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Analysis of Factors Affecting Imports in Turkey (2005-2017)

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Abstract

In this study, the relationship between imports and industrial production index, exchange rate and export/import coverage ratio are examined with the multiple regression analysis method using the monthly data from the 2005-2017 period in Turkey. The import equation of Turkey is estimated based on a model employing imports as the dependent variable. According to the results of this study, positive effects of industrial production index and export/import coverage ratio on imports are observed. Findings of the study support import-based growth in Turkey.

Keywords: *Import, Growth, Regression Analysis.*

Introduction

The goods, which cannot be produced within the country or are produced at high costs, can be provided at lower cost by import. Therefore, import enables reaching out to more effective producers that make production at lower prices. Developing countries particularly procure several investment goods and raw materials through imports, which is necessary to fulfill the industrialization efforts. Country economies are opened to foreign competition through removal of restrictions on foreign trade. Thus, import accelerates the growth rate of developing countries, and enables the sustainable growth targets of developed countries (Bayraktutan and Bıdırdı, 2010: 352).

There have been important changes in the level and context of exports after the export-oriented growth policies started to be implemented post-1980s in Turkey. Thereby, foreign trade suppressed by import-substitution policies have beenconsiderably liberalized. Substantial increases have been experienced in total imports and its sub-items with the effect of markets opening to foreign trade within this period.

Developed countries manufacture highly sophisticated and technological goods and services, in other words; higher value added competitive goods and services. Contradictory to its competitors in foreign markets, Turkey exports low-value-added products. Production and export have been supported through financial incentives in Turkey since 1980s. Import, production and export are determined mainly by the foreign exchange rate. Moreover, increasingly dependent production and export to imported intermediate goods causes a vicious cycle between export and import, depending on the changes in foreign exchange rate (Altay and Çelebioğlu, 2005: 44).

Some investment goods, raw materials and intermediate goods have to be imported from abroad in order to be able to produce some items in Turkey. Therefore, imports increase when the production increases (Seyidoğlu, 2003: 452). Industrial production index is used in explaining this relationship. Also foreign exchange rate and the export/import coverage ratio is used as other factors in the analysis, especially due to the dependent structure of export to import in developing countries.

The factors having impact on imports in Turkey between the years 2005 and 2017 are analyzed in this study. Accordingly, the structure and development of imports in Turkey are primarily explained, and an analysis is conducted through defining the model and variables after the relevant empirical literature is summarized. In addition, multiple regression analysis method is used to determine the influential factors on import.

Structure of Imports in Turkey

An export-based, global market-oriented economy policies were started to be implemented in Turkey after 1980. Accordingly, closed economy policies based on import substitution were ended. In parallel to the liberalization process experienced in the world economy, a considerable liberty was offered in the good, service and capital movements. Moreover, a large number of legislative regulations were issued, and the principles were adopted as a part of the development and economic policy towards an open economy. A significant increase occurred in the foreign trade volume as a result of the policies that were started to be implemented after 1980. However, despite such increase, Turkey could not completely accomplish the structural transformation expected in foreign trade. The most important reason behind is the fact that exported goods mostly consist of labor-intense and low-value-added goods, whereas imported goods mostly consist of capital-intensive commodities. The dependency of real sector production to imported intermediate goods and capital goods is one of the main obstacle at creating added value. On the other hand, import of consumption products have also shown an increase (Karakaş, 2017: 262).

The imported input dependency of production structure in Turkey leaded increases in import consistently except the fluctuations experienced during the crisis of November 2000 and February. Trade balance depicted a consistent deficit, and the foreign trade volume continued to increase depending on increases both in imports and exports. The export/import coverage ratio has shown a fluctuating structure (Saatçioğlu and Kutlu, 2004: 143).

Table 1. Distribution of Import by Country Groups (%)

Years	EU Countries	EFTA	BSEC	ECO	CIS	TR	OIC	Total of Other Countries
2017	36.4	3.3	13.1	4.8	11.2	1.4	13.7	62.9
2016	39.0	1.6	12.2	3.9	10.4	1.3	11.7	60.3
2015	38.0	1.5	15.2	4.5	13.1	1.3	10.8	61.4
2014	36.7	2.4	16.9	5.6	13.7	1.2	12.0	62.8
2013	36.7	4.2	16.4	5.9	13.5	1.4	12.7	62.8
2012	37.1	2.2	17.5	6.9	14.9	1.5	13.4	62.5
2011	38.0	2.4	16.1	7.2	13.8	1.5	13.0	61.6
2010	39.0	2.2	17.8	6.3	15.6	1.6	12.0	60.5
2009	40.2	2.0	19.6	4.3	17.6	1.3	9.5	59.1
2008	36.9	3.1	22.3	6.0	20.3	1.6	10.9	62.4

Source: Turkish Statistical Institute

Foreign trade started to liberalize worldwide with the rapidly emerging globalization tendency in the 20th century as the tariffs and quotas restricting the foreign trade were gradually decreased. Moreover, countries entered into a process of economic integration in order to boost external trade and established various organizations. Turkey's access to the Customs Union has impacted the foreign trade structure. While the share of Germany and Italy was high in 1990s, Turkey's import from China and Russia started to increase after 1996 (Koçak and Özmen, 2012: 31-32). China is ranked at the top in distribution of Turkey's import by countries in 2017. Germany, Russia, USA, Italy and France follow China respectively.

Distribution of import by country groups is listed in Table 1. It is seen that the EU countries have the highest share in Turkey's import. It is observed that the shares of member countries in Black Sea Economic Cooperation (BSEC), Economic Cooperation Organization (ECO), Commonwealth of Independent States (CIS) have decreased in Turkey's import figures, while, on the contrary, no significant change occurred in the share of European Free Trade Association (EFTA) countries, Turkic Republics and Organization of Islamic Cooperation (OIC) and other countries.

Table 2. Distribution of Import by Goods Group, 2005-2017
(Thousand US Dollars)

Years	Capital Goods	Share (%)	Raw Material (Intermediate Goods)	Share (%)	Consumption Goods	Share (%)	Total Imports
2005	20 363 222	17.44	81 868 284	70.11	13 975 300	11.97	116 774 151
2006	23 347 556	16.73	99 604 660	71.36	16 116 330	11.55	139 576 174
2007	27 054 433	15.91	123 639 631	72.70	18 694 022	10.99	170 062 715
2008	28 020 665	13.87	151 747 101	75.14	21 489 236	10.64	201 963 574
2009	21 462 823	15.23	99 509 821	70.61	19 289 707	13.69	140 928 421
2010	28 818 242	15.53	131 445 426	70.84	24 734 930	13.33	185 544 332
2011	37 270 611	15.48	173 140 243	71.89	29 692 268	12.33	240 841 676
2012	33 925 389	14.34	174 930 331	73.95	26 699 252	11.29	236 545 141
2013	36 771 127	14.61	183 811 325	73.04	30 415 894	12.09	251 661 250
2014	35 995 907	14.86	176 721 669	72.97	29 006 394	11.98	242 177 117
2015	34 904 940	16.84	143 316 885	69.16	28 586 784	13.79	207 234 359
2016	35 918 942	18.08	134 315 401	67.62	27 947 076	14.07	198 618 235
2017	33 116 125	14.16	171 465 399	73.34	28 488 121	12.18	233 803 864

Source: Turkish Statistical Institute

Table 2 shows the sub-items of import of Turkey for 2005-2017 period. Accordingly, while the import of intermediate goods has an important share in the total product imports of Turkey, import of capital goods ranks as number two, and followed by import of consumption. While the share of intermediate goods was 70% among total imports in 2005, the share of capital goods among imports was realized as 17%. In 2017, the share of intermediate goods increased to 73%, meaning that import of intermediate goods maintained its high share in the last decade. On the other hand, the share of capital goods among the total imported products is 15.6% at average, and the share of consumption goods is %12.3 at average. While the share of intermediate goods among the total imports increased in the 2008 global crisis period compared to the previous year, it is seen that the share of capital goods import decreased among the total imports.

Literature

The rapid increase and the experienced structural changes in the international trade are determined by various economic factors. The analysis of elements having an impact in establishing these factors is crucial. For determination of the policies to be implemented, it is necessary for countries to understand which factors affect the imports and how imports would respond to changing economic circumstances. Therefore,

the studies aiming to determine the import are frequently found in the literature (Kocak and Ozmen, 2012: 33-34). The studies conducted on the factors affecting imports in Turkey are presented below.

Özatay (1997) examined the import demand of Turkey for the period of 1987-1996, and used real income and real exchange rate as explanatory variables for the real import demand. The two-phased Engle-Granger method was used in the analysis, and it was concluded that the imbalances occurring in the short term improved in the long term, and the real exchange rate was an important variable negatively affecting the import both in the long and short terms.

Kotan and Saygılı (1999) estimated the import demand function in their study with the quarterly data from 1987-1999 by using the Engle-Granger cointegration and Bernanke-Sims structural Vector Autoregression (VAR) methods. Income level, inflation, nominal foreign exchange rate and international reserves were used as explanatory variables in the estimation of long-term import demand along with the seasonal dummy variables. It was concluded that all the variables were significant in the analysis. It was further concluded that the long-term import demand was inelastic vis-à-vis income and prices, and the elasticity value was high vis-à-vis the international reserves. Income and nominal foreign exchange rate were found to be statistically significant in the short term.

Aydın et al. (2004) examined the export supply and import demand with the single-equation demand and VAR analysis. First of all, long-term import demand, which consisted of real income, real exchange rate and seasonal variables, was estimated with the least squares method, and it was concluded that the import was determined by real exchange rate and national income. VAR model was also used in the study and the results of both models were compared. While the real income elasticity of import was found to be 2 in the long-term import demand regression, the real effective foreign exchange rate elasticity was determined to be 0.40. Their elasticity was found to be 1.19 and 0.53 respectively in the short-term regression.

Kutlar and Şimşek (2003) examined the relationship of Turkey's import demand with the GDP and the prices indices of commercial goods and the goods which are not subject to foreign trade by means of cointegration analysis covering the period between 1987:1 and 2000:4. It was determined in the study that there were two co-integrated vectors between these variables. It was concluded that the income elasticity was positive and higher than one in the long-term estimation of the import demand, in other words, one-unit change increased the import demand approximately one and half times. Moreover, it was found out that one-unit change in the ratio of import price index to the commercial goods price index decreases the import amount in a one-fifth rate while the ratio of non-commercial goods' prices to the commercial goods' prices showed a continuous increase.

Kadılar and Şimşek (2004) benefited from the bounds testing approach with data from the 1970-2002 period in order to examine the long-term relationship between the demand and the variables determining the import demand. They reached to the conclusion that the import volume was cointegrated with the long-term prices. In addition, it was determined that the Marshall-Lerner condition, which argues that devaluation is effective in decreasing foreign trade deficits in the long term if the sum of import and export price flexibility is bigger than one, was also valid. According to the obtained results, it was stated that the import volume was sensitive to the increases in domestic prices; and that the imports would increase if the foreign exchange rate was not sufficiently changed vis-à-vis the increases in the inflation rate.

Altay and Çelebioğlu (2005) examined the structural change in import function following the 2001 crisis in their study. Import quantity index was utilized for explaining changes in the import amount. Central Bank gross foreign exchange reserve, export quantity index, annual deposit interest rate and total industrial production index were taken as independent variables. In the import function of the first model set accordingly, it was stated that exports was not the key determinant of imports, based on the fact that export quantitiy index was found insignificant. It was further determined that one unit increase in foreign exchange reserves increased the import at a rate of 0.003 in the post-crisis term compared to the pre-crisis

term; and that one unit increase in WPI increased imports at a rate of 0.538 compared to the pre-crisis term, when WPI variable was included in the model.

Saatçioğlu (2005) searched the determinants of post-1990 Turkish imports by using time-series analysis. GNP, export, inflation and nominal effective foreign exchange rate were processed as explanatory variables in this study, and cointegration analysis was used. It was concluded in the analysis that the income effects were determinant on imports rather than the substitution effect, which was generated by changes in foreign exchange rate through the price mechanism.

Doğanlar et al. (2006) used the Engle-Granger and Johansen cointegration methods in the analysis of foreign trade between Turkey and Germany for 1991-2004 period. They determined the existence of a long-term relationship in the export and import demand functions, and they revealed that the price flexibility of exports and imports decreased after entry into the Customs Union. In addition, they stated that there was not a significant change in the income flexibility of export demand; and that the income flexibility of import demand decreased after entry into the Customs Union.

Onwuka and Zoral (2009) used the ARDL Bounds Testing and Fully Modified Least Squares (FMOLS) Method for estimating the import function between 1950 and 2004. Import was defined as a function of income, foreign exchange, foreign direct investments and domestic prices. It was determined that foreign direct investments, domestic prices and income were effective on the import demand in the long term, whereas only income, domestic prices and foreign exchange rate were effective in the short term.

Vergil and Erdoğan (2009) examined in their study whether the Marshall-Lerner condition was met for the period of 1989-2005 together with the validity of the J curve effect in the short term. They defined imports as a function of income and relative prices. They found the income elasticity of imports as 1.81 and price elasticity thereof as -0.18. It was concluded that the Marshall-Lerner condition was met in their study, and J curve effect was also valid for Turkey in the estimation made by using the Almon polynominal model.

Bayraktutan and Bıdırdı (2010) analyzed the import function between 1989 and 2004 in their study with the Engle Granger and Johansen cointegration methods. Determinants of import were discussed as the real exchange rate and real domestic income in the study. According to the long-term analysis results, income elasticity of Turkey's imports and foreign exchange elasticity were determined to be as 2.72 and 0.31 respectively. Accordingly, they stated that import was more sensitive to real income compared to real foreign exchange rate. With reference to the low elasticity of real exchange rate vis-à-vis imports, they stated that a significant increase would occur in imports of our country in the periods when the economy achieved growth; and that the income effect was far higher than the price effect on imports.

Koçak and Özmen (2012) examined the import function of Turkey with the cointegration analysis in the post-Customs Union period. Income and relative prices were discussed as determinants of the import function in this analysis. As a result of the conducted Johansen Maximum Likelihood estimations, a long-term relationship was established, and the income and price elasticities of import demand was found to be high. It was concluded accordingly that the share of import in the GDP was high, and it was sensitive to price changes.

Yıldız and Berber (2012) searched the validity of the import-oriented growth hypothesis for the period of 1989-2007. The relationship between import, imported intermediate goods, imported investment goods and the real GDP were examined with cointegration analysis and error correction model. Accordingly, it was determined that there was a causality relationship between growth and the total imports and imported intermediate goods. In addition, it was stated that there was a bilateral causality relationship between the imported investment goods and growth, and there occurred an import-oriented growth in Turkey within the same period.

Yurdakul (2016) analyzed the import function of Turkey with quarterly data for 2003:01-2012:04 period. Real income and foreign exchange rate were used as factors affecting the import in this study, and the Least Squares method was preferred for estimation of the import function. It was concluded that the total imports was sensitive to the changes in the foreign exchange rate in a model showing the relationship between income and foreign exchange. It was stated that the income effect on imports is much higher than the effect of foreign exchange rate in the discussed period.

Methodology and Empirical Results

The import equation of Turkey was estimated with the least squares model through employment of the multiple regression model. Monthly data was used for 2005 and 2017, and the seasonal effects were adjusted. The data on variables utilized in the estimated equation was obtained from the electronic data system of the Turkish Statistical Institution. Eviews 10.0 program was used in the estimation and analysis of the model. Significance of the model, which was generated by using the variables of exchange rate, export/import coverage ratio and industrial production index, was investigated with the f-test. Logarithm of data used in the model was taken. The data, which was understood not to be stable by the use of Augmented Dickey Fuller (ADF) Unit Root Test, was stabilized by taking their primary differences. Import, exchange rate, export/import coverage ratio, industrial production index were represented by IMP, EXR, CR and IPI respectively.

In case the probability value of the calculated t statistical figures of independent variables, which are included in the import equation estimated with the least squares method, is lower than 0.05, the relevant variable is considered to be significant for explaining the model. It was determined that real effective foreign exchange rate, industrial production index and export/import coverage ratio are included in the model as explanatory variables. The fact that the probability value of f statistic, which expresses the overall significance of the model, is lower than 0.05 exhibits that the model is significant. The change in independent variables explain the change in dependent variable at a rate of 0.77 (Table 3).

Table 3. Estimation of the Model

Independent Variable	Coefficients	Standard Error	t-statistic	Probability Value
EXR	0.223364	0.093604	2.386273	0.0183
IPI	0.913223	0.045639	20.00969	0.0000
CR	-0.392122	0.049281	-7.956818	0.0000
Constant	0.001695	0.004149	0.408517	0.6835
R^2	0.778487			
Adjusted R^2	0.774086			
F-Statistic	176.8916			
Probability Value of F-Statistic	0.0000			

Certain assumptions need to be realized for the least squares method to generate reliable estimations in the multiple regression model. The least squares method is where the parameter estimators, which minimize the sum of squares total, are chosen. Application of this method depends on observance of a number of assumptions. When one or some of these assumptions are not realized, the result becomes inaccurate (Büyükuysal and Öz, 2016:110). The assumptions such as multicollinearity, normality, autocorrelation and constant variance, which are predicted to occur in this case, have been tested respectively, and the equation is estimated by assuming that the model is significant.

$$IMP = 0.0016 + 0.2233EXR - 0.3921CR + 0.9132IPI$$

Multicollinearity problem is often encountered in the multiple linear regression analysis. It expresses the existence of a linear relationship between the independent variables. If one of the independent variables is expressed as the linear function of other independent variable(s), the existence of a linear relationship between independent variables can be examined. This may cause misestimation of the regression coefficients, obtaining exaggerated results for standard errors of regression coefficients, and accordingly widening of confidence intervals, and the decrease of t test value. The increase in standard error causes the regression coefficients to be regarded as insignificant and therefore leads to incorrect results (Topal et al., 2010: 53, 54). The existence of multicollinearity was controlled by checking the centered variance inflation factor (Centered VIF). Since it was observed that these values are between 1 and 5, multicollinearity was concluded to be non-existent (Table 4).

Table 4: Multicollinearity Test

Variables	Centered Variance Inflation Factor (Centered VIF)
CR	1.028263
EXR	1.106308
IPI	1.081234
Constant	NA

Normal distribution of error terms is another assumption concerning validity of the estimation. As a matter of fact, if μ_i is normally distributed, β_1 and β_2 will also be normally distributed. Jarque-Bera testing is used for this purpose. The method employed for obtaining the Jarque-Bera value is as follows (Yıldırım and Gökpınar, 2012:110):

- H_0: Errors are normally distributed.
  H_1: Errors are not normally distributed. It is calculated as:
- $JB = \frac{n}{6}(S^2 + \frac{(K-3)^2}{4})$
- $S = \frac{\mu_3}{\sigma^3} = \frac{\mu_3}{(\sigma^2)^{3/2}} = \frac{\frac{1}{n}\sum_{i=1}^{n}(x-\bar{x})^3}{(\frac{1}{n}\sum_{i=1}^{n}(x-\bar{x})^2)^{3/2}}$

$K = \frac{\mu_4}{\sigma^4} = \frac{\mu_4}{(\sigma^2)^2} = \frac{\frac{1}{n}\sum_{i=1}^{n}(x-\bar{x})^4}{(\frac{1}{n}\sum_{i=1}^{n}(x-\bar{x})^2)^2}$

n expresses the number of observations; S expresses the sample measure of skewness; K expresses the sample measure of kurtosis; $\bar{x}$ expresses sample mean; σ^2 expresses second moment or variance; μ_3 and μ_4 express third and fourth central moments. If $JB > X^2{}_{\propto,sd}$ or if the probability value of the JB statistic is smaller than 0.05, H_0 is rejected while H_1 is accepted and the errors are considered to be not normally distributed. IF $JB < X^2{}_{\propto,sd}$ or the probability value of JB statistic is bigger than 0.05, H_0 is accepted while H_1 is rejected, and the errors are considered to be normally distributed (Gujarati and Porter, 2009:130).

Table 5: Jargue-Bera Test

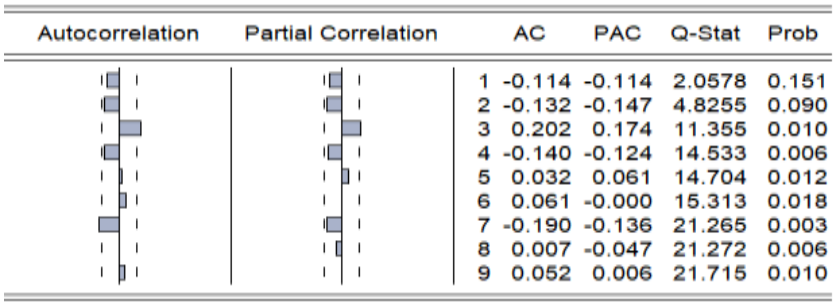
Jargue-Bera	Probability Value
1.985128	0.370625

Probability value of Jarque-Bera statistics is calculated as 0.370625. Since this value is bigger than 0.05, H_0 hypothesis was accepted, and the errors are considered to be normally distributed (Table 5).

Table 6: Breusch-Godfrey Autocorrelation Test

F-Statistic Value	Probability Value of F-Statistic (2)	Observed R^2	Chi-Square Probability Value (2)
2.699766	0.0705	5.420531	0.0665

Existence of autocorrelation is searched with Breusch-Godfrey Autocorrelation test. It is decided that there is no autocorrelation, since the chi-square probability value is bigger than 0.05 (Table 6). Moreover, it is observed that approximately one-fourth of the number of observations are within the confidence intervals of series in the correlogram graph obtained in lag length (Graphic 1).



Graphic 1. Correlogram Graph

A subsidiary regression comprising the independent variables and squares of the main model is created in the White test exercised for the constant variance control, which is another assumption. The White test statistics is calculated with the coefficient of specificity of this regression, and X^2 distributions are compared with the table values. H_0: there is no changing variance. H_1: there is a changing variance. It is calculated as $W = nR^2$. If $W > X^2$, in other words, if the probability value of chi-square distribution is smaller than 0.05, H_0 is rejected, and it is considered that there is a changing variance. If $W < X^2$, in other words, if the probability value of chi-square distribution is bigger than 0.05, H_0 is accepted, and the existence of the constant variance is rejected (Gujarati and Porter, 2009: 387).

Table 7: White Test

F-Statistic Value	Probability Value of F-Statistic	Observed R^2	Chi-Square Probability Value
1.376821	0.2037	12.20312	0.2021

Probability value of the chi-square distribution in White test is calculated as 0.2037. Since this value is bigger than 0.05, H_0 hypothesis is accepted and it is considered that there is a constant variance (Table 7).

Conclusion

Turkey has abandoned import substitution policy and adopted an outward and export-oriented policy in the goods, services and capital domain after 1980s. By such means, a significant development was accomplished in the national economy and foreign trade, and significant increases were experienced. However, the external deficit problem has continued due to dependence of exports on imports. Moreover, the facts that the emergency goods with low substitution have a high share while the capital-intensive commodities have even a higher share in imports; and on the contrary, that the low-value-added products predominantly comprise Turkey's exports negatively affect the ratio of exports meeting the imports. Turkey's dependency on imported goods to make production and export the same means that the foreign trade is dependent on these imported inputs. In the case of imports, changes in exchange rates aggravate this deficit problem.

Monthly data are used in the multiple regression analysis of the 2005-2017 period where exchange rate, export/import coverage ratio and industrial production index are discussed as independent variables. Import equation of Turkey is estimated with the least squares method after the significance of variables, overall significance of the model, and the validity of assumptions are controlled with statistical methods.

According to the findings, an increase of 1% in exchange rate causes an increase of 0.22% in the imports of Turkey; and an increase of 1% in export/import coverage ratio causes a decrease of 0.39% in the imports of Turkey; and an increase of 1% in the industrial production index causes an increase of 0.91% in the imports of Turkey. It becomes evident that, due to the import-based production and growth in Turkey, the increases in the exchange rate does not lead to decreases in the imports of Turkey; and that the exchange rate sensitivity of imports is low. On the other hand, the positive effect of an increase in the industrial production index on imports supports the import-based growth model.

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