equations for the Kónya (2006) panel causality test are as follows:

$$Y_{1,t} = \alpha_{1,1} + \sum_{i=1}^{ly_1} \beta_{1,1,i} Y_{1,t-i} + \sum_{i=1}^{lx_1} \delta_{1,1,i} X_{1,t-i} + \varepsilon_{1,1,t} \quad (15)$$

$$Y_{2,t} = \alpha_{1,2} + \sum_{i=1}^{ly_1} \beta_{1,2,i} Y_{2,t-i} + \sum_{i=1}^{lx_1} \delta_{1,2,i} X_{2,t-i} + \varepsilon_{1,2,t} \quad (16)$$

$$Y_{N,t} = \alpha_{1,N} + \sum_{i=1}^{ly_1} \beta_{1,N,i} Y_{N,t-i} + \sum_{i=1}^{lx_1} \delta_{1,N,i} X_{N,t-i} + \varepsilon_{1,N,t} \quad (17)$$

$$Y_{1,t} = \alpha_{2,1} + \sum_{i=1}^{ly_2} \beta_{2,1,i} Y_{1,t-i} + \sum_{i=1}^{lx_2} \delta_{2,1,i} X_{1,t-i} + \varepsilon_{2,1,t} \quad (18)$$

$$Y_{2,t} = \alpha_{2,2} + \sum_{i=1}^{ly_2} \beta_{2,2,i} Y_{2,t-i} + \sum_{i=1}^{lx_2} \delta_{2,2,i} X_{2,t-i} + \varepsilon_{2,2,t} \quad (19)$$

$$X_{N,t} = \alpha_{2,N} + \sum_{i=1}^{ly_2} \beta_{2,N,i} Y_{N,t-i} + \sum_{i=1}^{lx_2} \delta_{2,N,i} X_{N,t-i} + \varepsilon_{2,N,t} \quad (20)$$

The l in the equations represents the optimal lag length.

As a result of Kónya (2006) panel causality test, if $\delta_{1,j,i}$ and $\delta_{2,j,i}$ are not equal to zero for cross-section units, bidirectional between X and Y; if $\delta_{1,j,i}$ is not equal to zero for cross-section units and $\delta_{2,j,i}$ is equal to zero for cross-section units, there is a unidirectional Granger causality from X to Y; if $\delta_{1,j,i}$ and $\delta_{2,j,i}$ are equal to zero for cross-section units, there is no Granger causality between X and Y.

5. Data and Findings

In the study, the relationship between TO and INF was investigated. Within the scope of the research, the annual data of Mexico, Indonesia, South Korea, Turkey and Australia, which are expressed as MIKTA countries, for the period 1960-2020 were included. TO was calculated from the formula [(import+export)/GDP]*100 as stated in Aizenman (2008). These data were taken from 'data.worldbank.org'. Kónya (2006) panel causality test was used to determine the relationship between TO and INF in MIKTA countries.

The first step for panel data analysis is to test the cross-section dependence in the models. In the study, Breusch-Pagan LM (1980), Pesaran CD_{LM} (2008) and Pesaran CD (2004), which are of cross-section dependence tests were applied. The results of these tests are given in Table 1.

Table 1. Cross-Section Dependency Test Results

Test Type	Model 1: TO↛INF		Model 2: INF↛TO	
	Test Statistics	Probability	Test Statistics	Probability
Breusch-Pagan LM	273.910***	0.000	539.812***	0.000
Pesaran CD_{LM}	59.012***	0.000	118.470***	0.000
Pesaran CD	16.093***	0.000	23.218***	0.000

Note: *** denotes 1% significance level.

According to the results of the Breusch-Pagan LM (1980), Pesaran CD_{LM} (2008) and Pesaran CD (2004) cross-section dependence tests in Table 1, cross-section dependence was reached in both models at the 1% significance level. In line with these results, it is inevitable that the shock occurring in any of the countries examined will affect the others.

The second step in panel data analysis is to test the homogeneity/heterogeneity of the slope coefficients of the units. For that purpose, Pesaran and Yamagata's (2008) delta test was applied to determine it. The results of delta test are given in Table 2.

Table 2. Homogeneity Test Results

Test Type	Model 1: TO↛INF		Model 2: INF↛TO	
	Test Statistics	Probability	Test Statistics	Probability
$\tilde{\Delta}$	3.536***	0.000	7.721***	0.000
$\tilde{\Delta}_{adj}$	3.654***	0.000	7.915***	0.000

Note: *** denotes 1% significance level.

According to the delta test results of Pesaran and Yamagata (2008) in Table 2, it was concluded that the slope coefficients of the units were heterogeneous in both models at the 1% significance level. Kónya (2006) panel causality test was applied to determine the relationship between TO and INF in MIKTA countries due to the presence of cross-section dependence and heterogeneity in the models. The results of this test are given in Table 3.

Table 3. Kónya (2006) Panel Causality Test Results

Model Type	Countries	Wald Test Statistics	Bootstrap p Value	Critical Values		
				%1	%5	%10
Model 1: TO↛ INF	MEX	4.496	0.060	7.515	4.505	3.817
	IDN	1.955	0.210	7.912	5.813	4.276
	KOR	0.670	0.430	9.073	5.656	2.956
	TUR	1.097	0.280	7.810	4.092	2.645
	AUS	0.086	0.830	7.476	2.977	1.931
Panel Fisher: 13.355 **p-value:** 0.205						
Model Type	**Countries**	**Wald Test Statistics**	**Bootstrap p Value**	**Critical Values**		
				%1	**%5**	**%10**
Model 2: INF↛TO	MEX	0.237	0.680	4.947	3.375	2.385
	IDN	0.260	0.660	7.747	5.005	3.361
	KOR	2.277	0.110	4.800	3.122	2.279
	TUR	1.335	0.500	11.531	7.582	5.274
	AUS	0.101	0.790	17.179	6.245	3.660
Panel Fisher: 7.875 **p-value:** 0.641						

According to the Kónya (2006) panel causality test results in Table 3, it has been found that there is no causality between TO and INF, both on the panel basis and on the basis of countries.

6. Results and Evaluations

Trade globalization has led to the liberalization of trade relations in parallel with the increase in international trade in goods and services. Globalization of trade, on the other hand, covers the process of removing or reducing restrictions on the flows of goods and services between countries. The transformation experienced in the 1980s with the effect of globalization pushed the countries to implement open economy policies. Foreign policy practices of countries, especially in foreign trade relations, have an important place in terms of openness. Openness is a concept used to reveal the conditions under which a country integrates with other countries, which foreign or inward economic policy it implements or which one of them gives more importance, and the size of its commercial relations with each other.

In an open economy, foreign direct investment and the entry of new goods and technologies into the country change the domestic markets. Besides, export and import also increase due to possible endogenous growth symptoms arising from short-term growth, developments such as obtaining higher returns by countries' access to larger and wider markets, encouraging innovation and entrepreneurship activities by the government, and increasing competition. There are many studies in the literature that reveal the relationship between TO and INF in national economies. Although a consensus could not be reached, studies mostly revealed the existence of a negative relationship between the two indicators. The view that specialization and economies of scale that come with trade openness will reduce production costs and support the expectation that inflation will be at low levels (Güneş and Konur, 2013). Romer (1993) emphasized that INF will occur at low levels in commercially open economies, if the implementation of expansionary monetary policies is controlled and foreign trade policies are correctly managed. On the other hand, Romer (1993) suggested in his study that the INF rates of small and open economies would be lower. According to Romer, higher INF rates can also be encountered in closed economies.

In line with the importance of the subject, in this study, the relationship between the inflation and TO of countries was sought to be investigated. For the preliminary tests of this application, the cross-section dependency test was applied in the first stage, and then the homogeneity test was applied. According to the Breusch-Pagan (1980) LM, Pesaran (2008) CD_{LM} and Pesaran (2004) CD cross-sectional dependency tests, cross-section dependency was reached at the 1% significance level in the models (model 1: TO$\nrightarrow$ INF, model 2: INF$\nrightarrow$TO). Pesaran and Yamagata's (2008) homogeneity test indicates that models were heterogeneous at the 1% significance level. According to the results of the lastly applied Kónya (2006) panel causality test, there is no causality relationship between the TO and INF of MIKTA countries on the basis of both the panel and the countries. The findings obtained from this study contain different results from the literature. This result proves that not only the trade openness issue but also many internal variables are effective on inflation in selected countries. This study shows that the effects of domestic dynamics are more dominant on the increases and decreases in the price level as of the selected country group and period. It is thought that the development levels and economic structures of the countries are effective in the differences with the Romer (1993) theory on the results. However, it is hoped that the study will contribute to the academic literature and it is expected to provide a foresight for policy makers.

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