Chapter 3
Application of Panel Quantile Regression and Gravity Models in Exploring the Determinants of Turkish Automotive Export Industry

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Abstract This paper purposes to determine potential factors influencing the amount of Turkish automotive industry exports. For this purpose, the available data of 68 major trading partners of Turkey in terms of automotive industry exports were utilized for the sample period 2007–2015. Both panel quantile regression and the gravity model of trade approaches were considered to analyze the relevant data. The empirical findings of this paper revealed that the population and the distance variables were found as statistically significant for all quantiles, while the former has positive and the latter has negative signs as expected. Results also indicated that there was a statistically significant positive correlation between GDP per capita and the amount of Turkish automotive industry exports at 10 and 50% quantiles; however, it was not statistically significant at 90% quantile despite its positive sign. Among Turkey's exporter countries, being a EU member country dummy variable was found to have a statistically significant positive impact on the amount of automotive industry exports. Real exchange rate was not found as a significant determinant of the amount of automotive industry exports. In the lights of empirical evidence obtained from this study, several recommendations were made for Turkey's future international trade policies.

Keywords Automotive industry · Export · Quantile regression
Gravity model · Panel data

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3.1 Introduction

Economic growth is widely regarded as one of the most important macroeconomic goals of every country to boost employment and general welfare. In that context, there exists a strong empirical evidence in the existing literature that export-led expanding markets have positively contributed to economic growth by providing more efficient use of convenient resources since the late of 1800s (Emery 1967; Syron and Walsh 1968; Michaely 1977; Balassa 1978; Tyler 1981). As well as expanding markets, total exports also provide an indirect impact on economic development by increasing foreign exchange entry significantly. Developing countries require to increase fixed capital formation in numbers to increase their levels of revenues and to converge to developed countries. However, developing countries necessitate to import several commodities as their levels of technology lack to produce fixed capital formation. Nevertheless, their current foreign exchange reserves numerically are one of the most significant obstacles to their total imports. At that point, the total exports of a country play a key role to overcome the corresponding import restriction. Recent research (Yapraklı 2007; Altıntaş and Çetintaş 2010; Doru and Ersungur 2014; Kaya and Hüseyni 2015; Hüseyni and Çakmak 2016) that concerns on the impact of exports on economic growth confirms that exports positively contribute to economic growth of a country.

Recent rapid developments particularly on transportation and communication industries have led many automotive companies to transfer some of their production into developing countries due to keep closeness to relevant market, to utilize from inexpensive labor force and to avoid relatively high environment taxes. The current policies of automotive companies have been appeared as an alternative foreign exchange source for developing countries and the magnitude of automotive production and exports in developing countries have significantly increased. Moreover, the transfer of operations in the automotive industry into developing countries stands for expanding total exports, accordingly an increase in the supply of foreign exchange and more efficient finance of the imports of investment goods. As a developing country, Turkey also takes advantage of the present policies of multinational automotive companies while Turkish automotive exports have experienced a significant growth trend particularly after post-1996 period when Customs Union Agreement has come into force. The corresponding trend has led the total exports of the Turkish automotive industry to become one of the leading industries in Turkish economy, and numerically, the Turkish automotive industry has been an indispensable industry for total Turkish production and exports after post-2000 period.

Before the period of 2000s, labor-intensive textile industry has provided the most crucial contribution to Turkish exports in numbers, whereas automotive industry comes into prominence at the present time. Figure 3.1 illustrates the total exports of automotive industry in Turkey since 1989. As seen in Fig. 3.1, there is an enormous increase of the Turkish automotive exports after the year 2000 and the total automotive exports have overwhelmingly reached to $18 billion in 2008 compared to $800 million in 1998. As mentioned above, Customs Union

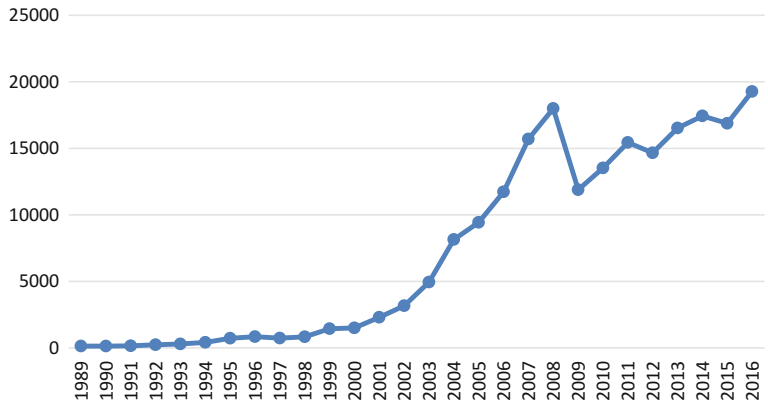

Fig. 3.1 Total automotive industry exports in Turkey between 1989 and 2016 (in $ million)

Agreement between Turkey and the European Union (EU) have significantly motivated the corresponding increase since the Agreement wholly eliminates certain tariffs on industrial goods. Not surprisingly, many multinational companies have carried out a remarkable amount of their automotive investments to the Turkish market and they have imported their products with inexpensive labor costs and environmental standards to specific regions including Europe, Middle and Near East. Thus, this circumstance stimulated the Turkish automotive exports to grow dramatically after post-2000 period. On the other hand, the negative impact of the 2008 Global Economic Crisis led the Turkish automotive industry exports to a remarkable decrease while the Turkish automotive industry exports have not been able to reach the previous favorable status before the crisis until 2015.

Figure 3.2 depicts a comparison between total exports and automotive industry exports of Turkey between 1989 and 2016 to better examine substantial changes relatively during the sample period. The blue line in Fig. 3.2 represents an index of the total amount of automotive industry exports while the claret red line represents an index of the total amount of exports for Turkey. In Fig. 3.2, an index was introduced by taking the numbers of 1989 year as the base and representing them as 100. As shown in Fig. 3.2, a more significant change trend has been experienced on the Turkish automotive industry exports than total exports in Turkey. Specifically, along with increases after 2000, the Turkish automotive industry exports have displayed a 140-time increase with respect to only a ten-time increase on total exports. In this sense, the impact of the 2008 Global Economic Crisis revisits, when both the Turkish automotive industry and total exports have significantly decreased in numbers in 2009. While the total exports have exhibited a strong and rapid recovery behavior after 2009, the Turkish automotive industry exports were not able to achieve such a short-term improvement numerically. One of the main reasons behind this situation may be explained as prolonged period under the negative influence of the 2008 Global Economic Crisis in the EU compared to rest of the world that led to the decline of supply. As the exports of the EU states

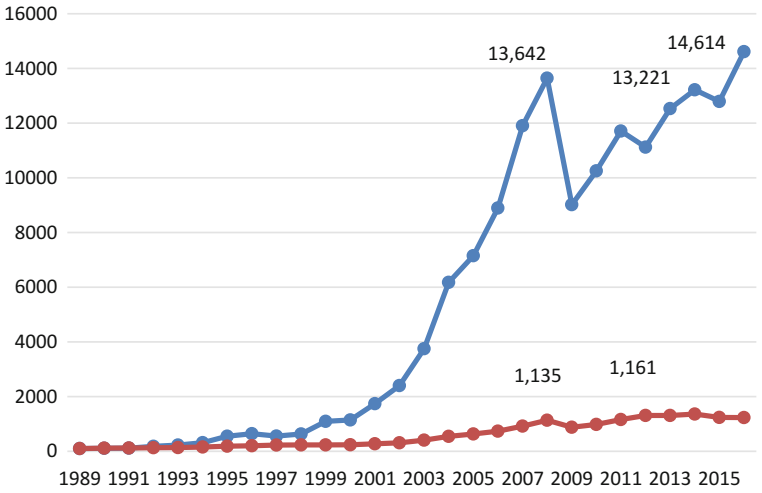

Fig. 3.2 Comparison between automotive industry and total exports of Turkey between 1989 and 2016

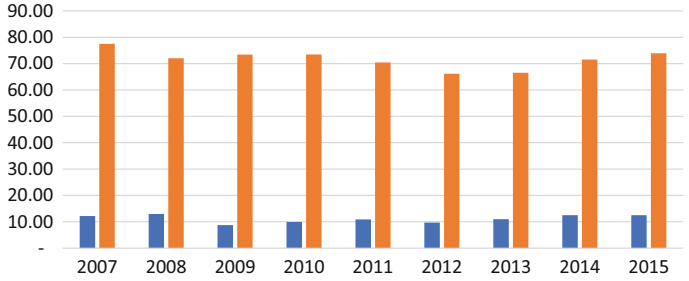

Fig. 3.3 Total exports of Turkey to the EU (in $ billion)

generate a majority of total exports of Turkey, the amount of Turkish automotive industry exports has been negatively affected.

Particularly, Fig. 3.3 illustrates exports of automotive products to the EU and the share of exports of automotive products to the EU on total exports of Turkey between 2007 and 2015. In Fig. 3.3, blue bars represent the total amount of exports to the EU member countries, while orange bars represent the share of the amount of automotive industry exports on the total amount of automotive industry exports. As seen in Fig. 3.3, the share of exports of automotive products to the EU on total exports varies between 70 and 80% during the sample period. This circumstance implies that Turkish automotive industry exports to the EU are highly dependent on the potential changes of automotive industry products supply in the EU.

3.2 Methodology

Quantile regression analysis provides a practical framework to examine how covariates make an impact on location, scale, and shape of the whole response distribution with an emphasis of classical least squares regression on the conditional mean (Koenker 2005). The generalization of conditional mean models is widely regarded as essential tools for the field of social sciences. Conditional mean models are able to explain a complete and parsimonious description of the association between the response distribution and the covariates and they provide maximum-likelihood and least-square estimators more useful in terms of calculation and interpretation (Hao and Naiman 2007).

Quantiles and quantile functions present a valuable information of summary measures when the distributions increasingly become less symmetrical and the quantile regression model specifies the condition quantile function. Theoretically, the pth quantile $Q^{(p)}$ of a cumulative distribution function F is accepted as the minimum set of values y that satisfies $F(y) \geq p$. In this context, as a function of p, the function $Q^{(p)}$ is defined as the quantile function of cumulative distribution function F (Hao and Naiman 2007).

The quantile regression model estimates the possible differential impact of a covariate on a variety of quantiles in the conditional distribution. A quantile regression model can be briefly defined in regard to the linear regression model as the following:

$$y_i = \beta_0^{(p)} + \beta_1^{(p)} x_i + \varepsilon_i^{(p)} \tag{1}$$

where $0 < p < 1$ denotes the proportion of the population having scores less than the quantile at p. Further, the pth condition quantile given x_i can be specified as

$$Q^{(p)}(y_i|x_i) = \beta_0^{(p)} + \beta_1^{(p)} x_i + Q^{(p)}(\varepsilon_i) \tag{2}$$

that can also be considered as the determination of the conditional pth quantile by quantile-specific parameters (i.e., $\beta_0^{(p)} + \beta_1^{(p)}$) and a specific value of covariate x_i. When the error terms ε_i are introduced, the equation

$$Q^{(p)}(y_i|x_i) = \beta_0^{(p)} + \beta_1^{(p)} x_i + Q^{(p)}(\varepsilon_i) \tag{3}$$

can be obtained (Hao and Naiman 2007).

Gravity models of international trade were introduced by Tinbergen (1962) and Pöyhönen (1963; Oguledo and Macphee 1994; Cheng and Wall 1999) and gravity model studies have been commonly utilized in explaining a wide variety of international and interregional association such as commuting, international trade, and labor migration (Cheng and Wall 1999). The gravity model is usually applied to international trade flows to state the size or the magnitude of trade flows between two countries (Oguledo and Macphee 1994). The traditional concept of the gravity

equation suggests that GDP and GDP per capita in numbers and both preference factors such as common border and language and trade impediment such as distance are main explanatory variables of bilateral trade (Egger 2002). In other words, the distance is described as a function of several variables that can be considered as trade resistance factors (Metulini et al. 2018) The gravity equation that facilitate to explain bilateral trade flows across pairs of countries is defined as the following:

$$PX_{ij} = \psi_0 (Y_i)^{\psi_1} (Y_i/L_i)^{\psi_2} (Y_j)^{\psi_3} (Y_j/L_j)^{\psi_4} (D_{ij})^{\psi_5} (A_{ij})^{\psi_6} e_{ij} \tag{4}$$

In Eq. (1), PX_{ij} denotes the value of the flow from country i to country j in US dollars; $Y_i(Y_j)$ denotes the value of nominal GDP in $i(j)$ in US dollars; $L_i(L_j)$ denotes the total population in $i(j)$; D_{ij} denotes the distance from the economic center of i to the economic center of j; A_{ij} denotes any other factor(s) that has an impact on trade between i and j, and finally, e_{ij} denotes the error term with a log-normal distribution. The estimates of ψ_1, ψ_2, ψ_3, ψ_4 are representatively expected to be positive, whereas the estimates of ψ_5 are expected to have a negative sign (Bergstrand 1989).

Quantile regression analysis and the gravity models of trade applications take their respectable place in the existing literature. Dufrenet et al. (2010) explore the variation of the impact of trade openness on the growth rate of per capita income with the conditional distribution of growth using a quantile regression approach and they suggest a heterogeneous trade versus growth association for both short and the long run. Using the data on aggregate bilateral sales in 2008 for 93 economies, Baltagi and Egger (2016) find that trade costs show a differentiation across the quantiles of the conditional distribution of bilateral exports. Using a quantile regression approach, Trinh and Doan (2018) found that internationalization was positively correlated with several variables including the growth of employment, output, and labor productivity for Vietnamese enterprises. Özer (2014) investigates the determinants of the textile production exports of Turkey for the sample period 2007–2012 using a gravity of trade and quantile approaches and finds that there exists a statistically significant association between the total population and a demand increase. On the contrary, Tatlıcı and Kızıltan (2011) find that the population and the amount of Turkish exports, while the distance was negatively correlated. Martínez-San Román et al. (2016) find evidence on the positive association between trade integration and foreign direct investment activity for their selected countries. Very recently, Metulini et al. (2018) perform a spatial-filtering zero-inflated approach to estimate the gravity model of trade which they argue to be considered when the level of trade between countries is zero. (See Egger and Pfaffermayer 2016; Egger and Staub 2016; Spring and Grossmann 2016 for further successful applications of gravity models of trade).

The dependent variable of this study was selected as the total amount of automotive industry exports of Turkey to country i in year t. The data of the dependent variable were drawn from the United Nations' Comtrade database (United Nations 2018). The independent variables that may possibly influence Turkish automotive industry of Turkey to country i in year t were explained in detail as the following.

3.2.1 GDP Per Capita

GDP per capita was included as an independent variable in the estimated model. As automotive industry products are not inferior goods, an increase on the GDP per capita for country *i*, namely an increase of revenues for the corresponding country, will increase the export capacity that also leads to increase automotive demand. An increasing automotive demand will inherently increase the amount of automotive imports for country *i*. The sign of the GDP per capita is expected to be positive. The GDP per capita data of selected countries was drawn from the World Bank database (The World Bank 2018).

3.2.2 Population

The total population of exporter country *i* to Turkey is the second independent variable that was included in the estimated model. An increase on the population of a country will encourage to an increase on the amount of total demand by providing a potential increase on the amount of consumption. The increasing total demand will have a positive impact on automotive industry exports by influencing the amount of total imports in proportion as the ratio of import tendency. The populations of exporter countries were also drawn from the World Bank database (The World Bank 2018) and the population variable is expected to have a positive sign.

3.2.3 The Distance Between Exporter Country to the Capital of Turkey

The total distance among countries will boost transportation costs, while the foreign trade capacity will tend to decrease numerically. In fact, recent foreign trade data put forward that relatively higher amount of foreign trade among neighbor countries. As high volume goods will also lead to increase transportation costs, the distance and foreign trade are widely regarded as negatively correlated. Since many goods of automotive industry have relatively higher volume, the distance between capital cities of exporter countries to the capital city of Turkey (i.e., Ankara) was included in the estimated model as an independent variable.

3.2.4 The Real Exchange Rate

The real exchange rate is available for both countries; therefore, it should be carefully used in the estimated model. An increase on real exchange rate for any

country *i* (i.e., appreciation of the currency) will encourage to increase the amount of automotive demand to Turkey. Nevertheless, if the real exchange rate has declined (i.e., depreciation of the currency) in the same period, the Turkish exporters will tend to sell their automotive industry products with higher prices. In that case, a consumer in country *i* will no longer use the increase on purchasing power by courtesy of the appreciation of the currency for imported automotive industry products from Turkey. This situation appears to avoid the increasing purchasing power by an increase on real exchange rate of country *i* to have a potentially positive impact on the amount of imports from Turkey. Moreover, if the decline on the real exchange rate is numerically less than an increase on the real exchange rate of country *i*, then the amount of imports of country *i* from Turkey may even decrease. In order to reflect the impact of actual changes of the real exchange rates for both countries, the real exchange rate of Turkey was divided into the foreign exchange rate of country *i* and the corresponding ratio was included in the final model being estimated. The data of the real exchange rates were drawn from multiple databases including the World Bank and Federal Reserve Economic Data (The World Bank 2018; Federal Reserve Bank of St. Louis 2018). The real exchange rate is expected to have a negative sign in the estimated model.

3.2.5 The Dummy Variable

As previously stated, the EU member countries were among the most important exporter countries of Turkey, especially after the Customs Union Agreement has come into force in 1996. When the prominent potential of the EU member countries were considered, being a EU member country is expected to be a relatively important determinant of the estimated model since Turkey will more likely to export to a EU member country than any other country in the rest of the world with respect to the recent total export statistics of Turkey. Therefore, a dummy variable was generated where 1 stands for being a EU member country and 0 stands for not being a EU member and was included in the estimated model. Hence, the marginal effect of being a EU member country on the demand of automotive industry products to Turkey would be examined. The dummy variable introduced to the model was expected to have a positive sign.

3.3 Empirical Evidence

The main objective of the present study is to examine the main determinants that may influence Turkey's vehicle (car, minibus, bus, van, and truck) exports to its major 68 trading partners over the period of 2007–2015. For this purpose, a gravity model and a panel data quantile regression approaches were performed calculated by the Bootstrap Method to obtain more consistent empirical results. The gravity

Table 3.1 Descriptive statistics of variables

Variables	Min.	1st Qu. 25% quantile	2nd Qu. 50% quantile	3rd Qu. 75% quantile	Max.	Mean	Skewness	Kurtosis
$\ln E_{it}$	5.704	14.731	17.532	18.869	21.736	16.772	−0.560	−0.260
$\ln Y_{it}$	6.016	8.611	9.624	10.639	11.674	9.499	−0.470	−0.660
$\ln P_{it}$	12.650	15.470	16.220	17.630	21.040	16.460	−0.010	0.040
$\ln \mathrm{DIS}_i$	6.659	7.612	8.164	8.997	9.717	8.258	0.020	−0.950
RERT_{it}	0.600	0.870	0.920	0.990	1.240	0.923	0.160	1.310

models take an increasingly attention to explain exports and trade for panel data analyses in the existing literature. An econometric model was introduced to determine factors that may possibly have an impact on the automotive industry product exports of Turkey as the following:

$$\ln E_{it} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln P_{it} + \beta_3 \ln \mathrm{DIS}_i + \beta_4 \mathrm{RERT}_{it} + \beta_5 D_{EU} + u_{it} \qquad (5)$$

where E_{it} denotes the total automotive industry exports (in US dollars) from Turkey to the i country in year t; Y_{it} denotes the GDP per capita of importer country i in year t; P_{it} denotes the total population of the importer country i in year t; DIS_i denotes the geographical distance from Turkey to country i; RERT_{it} denotes the ratio of Turkey's real exchange rate to real exchange rates of country i in year t; and finally, D_{EU} denotes the dummy variable of automotive industry exports to a country where stands for 1 if it is a member of the EU and 0 where it is not a member of the EU As seen in Eq. (1), some of the variables were measured in logarithmic terms. Table 3.1 presents the descriptive statistics of the variables used in the estimated model.

Table 3.1 indicates that different quantiles will describe different distribution tendency. For instance, when both mean and second quantile (i.e., median) values of selected variables are compared, and one can notice that the distribution of variables will substantially differ. Therefore, an ordinary least squares (OLS) regression approach may generate biased results (Santos Silva and Tenreyro 2006). As seen in Table 3.1, all variables are appeared to be skewed that confirms the use of quantile regression approach for the estimated model to determine potential factors that may have an impact on the automotive industry exports of Turkey. A set of data was collected from some databases related to the explanatory variables.

Table 3.2 summarizes the panel quantile regression analysis results to determine potential factors that may influence automotive industry exports of Turkey for the sample period 2007–2015. Due to the different levels of the GDP per capita variable, the impact of other independent variables on Turkey's automotive industry exports may also regard as different. Thus, this study adopts three different levels of the GDP per capita as three different levels of income and measures the direct

Table 3.2 Quantile regression results for the amount of Turkish automotive industry exports

	Quantiles		
Variables	10th quantile	50th quantile	90th quantile
ln Y_{it}	2.354 (0.022)*	2.545 (0.000)**	0.619 (0.287)
ln P_{it}	1.222 (0.000)**	1.144 (0.000)**	1.139 (0.000)**
ln DIS_i	−1.714 (0.008)**	−1.408 (0.000)**	−1.050 (0.000)**
RERT_{it}	0.375 (0.676)	0.820 (0.175)	−0.502 (0.298)
D_{EU}	1.170 (0.022)*	0.439 (0.004)**	0.206 (0.295)

Notes Values in parentheses are significancy probabilities
*Statistical significance at 5%
**Statistical significance at 1%

effects of selected independent variables on the automotive industry exports of Turkey to its major trading partners between 2007 and 2015.

Quantile regression analysis results in Table 3.2 present valuable information about the determinants of automotive industry exports of Turkey. In regard to high and low quantiles, the empirical evidence highlights that there exist significant differences for the impact of GDP per capita for selected countries on the conditional distribution of the amount of automotive industry exports to major trading partners. Particularly, the impact of GDP per capita on automotive industry exports was statistically significant and remarkable in the 10th quantile. For instance, several countries including Equatorial Guinea, Trinidad and Tobago, Dominican Republic, Paraguay, Costa Rica, Zambia, the Philippines, Iceland, Uganda, and Uruguay purchase automotive products with relatively low commercial values. On the other hand, the impact of GDP per capita on the automotive industry exports was not statistically significant for higher quantiles. In lower levels of quantiles, one of the most important barriers on car ownership can be principally considered as comparatively low income. Certainly, when individuals' income increases, their automotive demand also increases which will make a positive impact on Turkish automotive industry exports.

In higher quantiles, where some high-income countries including France, the UK, Germany, Italy, Russian Federation, Spain, Belgium, and the USA are appeared, tastes and preferences take the place of income level to be an important determinants of automotive industry demand. Specifically, the automotive industry demand cannot be simultaneously increased with a potential increase on the amount of income since the income level that will increase automotive demand is eliminated in a sense. Moreover, a potential increase on the amount of income in the relevant quantile with high-income cases may reversely lead an increase on the consumption of luxury automotive products which are not exported, in Turkey. In this circumstance, an exclusion of middle-segment products may even expected for Turkey's further exports. However, the amount of GDP per capita of countries in high quantiles shows a decreasing tendency in the long run during the selected

sample period. For that reason, the positive correlation between the amount of GDP per capita and Turkish automotive industry exports was not associated for all quantiles being observed. In this sense, one can argue that there exists an exact heterogeneity for the impact of different values of GDP per capita on the amount of automotive industry exports.

The population variable used in the model was found to have a statistically significant positive impact on the amount of Turkish automotive industry exports. In other words, a respectable increase on total population numerically leads to an increase on total consumption, and thus, exporter countries tend to increase their imports from Turkey including automotive industry products. Results revealed that there was a statistically significant correlation between the distance variable and the amount of automotive industry exports for all quantiles as well. As expected, the distance variable was found to have a negative sign that implies the amount of Turkish automotive industry exports decreases relatively when the distance from the capital of Turkey to the exporter country increases. The dummy variable, namely, being a EU member country was found as a statistically significant variable with a positive impact on the amount of Turkish automotive exports in the first two quantiles. This evidence was actually expected; however, being a EU member country was unexpectedly not found to have a statistically significant impact on the amount of Turkish automotive exports in higher quantiles despite its expected positive sign.

The real exchange rate was expected to have a negative sign before fitting the panel quantile regression model; however, it was not found as statistically significant. Accordingly, one can suggest that the real exchange rate may not essentially be an important determinant of Turkish automotive exports during the sample period. One explanation for this outcome may be comparatively high amounts of imported output numerically in the automotive industry. Though a real exchange rate appraisal contributes to competition power of exporter enterprises in the automotive industry, its actual impact on the amount of Turkish automotive exports is somehow deteriorated due to higher numbers of Turkish imports comparatively.

3.4 Main Conclusions and Policy Implications

Economic growth is an essential goal of every country to be accomplished because a sustainable economic growth has a crucial role on improving employment and welfare indicators. Recent debates since the late of eighteenth century suggest that the amount of exports is one of the most important determinants of economic growth when its impact on expanding markets and enabling the efficient use of resources. The amount of exports can especially provide developing countries an opportunity to converge to developed countries through increasing fixed capital investments numerically with foreign exchange entry.

Recent rapid developments on communication and transportation industries and simultaneous remarkable influence of globalization have led multinational companies to carry their production operations to developing countries. Particularly,

multinational companies take advantage of cheaper labor force and avoid strict environmental standards in developing country markets. Thus, developing countries are able to have increasing production and exporting opportunities. In that sense, automotive industry can be considered as the leading industry in terms of its high potential of exporting and the production operations in the automotive industry have been significantly increased. After the 1996 Custom Unions Agreement with the EU, many multinational automotive companies have shifted a respectable number of productions to the Turkish market by courtesy of eliminating customs tariffs. Thus, the amount of Turkish automotive industry exports has significantly improved since 2000s.

When the importance of automotive industry exports for the Turkish economy is considered, the determination of factors influencing the amount of Turkish automotive industry exports gives valuable information for future foreign trade policies. This study aimed at determining factors affecting the amount of Turkish exports to 68 major trading partners using panel quantile regression and gravity approaches instead of OLS estimators frequently performed in the existing literature. The empirical evidence obtained from the estimation results revealed that the population of importer country and the amount of per capita income were found as positively correlated with the amount of Turkish automotive exports. Additionally, when the distance between importer country and the capital of Turkey increases, the amount of Turkish automotive industry exports was more likely to have a decreasing behavior. As expected, exporting a EU member country was found to have a statistically significant increasing impact on the amount of automotive industry exports. The estimation results also indicated that the real exchange rate was not a statistically significant determinant of the amount of automotive industry exports during the sample period. Turkey cannot exactly succeed to use the competitive advantage of the possible declines on real exchange rates due to higher costs of imports in the automotive industry. Consequently, potential increases on the population and revenues of importer countries of Turkey were found to be significantly effective on Turkish automotive industry exports. The amount of automotive industry exports may be increased in the coming years, after the devastating impacts of the 2008 Global Economic Crisis in the EU completely disappear. Further, foreign trade policies in Turkey may also concentrate on decreasing the importing costs of the automotive industry to take the advantage of a decrease on real exchange rates.

References

Altıntaş, H., & Çetintaş, H. (2010). Türkiye'de ekonomik büyüme, beşeri sermaye ve ihracat arasındaki ilişkilerin ekonometrik analizi: 1970–2007 (in Turkish). Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi. 36, 33–56. http://dergipark.gov.tr/download/article-file/66628.

Balassa, B. (1978). Exports and economic growth: Further evidence. *Journal of Development Economics, 5*(2), 181–189. https://doi.org/10.1016/0304-3878(78)90006-8.

Baltagi, H., & Egger, P. (2016). Estimation of structural gravity quantile regression. *Empirical Economics, 50*, 5–15. https://doi.org/10.1007/s00181-015-0956-5.

Bergstrand, J. H. (1989). The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade. *Review of Economics and Statistics, 71*(1), 143–153. https://doi.org/10.2307/1928061.

Cheng, I. H., & Wall, H. J. (1999). Controlling for heterogeneity in gravity models of trade and integration. *Federal Reserve Bank St, 87*(1), 49–63.

Dufrenet, G., Mignon, V., & Tsangarides, C. (2010). The trade-growth nexus in the developing countries: A quantile regression approach. *Rev World Econ, 146*, 731–761. https://doi.org/10.1007/s10290-010-0067-5.

Egger, P. (2002). An econometric view on the estimation of gravity models and the calculation of trade potentials. *The World Economy, 25*(2), 297–312. https://doi.org/10.1111/1467-9701.00432.

Egger, P., & Pfaffermayr, M. (2016). A generalized spatial error components model for gravity equations. *Empirical Economics, 50*, 177–195. https://doi.org/10.1007/s00181-015-0980-5.

Egger, P., & Staub, K. E. (2016). GLM estimation of trade gravity models with fixed effects. *Empirical Economics, 50*, 137–175. https://doi.org/10.1007/s00181-015-0935-x.

Emery, R. F. (1967). The relation of exports and economic growth. *Kyklos, 20*(4), 470–486. https://doi.org/10.1111/j.1467-6435.1967.tb00859.x.

Ersungur, S. M., & Doru, O. (2014). Türkiye'de dış ticaret ve ekonomik kalkınma ilişkisinin ekonometrik analizi (1980–2010) (in Turkish). *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 28*(3), 225–240. http://dergipark.gov.tr/atauniiibd/issue/2714/36026.

Federal Reserve Bank of St. Louis (2018) Federal Reserve Economic Data. https://fred.stlouisfed.org/.

Hao, L., & Naiman, D. Q. (2007). *Quantile regression*. London: Sage Publications.

Hüseyni, İ., & Çakmak, E (2016) Türkiye'de ihracat ve ekonomik büyüme ilişkisi: Eş- bütünleşme and nedensellik ilişkisi (in Turkish). *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 30*(4), 831–844. http://e-dergi.atauni.edu.tr/atauniiibd/article/view/5000185805/5000174888.

Kaya, V., & Hüseyni, İ. (2015) İhracatın sektörel yapısı ve ülkelere dağılımının ekonomik büyüme üzerindeki etkileri: Türkiye örneği. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 29*(4), 749–773. http://dergipark.gov.tr/download/article-file/30571.

Koenker, R. (2005). *Quantile regression*. Cambridge: Cambridge University Press.

Martínez-San Román, V., Bengoa, M., & Sánchez-Robles, B. (2016). Foreign direct investment, trade integration and the home bias: Evidence from the European Union. *Empirical Economics, 50*, 197–229. https://doi.org/10.1007/s00181-015-0942-y.

Metulini, R., Patuelli, R., & Griffith, D. A. (2018). A spatial-filtering zero-inflated approach to the estimation of the gravity model of trade. *Econometrics, 6*(1), 1–15. https://doi.org/10.3390/econometrics6010009.

Michaely, M. (1977). Exports and growth: An empirical investigation. *Journal of Development Economics, 4*(1), 49–53. https://doi.org/10.1016/0304-3878(77)90006-2.

Oguledo, V. I., & Macphee, C. R. (1994). Gravity models: A reformulation and an application to discriminatory trade arrangements. *Applied Economics, 26*(2), 107–120. https://doi.org/10.1080/00036849400000066.

Özer, O. O. (2014). Türkiye'nin tekstil ürünleri ihracatının belirleyicileri: Çekim modeli yaklaşımı (in Turkish). *Tekstil ve Konfeksiyon, 24*(3), 252–258. http://dergipark.gov.tr/download/article-file/218239.

Pöyhönen, P. (1963). A tentative model for the volume of trade between countries. *Weltwirtsch Arch, 90*(1), 93–100. https://www.jstor.org/stable/40436776.

Santos Silva, J. M. C., & Tenreyro, S. (2006). The log of gravity. *Review of Economics and Statistics, 88*, 641–658. https://doi.org/10.1162/rest.88.4.641.

Spring, E., & Grossmann, V. (2016). Does bilateral trust across countries really affect international trade and factor mobility? *Empirical Economics, 50*, 103–136. https://doi.org/10.1007/s00181-015-0915-1.

Syron, R. F., & Walsh, B. M. (1968). The relation of exports and economic growth. *Kyklos, 21*(3), 541–545. https://doi.org/10.1111/j.1467-6435.1968.tb00131.x.

Tatlıcı, Ö., & Kızıltan, A. (2011). Çekim modeli: Türkiye'nin ihracatı üzerine bir uygulama (in Turkish). *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 25*, 287–299. http://dergipark.gov.tr/download/article-file/30446.

The World Bank. (2018). *Microdata library*. Washington, DC. Retrieved fromhttp://microdata.worldbank.org/index.php/home

Tinbergen, J. (1962). *Shaping the world economy: Suggestions for an international economic policy*. New York: The Twentieth Century Fund.

Trinh, L. G., & Doan, H. T. T. (2018). Internationalization and the growth of Vietnamese micro, small, and medium sized enterprises: Evidence from panel quantile regressions. *Journal of Asian Economics, 55*, 71–83. https://doi.org/10.1016/j.asieco.2018.01.002.

Tyler, W.G. (1981). Growth and export expansion in developing countries: Some empirical evidence. *Journal of Development Economics, 9*(1), 121–130. https://doi.org/10.1016/0304-3878(81)90007-9

United Nations. (2018). United Nations Comtrade International Trade Statistics Database. https://comtrade.un.org/.

Yapraklı, S. (2007). İhracat ile ekonomik büyüme arasındaki nedensellik: Türkiye üzerine ekonometrik bir analiz. *METU Studies in Development, 34*(1), 97–112. Retrieved from http://www2.feas.metu.edu.tr/metusd/ojs/index.php/metusd/article/view/153.

World Bank. World Bank open data. https://data.worldbank.org/.