

# An Analysis of the Dynamic Panel Gravity Model: The Effect of Immigration Flows from Turkey to OECD Countries on Foreign Trade

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**Abstract:** This study analyzes how bilateral trade between Turkey and Organisation for Economic Co-operation and Development (OECD) countries has been affected by the immigrant flows from Turkey to OECD countries. The main objective is to unveil which channels of foreign trade are affected by immigrant flows from Turkey to OECD countries. Most empirical studies examining the static relationship between international migration and bilateral foreign trade take advantage of panel gravity models. This paper outlines a new approach on using a dynamic panel gravity model to analyze the dynamic relationship between international migration and bilateral foreign trade. This study tests the impact of immigrant flows from Turkey to OECD countries on bilateral foreign trade between countries from 2000-2016 for the first time using the system GMM estimation method. The evidence from this study indicates the relationship between bilateral foreign trade and immigrant flows from Turkey to OECD countries from Turkey to have complementarity. In addition, this study's findings indicate immigration flows from Turkey to OECD countries to contribute to the exports from immigrants' host countries and to increase Turkey's imports. The results show these immigrant flows to be effective by means of networking channels in terms of foreign trade.

**Keywords:** International migration, immigrant flows, foreign trade, bilateral foreign trade, dynamic panel gravity model.

**Öz:** Bu çalışma, Türkiye ile OECD ülkeleri arasındaki ikili ticaretin Türkiye'den OECD ülkesine giden göçmen akımlarından nasıl etkilendiğini incelemeyi amaçlamaktadır. Çalışmanın temel hedefi, Türkiye'den 23 OECD ülkesine giden göçmenlerin dış ticareti hangi kanallar ile etkilediğini ortaya koymaktır. Uluslararası göç ve ikili dış ticaret arasındaki statik ilişkiye incelemek amacıyla uygulamalı analizler yapan çalışmaların büyük bir kısmı, panel çekim modellerinin avantajlarından faydalananlardır. Ancak biz uluslararası göç ile ikili dış ticaret arasındaki dinamik ilişkiye analiz etmek için dinamik panel yerçekimi modelini kullanmayı tercih ettiğim. Bu manada, literatürde daha önce yapılmamış biçimde, 2000-2016 yılları arasında Türkiye'den OECD ülkelerine yaşanan göç akımlarının ülkeler arası ikili dış ticaret üzerindeki etkisi dinamik olarak sistem GMM tahmin yöntemi ile test edilmiştir. Ülkeler arasındaki ikili dış ticaret ilişkisi ve Türkiye'den OECD ülkelerine giden göçmen akımları arasındaki ilişkinin tamamlayıcı nitelikte olduğu sonucuna erişilmiştir. Buna ek olarak, Türkiye'den OECD ülkelerine giden göç akımlarının, göçmenlerin sonradan göç etmiş oldukları ülkelerin ihracatını artırdığı, ihracatına katkı sağladığı, Türkiye'nin ithalatını artırdığı elde edilen sonuçlar arasındadır. Çalışmanın analiz bulguları göstermektedir ki; OECD ülkelerine Türkiye'den giden göçmen akımları, Türkiye ve OECD ülkeleri arasındaki karşılıklı dış ticareti network (bilgi) kanalı ile etkilemektedir.

**Anahtar Kelimeler:** Uluslararası göç, göçmen akımları, dış ticaret, karşılıklı dış ticaret, dinamik panel gravity modeli.

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## Introduction

Migration is an individual or collective relocation activity that has been performed through humanity's existence. During humanity's primitive age, people migrated for reasons based on climate, weather, and living conditions; over time, people started to migrate for other reasons. Now, millions of people migrate to access social welfare and better living conditions. Globalization has deepened and changed the form, causes, and effects migration movements have on countries. In this context, foreign trade has become increasingly necessary due to technological, innovative development, workforce, and welfare differences between countries. The effects of individual tastes and preferences as well as developments in telecommunications and transportation have facilitated international trade by reducing the costs of foreign trade. In light of this information, foreign trade and migration are the two most essential components of globalization.

According to factor endowment theory, international trade is a substitute for immigration (Heckscher & Ohlin, 1949). Labor migration from country A to country B increases the amount of labor in country B. Factor price equalization theory states that a rise in wages in country A due to a decrease in labor supply results in a decrease in wages in country B. As a result, factor prices converge between the two countries (Samuelson, 1949). After this convergence, the comparative advantage before immigration disappears and creates a deterrent effect on trade. While traditional foreign trade theories revealed a substitutive relationship between migration and trade, by excluding some of the assumptions of these theories, the structure of the relationship between migration and trade to gain complementarity. When abandoning the assumptions of the Heckscher-Ohlin Theorem, the nature of this relationship reverses. In other words, the relationship between factor mobility and commodity trade becomes complementary (Mundell, 1957; Markusen, 1983). After Mundell (1957), most studies investigated if the relationship between foreign trade and factor mobility is complementarity or substitution. Gould's (1994) study is a guide for those working in this field. The immigrant flows between countries affect foreign trade through preferences and network channels. Immigrants do not change their consumption patterns too much and maintain their consumption patterns as if they were living in their home country. Thus, the import demand for the receiving country may increase. In addition, the citizens of the receiving country become more aware of the goods immigrants consume, and an additional consumption demand occurs; this situation creates the preference channel of preference. The other channel is the network channel; it impacts bilateral trade relations by reducing transaction

costs between two countries (Gould, 1994). The results from many studies citing Gould have emphasized the importance of the network effect of immigrants and expressed the idea that migration can reduce transaction costs between origin and host countries through ethnic networks or information mechanisms (Girma & Yu, 2002; Rauch & Trindade, 2002; Combes et al., 2002). The fundamental framework of the literature is that international trade and investment transactions struggle with unofficial trade barriers, as well as official trade barriers such as transportation costs and tariffs (Javorcik et al., 2011). Ethnic and social networks have an important task in promoting countries' economic relations. Making the most important contribution to the field in this sense, Rauch and Trindade (2002) emphasized ethnic Chinese networks in particular to increase bilateral trade through formal and informal intercourse.

This paper we examines the effect immigration flows from Turkey to OECD have on foreign trade using annual data between 2000-2016. At the same time, the paper determines whether the relationship between immigrant flows and foreign trade is substitution or complementarity in nature. Choosing the appropriate specification is very important in terms of determining the relationship between these variables. An inaccurate functional form can bias the estimates, and omitted variables that capture the forces promoting both trade and immigration levels will lead to an overestimate of the effect immigration has on trade. Head and Ries (1998), Dunlevy and Hutchinson (2001), Rauch and Trindade (2002), and Girma and Yu (2006) employed log-linear model specifications that assume a constant elasticity for the effect of immigration on trade. This specification is as natural as the basic gravity equation is static and log linear. Gravity models posit a log-linear relationship among trade volumes, origin and hosting countries' GDPs, and trade distances. Consistent with previous models, the model in this study introduces a model of trade and immigration that includes the comparative advantages and dynamic relationships between countries. This study performs a dynamic panel gravity analysis of the relationship between immigration flows and foreign trade using the system GMM estimation method. Despite using the same method as Benedictis and Vicarelli (2005); Faustino and Leitao (2008); Zarzosoa, Lehmann, and Horsewood (2009), this study's analysis focuses on data on trade and migration relations from Turkey. This study appears to be the first empirical study in the international economics literature to test the dynamic relationship between immigrant flows and foreign trade over the case of OECD countries and Turkey. The study tests the hypothesis regarding the complementary relationship between foreign trade and international migration. Determining the optimal number of immigrants in a country provides

some short-term and long-term ideas about countries. Examining the effects that migrant flows have on international trade is very important in terms of considering the macroeconomic benefits of migrant flows in terms of which migration policies to create. A well-implemented migration policy is expected to anticipate the labor supply to replace the aging population in the long run and increase market size.

This paper aims to investigate the effect immigrant flows from Turkey to the 23 OECD member countries<sup>1</sup> have on foreign trade. Total foreign trade between Turkey and OECD member countries constitutes about 50% of Turkey's total foreign trade. In this context, the objectives of this study are to test the hypothesis of complementarity of foreign trade and the migration relationship between Turkey and the selected OECD countries, to theoretically explain the effect of immigrant flows on foreign trade, and to develop a dynamic panel gravity model. The study is shaped around the following hypotheses: The immigrant flows from Turkey to 23 OECD countries positively affect bilateral trade (imports and exports) between Turkey and each OECD country between 2000-2016 (Hypothesis 1), and A complementarity relationship exists between immigrant flows and foreign trade from Turkey to OECD countries between 2000-2016 (Hypothesis 2). This study seeks to answer what impact immigrant flows from Turkey to 23 OECD countries have on foreign trade between 2000-2016?

Most models that analyze the determinants and effects of international migration use a simplified framework usually based on the Heckscher-Ohlin model (Mundell, 1957; Wong, 1986; Feenstra & Kee, 2008; Iranzo & Peri, 2009). However, these models are not particularly suitable for analyzing the dynamic relationship between migration and trade (Faustino & Leitao, 2008). This study makes certain new contributions. First, the article examines the impact of migration on two-way trade flows. Second, the dynamic panel data analysis, which provides more reliable results, is superior to the methods used in other studies. Third, the results verify the conclusion that immigration may be a tool that contributes to reducing transaction costs and stimulating Turkey's imports and exports.

The paper is organized as follows. The following section provides a literature review on the relationship between international migration and foreign trade. The second section provides a statistical explanation of the data for methodological

1 These countries include Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Germany, Hungary, Iceland, Israel, Italy, South Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Spain, Sweden, Switzerland, The United States.

considerations and variables. The third section concludes the paper with the policy implications and presents assessments, limitations, and a pathway for future investigation.

## **A Literature Review of Foreign Trade and Migration Relations**

The complementary relationship between trade and migration has been considered from two divergent methods in the current literature on international economics. The first method occurs in studies that assume migration to be a real factor arbitrage as part of neoclassical trade theory. These studies prioritize theoretical foundations (Mundell, 1957). The second method is found in studies discussing immigrant flows within the social structure in the context of networks and human capital. These studies also focus on empirical analysis (Gould, 1994; Head & Ries, 1998; Dunlevy & Hutchinson, 1999, 2001; Girma & Yu, 2002; Rauch & Trindade, 2002; Combes, Lafourcade, & Mayer, 2002; Bellino & Giuseppe, 2016).

Gould (1994) and Rauch (1991) conducted studies as an alternative to traditional trade theories based on the thesis that the relationship may have complementarity by criticizing the substitution relationship between international migration and foreign trade. Immigrants have knowledge of their own countries in terms of work, business culture, political and belief systems, and language. Immigrants who establish the networks and social and individual connections with their own countries affect the commercial relations between the immigrants' host and origin countries. As Gould (1994) pointed out, the immigrant flows affect foreign trade through preferences and network channels.

Gould (1994) conducted the first applied study in the literature on the link between migration and foreign trade. Gould examined the impact of immigrant flows on trade between 1970-1986 for the USA and 47 trade partners. Pioneering studies are also found to have investigated the effect of immigrant flows on foreign trade (Head & Ries, 1998; Dunlevy & Hutchinson, 1999-2001; Girma & Yu, 2002; Rauch & Trindade, 2002; Combes et al. 2002; Bellino and Giuseppe, 2016). In addition to these studies investigating developed countries, Bacarreza and Ehrlich (2006) analyzed the link between immigrant flows and foreign trade in Bolivia. Both export and import models can be created to model the effect of immigrant flows on foreign trade. In these models, immigrant flows may not affect import and export in the same way. Gould (1994) concluded that a new immigrant added to the number of immigrants had a greater marginal effect on exports than imports. However, Gould

also argued that immigrants have a greater impact on consumer goods in the market by distinguishing between consumption and production goods because consumer goods can be differentiated more easily than industrial goods.

The study results from Head and Ries (1998), Dunlevy and Hutchinson (1999, 2001), and Bacarreza and Ehrlich (2006) revealed immigrant flows to affect foreign trade through the preferences in trade channels. According to the results from Girma and Yu's (2002) study, network (information) channels are also effective. The results from practical studies testing the network hypothesis have suggested migrant flows to affect the trade of commodity groups, where knowledge is more important. Trade in differentiated goods require more immigrant knowledge than trade in homogeneous goods. Gould (1994) concluded the immigration-trade connection to be greater on the consumer goods sector than the industrial goods sector. Dunlevy and Hutchinson (1999-2001) found immigrant flows to affect the import of intermediate and final goods more than the import of raw materials.

Literature that explains the link between international migration and foreign trade prioritizes the relationship between migration and inter-industry trade. Unlike this perspective, analyzing the relationship between intra-industry trade and immigrant flows is imperative as trade these days is largely intra-industry, not inter-industry. Bellino and Celi (2016) concluded the immigrant flows for OECD and non-OECD countries with Italy to affect foreign trade between immigrants' host and origin countries through preferences in trade channels. However, immigrants that come to Italy affect the foreign trade between immigrants' host and origin countries through network channels. Bellino and Celi's article is essential as it highlights immigrants from OECD countries to impact horizontal intra-industry trade (HIIT) due to similar income distributions. They concluded immigrant flows from non-OECD countries to Italy to impact vertical intra-industry trade (VIIT) due to income differences. Immigrant flows to Italy from non-OECD countries negatively impact HIIT.

Girma and Yu (2002) found immigrant flows from commonwealth countries to the UK to have a powerful influence on foreign trade between immigrants' host and origin countries. However, Girma and Yu's results differ from Combes et al. (2002). Combes et al. emphasized the inter-regional impact of immigrant flows on foreign trade between immigrants' host and origin regions due to the many commonalities in the regions in France (e.g., language, business culture, social institutions, historical ties, and legal systems). He concluded countries with higher immigrant flow to trade more than countries with lower immigrant flows. As Wagner, Head, and Ries (2002) stated, the type of information that immigrants convey between countries is specific

personal information rather than pure corporate information. Indeed, the results from Girma and Yu's (2002) econometric analysis do not support the hypothesis that the effect of immigrants on trade is universal. Studies also emphasize the effect of migration on foreign trade to be insignificant. Özekicioğlu and Soyyiğit (2019) examined whether immigration to Germany from Central and Eastern European countries had impacted foreign trade between 2000-2016; they benefited from the panel gravity model in their study. The results from their study stated the effect channel between migration and trade to be affected by the nature of the migration as well as the number of migrations the country receives. Immigrants with low levels of education and knowledge are emphasized to not affect the host country's trade.

Most of the studies analyzing the foreign trade relations of countries are based on cross-sectional data. However, gravity model applications have become widespread in recent years with panel data analysis. Nevertheless, one should not forget that most of the analyses made with both cross-sectional data and panel data fall within the scope of static analyses. Trade relations between countries are formed on cumulative experience with cultural, political, and geographical factors. This should not be neglected, as lagged trade values affect current trade values. Therefore, dynamic model application results are more reliable than static model application results. Benedictis and Vicarelli (2005); Faustino and Leitao (2008); and Zarzoso, Lehmann, and Horsewood (2009) estimated the foreign trade relation between countries using dynamic panel gravity models. Zarzoso et al. (2009) and Benedictis and Vicarelli (2005) presented comparative results based on static and dynamic panel gravity models. When foreign trade relations are estimated by dynamic analysis rather than static analysis, better results are usually generated by obtaining the standard error terms of the regression. Also, the trade potential between countries has a dynamic structure that changes over time.

Therefore, dynamic panel gravity modeling should be considered more significant. Eichengreen and Irwin (1996) focused on the differences between the least squares dummy variable (LSDV) and the generalized moments model (GMM) for the estimation method. The static gravity model has expanded with the dynamic model. Zarzoso et al. (2009) compared results from the static and dynamic panel gravity models, obtaining unbiased estimators using multilateral resistance terms (MRTs) to maintain time variance in a static model. The dynamic panel gravity model can be estimated using GMM. The estimation results from the dynamic panel gravity model reveal more meaningful and robust estimators than the static model does.

## Methodology

### Econometric Model Options for Estimating Dynamic Panel Data

Panel data is better than cross-section and time-series data, offering more degrees of freedom and reducing multicollinearity among the explanatory variables, which increases the reliability of regression results. In panel data models, different control variables affecting trade besides gravity effects can also be included in the model. For this reason, preferring the panel gravity model is a common approach in studies in the field of international economy.

Influenced by Newton's law of gravity, Tinbergen (1962) used models, basing the foreign trade volume of two countries on national income and geographic distance. In this sense, Tinbergen is one of the leading researchers using the gravity model in foreign trade. Anderson (1979) and Bergstrand (1989) made an original contribution to developing the gravity model and its widespread use in international trade. Anderson (1979), Bergstrand (1989), Helpman and Krugman (1985), and Deardoff (1998) contributed to the micro-foundations of the gravity model by providing a formal theoretical framework for gravity equations.

The empirical literature on gravity models also took advantage of a dynamic theory of gravity. The majority of this literature was based on cross-sectional estimates until the 1990s. Since then, many studies have benefited from dynamic panel gravity econometric techniques when examining the effect of trade unions and trade agreements on bilateral trade within a dynamic structure (Olivero & Yotov, 2012, p. 66).

Modeling economic behavior over a certain period can be achieved through static panel data analysis using current period data. However, the behaviors of economic actors are greatly influenced by the values and experiences of the past. Dynamic panel data models are different from static panel data models as they contain the lagged values of the dependent variable. Dynamic panel data models include the lagged value of the dependent variable as an independent variable. Difference GMM and system GMM have become increasingly popular; they are considered powerful methods for predicting dynamic panel data models (Yerdelen Tatoglu, 2018, p. 113).

Dynamic panel data estimation methods exist that have different complementary features. Amemiya and MacCurdy (1986); Anderson and Hsiao (1982); Breusch, Mizon, and Schmidt (1989); and Hausman and Taylor (1981) aimed to eliminate endogeneity by modeling the relationship between the independent variable and

error term and introducing an instrumental variable. However, this method does not take into account unit effects. As a result, Hansen (1982); Holtz-Eakin, Newey, and Rosen (1988); and Arellano and Bond (1991) proposed the difference-GMM estimation method. The difference-GMM estimation method takes the first difference from the regression equation and eliminates the individual fixed effect in the model. After this, lagged variables are used as instrumental variables in the difference equation to control for the endogeneity. Arellano and Bover (1995) and Blundell and Bond (1998) proposed the system GMM estimator for panel data models where the GMM estimator is not suitable. The system GMM estimation method includes an additional hypothesis where the first differences of instrumental variables are not correlated with unit effects. In this way, the two-system equation creates the original equation and the transformed system.

The model results estimated by the pooled least squares assumption are inconsistent as they do not include country heterogeneity in the model. Although the fixed effects estimator includes unit effects in the model, it produces biased estimators due to the endogeneity problem. The system GMM estimator offers effective results for issues regarding endogeneity, omitted variables, and unobservable unit heterogeneity (Bond, Hoeffler, & Temple, 2001). This study uses system GMM with a higher number of lagged variables and the percentage of unit effects within the disturbance term, modeling with a larger number of countries over a shorter period (23 countries and 17 years). Arellano and Bover (1995) proposed diagnostic tests be employed to check the validity of the instruments in GMM estimations. Firstly, the autocorrelation test is designed to check the second-order autocorrelation in the first-differenced residuals. The null hypothesis states that no autocorrelations are present. If the null hypothesis cannot be rejected, no second-order autocorrelations can be said to exist, and the GMM estimator can be said to be valid and consistent. Afterward, the study applies the Hansen test to examine the validity of the instrumental variables used in the system GMM estimation. The null hypothesis is constructed such that overidentification restrictions are valid. Not being able to reject this null hypothesis means that the instruments used for GMM estimation are valid.

## Variable and Data Source Descriptions

This paper uses annual panel data for Turkey's exports to, imports from, and outgoing migrations to 23 OECD member trade partners for 2000–2016.

Firstly, exports (*exp*) and imports (*imp*) are taken as the dependent variables, proxied through the annual value of Turkey's exports and imports (in thousands of US dollars) with the selected 23 OECD countries. The data have been obtained from the Turkish Statistical Institute (TUIK). The OECD countries selected for the analysis are suitable as most of Turkey's imports and exports involve these countries over the 2000-2016 period. Secondly, immigrants from Turkey to OECD countries (*inmig*) measures the inflows of foreign population by nationality. The data were extracted from OECD. Thirdly, distance (*dist*) is a time-invariant variable, and data on the geographic distance between Istanbul or Ankara and capital cities of OECD countries have been collected from *Centre d'Études Prospectives et d'Informations Internationales* (CEPII). Lastly, the variables of income level, population, and GDP found in most gravity models have been taken as a measure of macroeconomic performance and market size. The values for gross domestic product (*gdp*, *gdpt*) were obtained from OECD and population (*pop*, *popt*) from the World Bank's World Development Indicators (WDIs).

## Empirical Results

We estimate the dynamic panel gravity model using a balanced panel from 2000 to 2016. The econometric model is specified as follows:

$$Y_{it} = dY_{it-1} + \beta X_{it} + \mu_i + u_{it} \quad (1)$$

where  $Y_{it}$  is the logarithm of export and import for country  $i$  in period  $t$ ;  $X_{it}$  represents the vector of variables that induce exports and imports;  $\mu_i$  expresses the unobservable unit-specific effect, and  $u_{it}$  is the error term.

The dynamic panel gravity model can now be written as follows:

$$\text{imp}_{it} = \beta_1 \text{imp}_{ij,t-1} + \beta_2 \text{inmig}_{jt} - \beta_3 \text{dist}_{ij} + \beta_4 \text{gdpt}_{it} + \beta_5 \text{gdp}_{jt} + \beta_6 \text{langeng}_{ij} + \beta_7 \text{eumember}_{ij} + e_{it} \quad (2)$$

$$\text{exp}_{it} = \beta_1 \text{exp}_{ij,t-1} + \beta_2 \text{inmig}_{jt} - \beta_3 \text{dist}_{ij} + \beta_4 \text{gdpt}_{it} + \beta_5 \text{gdp}_{jt} + \beta_6 \text{langeng}_{ij} + \beta_7 \text{eumember}_{ij} + e_{it} \quad (3)$$

$$\text{imp}_{it} = \alpha + \beta_1 \text{imp}_{ij,t-1} + \beta_2 \text{inmig}_{jt} + \beta_3 \text{ln} \text{dist}_{ij} + \beta_4 \text{popt}_{it} + \beta_5 \text{pop}_{jt} + \beta_6 \text{langeng}_{ij} + \beta_7 \text{eumember}_{ij} + e_{it} \quad (4)$$

$$\text{exp}_{it} = \beta_1 \text{exp}_{ij,t-1} + \beta_2 \text{inmig}_{jt} - \beta_3 \text{dist}_{ij} + \beta_4 \text{popt}_{it} + \beta_5 \text{pop}_{jt} + \beta_6 \text{langeng}_{ij} + \beta_7 \text{eumember}_{ij} + e_{it} \quad (5)$$

where  $exp$  denotes Turkey's exports to OECD countries;  $imp$  denotes Turkey's imports to OECD countries; and  $dist$  is to the straight distance between Turkey and each OECD country's capital city;  $gdp$  indicates constant price GDP of OECD countries,  $gdpt$  denotes Turkey's constant price GDP;  $pop$  equals the population of the respective OECD country,  $popt$  indicates Turkey's population;  $langeng$  takes the value of 1 if countries' official language is English, otherwise it is 0;  $eumember$  equals 1 if the country is a member of the European Union, otherwise it is 0. Lastly,  $L$  is the error term.

**Table 1**

*Summary Statistics*

Variable	Country	Year	Number of Observations	Mean	Standard Deviations	Min.	Max
$exp$	23	17	391	23.293	1.808	7.887	16.533
$L.exp$	23	17	390	5.770	0.784	3.425	7.180
$imp$	23	17	391	13.852	1.789	7.659	17.001
$inmig$	23	17	391	6.392	1.988	0	10.970
$L.imp$	23	17	390	60.134	0.7764	33.263	73.835
$pop$	23	17	391	16.399	1.524	12.546	19.594
$popt$	23	17	391	18.073	0.0685	17.962	18.191
$gdp$	23	17	391	13.096	1.456	9.178	16.647
$gdpt$	23	17	391	14.003	0.257	13.592	14.421
$dist$	23	17	391	8.113	0.793	6.847	9.730
$eu$	23	17	391	0.608	0.488	0	1
$L$	23	17	391	0.173	0.379	0	1

Summary statistics for the variables in the models are shown in Table 1. The number of observations for all variables is 391, excluding lagged variables. While  $exp$  has the highest mean value,  $L$  has the lowest mean value;  $exp$  has the highest standard deviation, while  $L$  has the lowest standard deviation;  $L.imp$  has the highest max. value, while  $L.exp$  has the lowest minimum value.

**Table 2**  
*Correlation Values of Variables*

	pop	pop <sub>t</sub>	gdpt	gdp	exp	imp	inmig	dist	eu	L	l.exp	l.imp
pop	1000											
pop <sub>t</sub>	0.025	1000										
gdpt	0.025	0.988	1000									
gdp	0.973	0.067	0.067	1000								
exp	0.720	0.271	0.277	0.766	1000							
imp	0.770	0.238	0.246	0.815	0.899	1000						
<b>inmig</b>	<b>0.667</b>	<b>0.028</b>	<b>0.026</b>	<b>0.743</b>	<b>0.789</b>	<b>0.794</b>	<b>1000</b>					
dist	0.143	0.007	0.006	0.135	-0.317	-0.317	-0.256	1000				
eu	-0.001	-0.005	-0.004	0.033	0.323	0.323	0.393	-0.676	1000			
L	0.255	0.009	0.007	0.293	-0.166	-0.166	0.000	0.732	-0.569	1000		
L.exp	0.692	0.213	0.227	0.730	0.842	0.842	0.737	-0.370	0.343	-0.088	1000	
L.imp	0.732	0.212	0.224	0.772	0.931	0.931	0.746	-0.289	0.306	-0.153	0.899	1000

The correlation matrix among the variables is shown in Table 2. Accordingly, the highest positive correlation is between *pop* and *gap*. The next highest correlations in order are between *gap* and *pop*, *imp* and *exp*, *L.imp* and *gap*, and *imp* and *inmig*.

**Table 3**

*Dynamic Panel Data Estimation Results*

Model		23 Countries, 17 Years (2000-2016)			
Variables	Proxy	imp (I)	exp (II)	imp (III)	exp (IV)
L.imp	Lagged value of imports	1.043*** (0.182)		0.837*** 0.217	
L.exp	Lagged value of exports		1.530*** (0.135)		1.988*** (0.081)
inmig	Immigrants from Turkey to OECD countries	0.092** (0.045)	0.090** (0.044)	0.206*** (0.062)	0.110*** (0.040)
pop	Population			0.473*** (0.107)	0.118*** (0.045)
popt	Population of Turkey			3.826*** (0.761)	0.058 (0.046)
gdpt	GDP of Turkey	0.255*** (0.054)	0.367*** (0.073)		
gdp	GDP	0.542*** (0.098)	0.268*** (0.073)		
dist	Distance	-0.420*** (0.083)	-0.574*** (0.112)	-0.335*** (0.110)	-0.231** (0.040)
eu	EU member countries dummy variable	-0.272** (0.131)	-0.231** (0.112)	-0.207 (0.212)	-0.175 (0.118)
L	The dummy variable of the countries whose official language is English	-0.635*** (0.000)	0.204 (0.216)	-0.662*** (0.239)	0.052 (0.139)
Constant				-66.463*** -14.036	
Number of Observations		390	390	390	390

Number of Instruments	22	21	22	21
AR(1) p-value	0.000	0.074	0.009	0.066
AR(2) p-value	0.061	0.858	0.071	0.872
Hansen p-value	0.086	0.093	0.063	0.492

**Note:** The natural logarithm has been taken for all variables. Expressions in parentheses indicate standard deviation. \*\*\* = 1% level of significance, \*\* 5% level of significance, and \* = 10% level of significance.

Table 3 reports the coefficient estimates and significances of all variables in the dynamic panel gravity model. The results from the system GMM are found to be robust. For the validity of the GMM estimation results, no AR (1)s (first-order autocorrelations) are expected, while a negative second-order autocorrelation AR (2) is expected. The test for the first-order autocorrelation AR (1) infers the null hypothesis of no first-order autocorrelations to be rejected at a 95% confidence interval in Models I and III and a 90% confidence interval for Models II and IV. At the same time, according to the AR (2) test result, the basic hypothesis stating a second-order autocorrelation to be present cannot be rejected. The statistics for the Hansen test are also presented regarding the validity of the instruments in the system GMM regression. The Hansen test for over-identification indicates the null of exogenous instruments to not be rejected with  $p$  values of 0.086 (Model I), 0.093 (Model II), 0.063 (Model III), and 0.492 (Model IV). Additionally, the total number of instruments (i.e., 21, 22) should be noted as being rigorously less than the total number of units.

Migrant flows positively affect imports and exports between migrants' host and origin countries, supporting the study's hypothesis that immigrants affect countries' foreign trade. As postulated in the literature, immigrant flows impacted imports and exports between 2000-2016. This result meets the expectation that countries having higher immigration between one another positively impacts bilateral foreign trade.

Also, the sign of the lagged dependent variables ( $L.exp$  and  $L.imp$ ) are found to be positive. As expected,  $gdp$ ,  $gdpt$ ,  $pop$ , and  $popt$  have a significant and positive effect on imports and exports. These variables have also been included to check for relative economic size effects. The coefficient of distance ( $dist$ ) significantly and negatively correlates with exports and imports (i.e., the distance between Turkey and the OECD country has a negative effect on the countries' trade. A 1% increase in immigrant flows from Turkey to OECD countries results in a 0.09% growth in

Turkey's exports and imports in Models I and II, a 0.20% growth in Model III, and a 0.11% growth in Model IV.

## Conclusion

International migration and foreign trade often develop under common factors such as globalization, telecommunication, transportation, and technology. International immigrant flows also have some effects on the countries' trade. The factor of labor is significant for two reasons. Firstly, the main element of immigrant flows is human. Secondly, the demand for consumption is the human factor that includes labor. A recent literature on this topic found the immigrant link to influence bilateral trade flow through two virtual channels (i.e., preference and network channels). Many empirical studies have shown immigrant flows to impact foreign trade due to the transfer of migrants' acquisitions from their home country. In this way, individual immigrant's business connections or personal contacts with a home country decrease the transaction costs of foreign trade. On one hand, immigrants reduce transaction costs in foreign trade between the two countries through network channels; on the other hand, they ensure the import of relevant goods to the receiving country from the home country through preference channels.

Thus, these results and findings need to be interpreted with attention. These tests show a 1% increase in immigrant flows from Turkey to OECD countries to result in an additional increase in Turkey' imports and exports to relevant countries by 0.09%. Additionally, the result from another model show a 1% increase in the immigrant flows from Turkey to OECD countries to increase Turkey's imports and exports to the relevant country by about 0.20% and 0.11%, respectively. According to the estimation results from the dynamic panel gravity model, immigrant flows from Turkey to other OECD countries increase Turkey's exports and imports to the relevant OECD countries. However, a more significant impact occurs on Turkey's imports. Gould (1994) stated immigrant flows to increase the exports of the host countries (through the impact of network channels). Because the immigrant flows from Turkey to OECD countries affects imports more than exports (increases the exports from the host country), network channels can be said to be more effective. Head and Ries (1998), Dunlevy and Hutchinson (1999, 2001), Girma and Yu (2002), Rauch and Trindade (2002), and Combes et al. (2002) have focused on the impact from networks in their empirical studies investigating links between international migration and foreign trade. Empirical studies in the literature have reported first immigrants to affect foreign

trade through preference channels. Traditional foreign trade theories that stated the relationship between international migration and foreign trade to be substitution could not be confirmed for Turkey or OECD countries. However, when changing the assumptions for traditional foreign trade theories, this relationship is concluded to have complementarity. While many studies in the literature explain the relationship between foreign trade and international migration within the static model framework, this article examines the relationship between international migration and foreign trade using a dynamic modeling approach. The present study may contribute to the international economy literature in terms of dynamic model usage.

These findings have serious managerial implications. The current research suggests that policymakers should encourage stakeholders to consider immigrant flows with regard to foreign trade. Examining the effects of immigrant flows on foreign trade should guide the immigration policies to be established in the upcoming period. Determining the optimal number of immigrants in a country provides some short-term and long-term ideas. Effective migration policies are expected to increase the market size of the receiving country, foresee the increase of the population and the labor supply that will replace the aging population in the long run. Turkey's Development Plans focus on the development of export-oriented growth. Policy makers should take into account the positive impact migration movements have on Turkey's trade, especially on exports. Decision makers and government executives should maintain open network channels that activate the ties of outgoing migrants from Turkey with their homeland through both individual and institutional organizations. This will contribute to Turkey's export of more goods to more countries. The findings emphasize the possibility of increasing the positive effect of migration flows within the commercial policies envisaged in terms of developing Turkey's trade. Our study has carried out an applied analysis of variables such as foreign trade and migration using macro data. Turkey's current economic policies aim to increase the exportation of high value-added goods and to gradually reduce import dependency on intermediate goods. Analyzing the effect immigrant flows between Turkey and OECD countries have on trade data classified by sector and product will increase the comprehensiveness of this study.

## Limitations

The current research can be considered to have two limitations. First, Turkey is situated between developed EU countries and the Middle Eastern and African countries that are in the lower-income group in terms of development. Rigorous

controls and measures are applied to migrants who want to go to developed countries. Therefore, Turkey is a primary migration route for migrants. Separating the effect of immigrants coming to Turkey to immigrate to EU countries from the effect of total immigrants in Turkey is difficult. Second, while access to the data of immigrant flows to 23 OECD countries from Turkey is available, data regarding immigrant flows to Turkey from the 23 OECD countries could not be accessed in the relevant years. These limitations reveal the difficulty of collecting data on immigrant flows.

## Recommendations

This paper has researched the effect of international labor migration on foreign trade; the effect of the factor of capital on foreign trade still requires further systematic investigation in terms of guiding those who will work in this field. Testing with respect to the demographic characteristics of immigrant flows from Turkey will contribute to this. The aim of research to be carried out after this study will be to investigate the relationship between capital flows and foreign trade and to detail the relationship between international migration and foreign trade with data obtained at the level of firms.

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