ANALYSIS OF FOREIGN DIRECT INVESTMENT IN FOOD PRODUCT SECTOR IN TURKEY

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Abstract

This paper analyzes the determinants of Foreign Direct Investment (FDI) in the food products sector in Turkey. An Autoregressive Distributed Lag (ARDL) model is applied to the monthly data over the period of January 2009 to December 2016. In the model, FDI inflows are modeled as a function of the degree of openness, exchange rate, export price, and wage rate. The empirical results confirm there is an evidence of a long-run equilibrium relationship among these variables in Turkey. Findings indicate that the degree of openness and export price have a positive sign and are statistically significant, while the wage rate has a negative sign and is statistically significant. The error correction term (ECT) of the estimated model is negative (−0,92) and statistically significant which indicates that deviations of actual FDI from the previous period's shock will be converged to the long-run equilibrium.

***Keywords**: FDI, ARDL, Bound Testing Approach, Macroeconomics*
***JEL codes**: C12, F21, F23*

TÜRKİYE'YE GIDA SEKTÖRÜ'NDE YAPILAN DOĞRUDAN YABANCI SERMAYE YATIRIMLARININ EKONOMETRİK ANALİZİ

Öz

Bu makalede, Türkiye'ye gıda sektöründe yapılan doğrudan yabancı sermaye yatırımları, ARDL metodu ile 2009 - 2016 yılları arası dönemde aylık veriler kullanılarak analiz edilmeye çalışılmıştır. Çalışmada; bağımlı değişken olarak doğrudan yabancı sermaye yatırımları ve bağımsız değişkenler olarak da ticaret açıklığı, döviz kuru, ihracat fiyatı ve ücret oranı verilerinden yararlanılmıştır. Çalışmanın sonuçlarına göre, incelenen faktörlerden ticaret açıklığı ve ihracat fiyatı gıda sektörüne yapılan yabancı sermaye yatırımlarını pozitif etkilerken, ücret oranı arttıkça yabancı sermaye yatırımları azaltmaktadır. Hata düzeltme teriminin katsayısı, istatistiki olarak anlamlı ve beklenildiği gibi negatiftir. Bu değer, kısa dönemde meydana gelecek şoklar nedeniyle uzun dönemde meydana gelen dengeden sapmanın %92'sinin bir dönem sonra yani bir ay sonra dengeye yakınsayarak düzeleceğini belirtmektedir.

***Anahtar Kelimeler**: Doğrudan yabancı sermaye yatırımları, Sınır testi yaklaşımı, ARDL, Makroekonomi*
***JEL Kodları**: C12, F21, F23*

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1. Introduction

Foreign direct investment (FDI) is the investment made by foreign companies in a country, which leads to economic growth of that country. A country needs capital and revenues to propel the economic growth and FDI helps in achieving this feat by bridging the investment-savings gap (Borensztein, Gregorio and Lee, 1998). FDI also brings peace, security, advanced information technology, industrial cluster development and other benefits to economies (Sanderatne, 2001). Besides, FDI adds value to industries and increases the Gross Domestic Product (GDP) and earnings through the foreign exchange (Borensztein, Gregorio and Lee, 1998). If FDI is made in a particular sector, it brings significant transformation by making the companies in that sector able to hire a skilled workforce and improve the quality of products and services.

Food FDI increased sharply in the last few years. This trend is evidenced due to a number of factors such as increasing production and exports of processed food (Athukorala and Kunal, 1998), escalating food insecurity, high food prices, scarcity of land and water resources in countries making them unable to provide adequate food supplies, and increasing urbanization and population making people dependent on imported and ready-made food items. Food FDI is important because developing countries are faced with population booms and their agriculture and land resources are limited (UNCTAD, 2006). Hence, food FDI presents a strategic response to private sector food companies, which find good business opportunities to invest in food demand-struck nations while the nations are able to support the living of their population (Hallam, 2009). Nations in Africa and elsewhere that are the most affected by food insecurity and shortages benefit the most from food FDI; food supplies are ensured while the government offers tax and subsidies to foreign investors to sustain the food manufacturing and agriculture industry (Gibbon and Ponte, 2005).

The objective of this article is to analyze the main determinants of food product FDI inflows in the case of Turkey. Thus, this paper is, to the best of our knowledge, the first indirectly testing the linkage between the determinants of FDI flows into the Turkish food processing industry. The empirical results show that the degree of openness and export price have a positive sign and are statistically significant, while the wage rate presents a negative sign and is statistically significant. However, the coefficient of ECT is estimated to −0.92 (0.00) which indicates that approximately 92 percent of the disequilibrium in FDI from the previous period's shock will converge to the long-run equilibrium.

The remainder of the paper is set out as follows: After the introductory section, the paper continues with an overview of the relationship between total FDI inflows and economic growth in Turkey, and then looks into Turkey's food industry from different perspectives. Section 3 summarizes empirical evidence of earlier studies on the determinants of FDI in the food processing industry. Data and econometric methodology are discussed in Section 4. The results are then analyzed in Section 5. The paper concludes with evaluating the consequences of the major findings and recommendations.

2. Overview of FDI Flows in Turkey

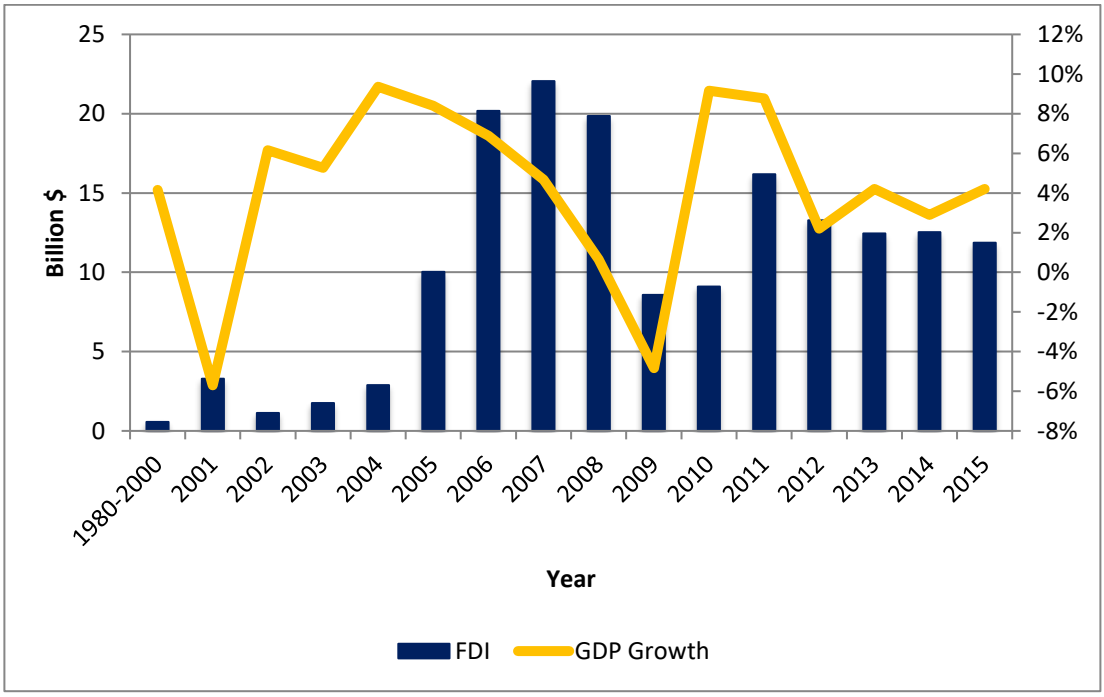
Turkey is a country located at the junction of Europe, Asia, and the Middle East. Its competitive advantages, such as geographic importance, closeness to different markets, young labor force, political and financial stability, and expanding local economy make it one of the most appealing destinations for foreign direct investment (FDI). A survey conducted in 2013 by Ernst & Young based on representative samples of 201 multinational firms for Turkey shows that about 88 percent of respondents believe that Turkey's geographic location is either very or fairly attractive, and 79 percent rate the domestic market as very or fairly attractive. Labor costs and local labor skill level were also listed by most respondents (80 and 76 per cent respectively) as very or fairly attractive.

Macroeconomic stability, the telecommunications infrastructure, and the Turkish culture were also viewed favorably by respondents.

Starting in 2002, the Turkish government put into practice new economic policies to increase monetary, fiscal and financial sector stability. The aim of these regulations is to improve confidence in the business environment and to overcome economic crises with minimum damage (Business Reporter, 2013). Based on these positive steps, the economy between the years 2002 and 2007 enjoyed strong and uninterrupted economic growth with at an average annual rate of 6.8% GDP growth. Yet, this positive trend reversed with the global economic meltdown of 2008. Starting in mid-2008, the Turkish production and construction sectors contracted by 10.8 per cent and 13.4 per cent respectively. The GDP growth rate dropped to 0.7 per cent in 2008, and GDP declined at a rate of 4.8 per cent in 2009. Although Turkey was deeply affected by the global crisis, it recovered quickly. The Turkish economy experienced a positive growth in 2010 at a rate of an 9.2 per cent, 8.8 per cent in 2011, 2.2 per cent in 2012, 4.2 per cent in 2013, 2.9 per cent in 2014 and 4 per cent in 2015 (TurkStat, 2017).

Political and economic stability, a confident investment climate, a young and dynamic population, the closeness of Turkey to Europe as well as to the Middle East and Africa all help to attract more FDI into Turkey. The total FDI inflow in Turkey escalated dramatically in the mid-2000s.

Figure 1: **FDI Inflows (Million $) and GDP Growth Relation in Turkey**
(Note: Values are averaged over the period 1980-2000)



Source: The Central Bank of the Republic of Turkey (CBRT, 2016).

Figure 1 illustrates the relationship between GDP growth and the inflows of FDI into Turkey over the period 2000 to 2015. While the accumulated FDI inflows to Turkey amounted to only about USD 1.2 billion a year during the 1980-2000 period, it surged to USD 11.5 billion between 2001 and 2015, an increase of thirteen-fold. Turkey's FDI inflows reached USD 22 billion in 2007, the highest level ever

recorded. There was some fluctuation between the years. In 2009, FDI decreased to USD 8.5 billion as a result of the global slowdown of 2008. After falling sharply during the crisis, FDI inflows to Turkey reached USD 9.1 billion in 2010, USD 16.2 billion in 2011, and dropped to USD 11 billion in 2015. Compared to 2011, FDI inflows to Turkey decreased by 26 per cent in 2015 in line with the global FDI flows (CBRT, 2017).

Turkey's food processing industry is the largest and most dynamic sector among the manufacturing activities. Nandu Nandkishore who is the executive vice president at Nestle states that "Turkey is one the fastest growing and most dynamic market in Asia, Oceania, and Africa. This investment makes the site one of its major regional manufacturing hubs, in western Turkey" (Business Reporter, 2013, p.3). Following a very serious economic transformation in the last 10 years, the performance of Turkey's food product sector has developed significantly and many multinational firms have increased their investment in Turkey. During the period 2007 to 2012, the amount of FDI inflows in the food processing industry increased at the rate of 68.6 per cent per annum, reached a peak of USD 2201 million, and then it has been on a downward trend since 2013 (CBRT, 2017).

According to a report by the Global Agriculture Information Network dated 2014 (Atalaysun, 2014), the major multinational enterprises (MNEs) investing into Turkey's food processing sector were Coca-Cola, Pepsi Co., Unilever, Cargill, Nestle, Danone, Cadbury Schweppes, Kraft, Carlsberg, Frito-Lay, Haribo, CP, and Perfetti van Melle. Unilever, the largest in the industry with its 30 brands in the Turkish market, employs over 5000 people and reported net revenues of 3,391,950,836 million Turkish lira in 2014 (ICI, 2014).

3. Review of the Literature on Food FDI

FDI in the food sector has increased for a number of reasons. First, it helps address the issue of food insecurity in developing nations where advanced technology, agricultural tools and equipment and other food production features are either absent or in their initial stages. It particularly helps nations increase domestic food supplies and production to ensure the availability of food to the local population (Smith and Häberli 2012; Slimane et al., 2015), thereby reducing local poverty and improving the basic standard of living (FAO, 2015). It also helps create employment opportunities because FDI helps increase production levels, thus leveraging the demand for workers and employees (Gerlach and Liu, 2010).

While numerous empirical studies have been conducted to identify the factors that affect the level of FDI activity in host countries, studies bearing on food industry FDI determinants are limited. Each study uses different variables, which are identified as determinants of food product FDI change from country to country and from study to study. Bolling *et. al.* (1998) explained U.S. foreign direct investment and trade in processed food in the Western Hemisphere countries' (WHC) food processing industries. That study covered the period from 1984 through 1994 with four country cases, Brazil, Canada, Mexico, and Argentina. They used the Burfisher-Robinson-Thierfelder computable general equilibrium (CGE) model. The findings of the study suggest that "increased investment is an important factor in making free trade agreements (FTA') successful in generating added real income and trade" (Bolling *et al.*, 1998, p.15). Further, they also found that "there is a significant effect on U.S. trade with Mexico, but there is no significant effect on any of the other aggregate economic indicators for the United States" (Bolling *et al.*, 1998, p.16).

Using a similar country set, Mattson and Koo (2002) studied the relationship between U.S. exports and FDI in the processed food industry in the Western Hemisphere. They used a sample of eight Western Hemisphere countries, such as Canada, Mexico, Argentina, Brazil, Colombia, Costa Rica, Guatemala, and Venezuela, over the 1989-1998 periods. They include a number of macroeconomic

variables such as market size, exchange rate, and agricultural tariffs. They found that foreign affiliate sales are complements for exports from the U.S. food processing industry. That is, FDI has a positive and significant impact on exports while the effect of tariffs on exports is negative. On the other hand, exports and market size have a positive and significant impact on FDI inflows but these inflows are negatively influenced by exchange rate volatility.

Walkenhorst (2001) performed a country-level empirical study concerning the determinants of FDI inflow in Poland's food industry in 28 countries of investor-origin during the 1990s. In this study, he estimated a Tobit model based on a gravity model. The results reveal that the market size of a country, geographical distance from the investing country, trade intensity, and relative unit cost of labor are significant factors in determining the FDI inflows in Poland's food industry.

Makki *et al.* (2003) examined the effects of host country characteristics on U.S. processed food FDI and exports using panel data. The data covered 36 developed and developing countries for the years 1989 through 2000. They examined a number of macroeconomic variables such as GDP, per-capita income, trade, tax rates, interest rates, inflation rates, exchange rates, consumer price index, and food price index. The findings of the study reveal that the choice of a host country for FDI depends on various country characteristics and policies. The openness of countries, market size and per-capita income have a significant impact on the decision of U.S. food-processing firms whether to invest abroad or not, but the impact of these factors varies between developed and developing countries.

Wilson (2006) investigated the relationship between food product FDI, trade, and trade policy by utilizing a gravity model on panel data from several OECD countries for the years 1990 to 2000. According to this study, trade and FDI flows are connected to each other and outward investments and exports are positively influenced by market share. Further, the Market Price Support[3] (MPS) has a negative and significant impact on FDI inflows that indicates that "large domestic support at home relative to the domestic support of the exporting country increases imports of food products; therefore, higher relative cost of production encourages imports" (Wilson, 2006, p.12).

Similarly, Wilson and Cacho (2007) used panel data from 1990 to 2000 to analyze the relationships among FDI, trade and trade-related policies in the food sector in the OECD and four African countries (Ghana, Mozambique, Tunisia and Uganda) based on a gravity model. They include variables such as the home country GDP, host country GDP, the market price support (MPS), wages, distance, market share, and tariff rates. The study found that FDI and trade policy are related. Market share and tariff rates have a positive impact on outward investment whereas outward investment is influenced negatively by MPS and wages. Furthermore, the dummy variable for non-membership in NAFTA or the EU has a negative impact in determining the FDI inflows.

Herger *et al*. (2008) explored the determinants of cross-border acquisitions with a primary focus on the global agricultural sector. They employed a panel data set of 2000 international acquisitions covering 46 host and 45 source countries. Market size and relative costs were found to be important determinants of food sector FDI. Stock market conditions in the source countries were also an important consideration. However, they found differences in the factors driving food sector acquisitions in food processing versus retailing and also between acquisitions in developed versus developing countries.

Philips and Ahmadi-Esfahani (2010) explored the relationship between foreign direct investments, export markets, and spillovers in the Australian food manufacturing sector. They utilized firm-level data to assess the probability of the participation of a firm in export activities based on features such as

[3] *The MPS reflects the additional costs of primary agricultural inputs into the food industry (Wilson, 2006, p.6).*

spillover from firms owned by foreigners. They determined that foreign ownership has an insignificant impact on the probability of a company's participation in export activities.

Lastly, Ghazalian and Fakih (2017) examine the concepts of innovation, and research design in food processing in most of the transition countries in Central and Eastern Europe (CEE). Their findings revealed that economic transformations in the countries within CEE have greatly promoted innovation activities in the sector of food processing. They suggest that deepened and broadened economic liberalization policies would improve the innovation performance of transition countries thereby enhancing their competitiveness in the global arena.

From the review of the above empirical studies on determinants of FDI inflows in the food-processing industry, there is no study has been conducted in the food product market FDI inflows for the case of Turkey. This paper tries to fill in this gap.

4. Data and Methodology of Empirical Investigation

This study analyzes a set of potential determinant variables that influence the FDI inflows to Turkey's food production sector. Monthly time-series data spanning the period from January of 2009 to December of 2016, for a total of 96 observations for each variable, was obtained from the Central Bank of the Republic of Turkey. We classify the explanatory variables into four categories including the Trade Openness index (Openness) for the food production industry; the average daily earning (Wage); the export price for the food product industry (Price); and the exchange rate, which is expressed as local currency units against the U.S. dollar.

Trade openness is used to measure a country's degree of openness. A large number of empirical studies have tested the link between trade openness and FDI flows (Jordaan, 2004; Demirhan, 2008; Sridharan et al., 2010; Blonigen and Jeremy, 2011; Grubaugh S. G., 2013; Guris and Gozgor, 2015). Although in theory trade openness should attract greater levels of FDI, there is mixed evidence concerning the effect of openness on FDI flows. Studies indicate that it depends on the type of investment. In this study, we use the degree of openness index[4], which is computed as the sum of the monthly seasonal and calendar adjusted export index and import index divided by the monthly seasonal and calendar adjusted industrial production index for the food processing industry. Foreign trade indices monitor an overall measure of value and volume changes of imported and exported goods. The data for trade openness for the food processing industry are obtained directly from the Turkish Statistical Institute (TurkStat) and the variable is expressed in US dollars.

The impact of export price depends on the level of the country's development. Makki *et. al.* (2003) show that the export price reduces the level of FDI inflows to developed countries, but has the reverse effect in the developing countries (Makki *et. al.,* 2003). In this study, we use the consumer price index for the food processing sector to test the relationship between export price and FDI inflows. The expected sign of the export price on FDI flows is positive and the data for the export price, indicated by the unit value of imports, for the food processing industry are obtained directly from the Turkish Statistical Institute (TurkStat) and the variable is expressed in US dollars.

Wage rate influences the level of FDI inflows into the host country. The expected sign of the wage rate on FDI flows is negative because one purpose of the MNEs is to cut their production costs. Thus, the wage rate is one of the important factors that affects foreign investors' decisions in order to invest

[4] The Openness Index is an economic metric calculated as the ratio of country's total trade, the sum of exports plus imports, to the country's gross domestic product ((X+M)/GDP) (Wikipedia).

abroad or not (Makki *et al.,* 2003). The data for wages for the food processing industry are obtained from the Turkish Social Security Institute and the variable is expressed in US dollars.

Several studies have examined the relationship between the exchange rates and FDI flows. However, there is no clear statement as to how exchange rates affect FDI. For example, Barrel and Pain (1998) found that a depreciation in the host countries' currencies increased FDI flows whereas Waldkirch (2003) concluded that an appreciation of host currency increases FDI flows into Mexico. Amuedo-Dorantes and Pozo (2001) reported no statistically significant relationship between exchange rates and inward FDI flows into the United States. The data for the exchange rate is obtained from the Central Bank of the Republic of Turkey and the variable is expressed in US dollars.

In order to analyze the determinants of FDI, we use the following reduced form:

$$FDI_t = f(Price_t, Wage_t, ExchangeRate_t, Openness_t, u) \quad (1)$$

where FDI_t is the inflows of foreign direct investment for food, beverage, and tobacco product in the host country, $Price_t$ is export prices, indicated by the unit value, $Wage_t$ is the average daily earning, $Openness_t$ is the openness of the economy, $ExchangeRate_t$ is the average exchange rates expressed in local currency units against the U.S. dollar and u is the error term.

All variables are expressed in logarithmic values in order to eliminate or reduce the effect of any heteroscedasticity problem for economic time series data. Thus, the regression equation used for this econometric analysis is:

$$\ln(FDI)_t = \alpha_0 + \alpha_1 \ln(Price)_t + \alpha_2 \ln(Wage)_t + \alpha_3 \ln(ExchangeRate_t)_t + \alpha_4 \ln(Openness)_t + u_t \quad (2)$$

where the variables are as stated before and where the parameters to be estimated are $\alpha_1, \alpha_2, \alpha_3$, α_4, and α_5 stand for the long-run elasticities of FDI with respect to export prices, wages, exchange rates, and openness, respectively. The stochastic error term, denoted by u, is assumed to satisfy the normal requirements. The subscript *t* represents monthly time period.

This study uses the Autoregressive Distributed Lag (ARDL) model (or the bounds test approach) which was originally proposed by Pesaran and Shin (1999) and further developed by Pesaran *et al.* (2001). If the underlying variables are purely stationary, I(0), or stationary in the first difference, I(1), or a mixture of both, then the ARDL approach is an appropriate model. Hence, we have:

$$\Delta \ln(FDI)_t = \beta_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta In(FDI)_{(t-i)} + \sum_{i=0}^{m} \alpha_{2i} \Delta In(Price)_{(t-i)} + \sum_{i=0}^{m} \alpha_{3i} \Delta In(Wage)_{(t-i)} + \sum_{i=0}^{m} \alpha_{4i} \Delta In(ExchangeRate)_{(t-i)} + \sum_{i=0}^{m} \alpha_{5i} \Delta In(Openness)_{(t-i)} + \theta_1 ln(FDI)_{t-1} + \theta_2 ln(Price)_{t-1} + \theta_3 ln(Wage)_{t-1} + \theta_4 ln(ExchangeRate)_{t-1} + \theta_5 ln(Openness)_{t-1} + v_t \quad (3)$$

where all variables are as previously defined, Δ denotes the first difference operator; m is the optimal lag length; the terms with summation signs represent the error correction dynamics (short run multipliers of the model), i.e. $\alpha_{1i}, \alpha_{2i}, \alpha_{3i}, \alpha_{4i}$, and α_{5i}, and the second part of the equation (the terms with $\theta's$) represents the long-run multipliers of the model; β_0 is the drift component, and v_t is white noise error.

After estimating equation (3) using the OLS technique, the null hypothesis of the non-existence of the long-run relationship amongst the variables is conducted, i.e. $H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = 0$ against the alternative hypothesis $H_0: \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq 0$. The joint F-statistic or Wald statistic can be used for testing the significance of the coefficients on the lagged levels of the explanatory variables in the conditional-error correction form of the ARDL model. Four sets of appropriate asymptotic critical value bounds for the F-statistics, such as 1 per cent, 2.5 per cent, 5 per cent, and 10 per cent, for each level of significance are calculated by Pesaran and Pesaran (2009) and the estimated F-statistic value is compared with the critical values. If the estimated F -value is above

the upper bound critical level (for (*I(1)*), the null hypothesis is rejected which implies there is a co-integration relationship among the time series. Contrarily, if the computed F-value is smaller than the lower bound critical value (for (*I(0)*), the null hypothesis cannot be rejected which concludes that there is no long-run relationship among the time series. Finally, if the F-statistic within lower and upper critical bounds, however, the result is inconclusive.

Once a long-run relationship has been established, the second step is to estimate equation (3) using the appropriate lag length based on the Akaike's Information Criterion (AIC). The third and final stage is to estimate the short-run dynamics by constructing a one-period lagged error correction version of the ARDL model, which is associated with the long-run coefficients. This is specified as follows:

$$\Delta \ln(FDI)_t = \beta_0 + \sum_{i=1}^{k} \alpha_1 \Delta In(FDI)_{(t-i)} + \sum_{i=0}^{k} \alpha_2 \Delta\, In(Price)_{(t-i)} + \sum_{i=0}^{k} \alpha_3 \Delta In(Wage)_{(t-i)} + \sum_{i=0}^{k} \alpha_4 \Delta In(ExchangeRate)_{(t-i)} + \sum_{i=0}^{k} \alpha_5 \Delta In(Opennes)_{(t-i)} + \psi ECT_{t-1} + \varepsilon_t \quad (4)$$

where $\alpha_{1i}, \alpha_{2i}, \alpha_{3i}, \alpha_{4i}$ and α_{5i} denote the short-run dynamic coefficients of the model's convergence to equilibrium, ψ is the speed of adjustment for the explained variable towards long-run equilibrium and *ECT* is the error correction. The error correction term (*ECT*) is defined as: $ECT = lnFDI_t - (\varphi_1 lnPrice_t + \varphi_2 lnWage + \varphi_3 lnExchangeRate + \varphi_4 lnOpenness)$ and the coefficient of ECT (ψ) is expected to be less than zero and statistically significant in order to imply co-integration relationship.

5. Empirical Results

Monthly data over the period of January 2009 to December 2016 were used to estimate equation (9). The descriptive statistics of the selected variables are reported in Table 1.

Table 1: **Definitions and Descriptive Statistics of the Variables Used in the Empirical Analysis**

Variable	Definition	Descriptive Statistics					
		Obs.	Mean	S.D.	Median	Min.	Max.
FDI	FDI inflows for food product industry	96	16.448	1.579	16.523	13.815	21.375
Openness	Trade Openness Index for food product industry calculated with the 2005 base year	96	0.855	0.151	0.815	0.547	1.239
Wage	Average monthly wage for food product industry	96	4.413	0.250	4.410	3.929	4.917
Export Price	Export price, indicated by the unit value of imports for the food processing industry	96	5.654	0.244	5.684	5.180	6.099
Exchange Rate	Exchange rate is the average exchange rates expressed in local currency units against the U.S. dollar	96	0.682	0.247	0.594	0.349	1.249

Source: Author's calculation using Eviews 10. All variables are expressed in natural logarithm.

As is shown in Table 1 above, among all variables, *Openness* is the lowest standard deviation values with 0.151 that states the ranking of this variable in explaining variability in FDI. In addition, the monthly *FDI inflow* has the highest mean and standard deviation of 16.448 and 1.579 respectively in the data.

Time series data are often non-stationary and this situation could cause the problem of spurious regression and biased results (Maddala, 2001). A number of unit root tests have been developed to test the stationarity of the variables and the conclusions of those stationary tests may differ from each other (Nieh and Wang, 2005). This paper performs two different unit root tests, i.e., Augmented Dickey and Fuller (ADF, 1981) and Philips and Perron (PP, 1988) to check the order of integration of the

variables under consideration by examining the Akaike information criteria (AIC) with maximum lag lengths. All the tests mentioned above are testing the null hypothesis of stationary data. Table 2 reports the results of the two different stationarity tests.

Table 2: **The Unit Roots Tests for Stationarity**

Variable		ADF_c	ADF_{c+t}	PP_c	PP_{c+t}
FDI	Level	−8.805***	−9.012***	−8.852***	−43.544***
	Differenced	–	–	–	–
Exchange Rate	Level	1.686[0]	−2.583	1.418[1]	−1.897***
	Differenced	−7.164***	−7.617***	−7.164***	−7.580***
Openness	Level	−3.905***	−3.841***	−3.905***	−3.841***
	Differenced	–	−11.468***	–	−12.762***
Export Price	Level	−0.684	−3.978**	−0.674	−3.443
	Differenced	−8.707***	–	−8.632***	−8.571***
Wage	Level	1.603	−6.795***	−0.229	−9.371***
	Differenced	−6.795***	–	−25.007***	–

Notes: All variables are in logs in the series. (***) and (**) show values are significant at 1% and 5% level with MacKinnon (1996), respectively. Results obtained from Eviews 10.

The variables *FDI* and *Openness* are stationary in level form *I(0)*, whereas other variables, i.e., *ExchangeRate, Price* and *Wage* are non-stationary in their level form. After differencing the data, the unit root test reveals that the series for *ExchangeRate, Price* and *Wage* became stationary and integrated of order *I(1)*. Therefore, the findings obtained from the tests clearly indicate that the series are integrated with a mixture of *I(0)* and *I(1)* which support the use of the ARDL model.

The computed F-statistic is 13.578, which exceeds the upper critical bound values for 1 per cent level of significance (3.09), supporting the hypothesis of co-integration among foreign direct investment, exchange rate, trade openness, wage, and export price in the model. Table 3 reports the F-statistic results for ARDL model.

Table 3: **ARDL Bounds Test for Co-integration**

Variables	**F-statistics**	**Inference**
F(FDI/Price, Exchange Rate, Openness, Wage)	**13.578*** **	Co-integration
Significance Value	**Lower Bound**	**Upper Bound**
1%	2.20	3.09
2.5%	2.56	3.49
5%	2.88	3.87
10%	3.29	4.37

Notes: *** Statistical level at 1% level; ** Statistical level at 5% level; and * Statistical level at 10% level. The lag length k=11 was selected based on the Akaike info criterion (AIC), Schwarz info criterion (SC) and Hannan-Quinn criterion (HQC). Results obtained from Eviews 10.

After confirming the co-integration relationship among variables, the next step is to select the long-run ARDL model. Akaike's Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn Information Criterion (HQC) are used in the determination of optimal lag length for the ARDL model by testing the lowest number of lags and concludes that the ARDL model satisfies the condition of the tests of serial autocorrelation, heteroscedasticity, and normality at the same time. Pesaran and Pesaran (1997) suggest choosing 12 lags as the optimal lag length given the fact that we are using

monthly data. Given the maximum number of lags length (12) and the number of variables employed (5), we selected the lag 11, which corresponds to the ARDL (1,0,0,8,2)[5] for the long-run model after various specification trials. The results of this ARDL model based on AIC, SIC, and HQC are reported in Table 4 along with the relevant diagnostic tests.

Table 4: **ARDL Lag Length Order Selection Criteria Based on AIC, SCI and HQC**

Lag Length	Selected Model	AIC	SIC	HQC	Normality (prob.)	Serial Correlation	Heterosce-dasticity	Bound-test	ECT(−1)
1	(1,0,0,1,1)	3.784	3.999	3.871	0.719	0.705	0.889	13.952	−0.955
2	(1,0,0,1,2)	3.743	3.986	3.841	0.024	0.749	0.952	15.640	−0.981
3	(1,0,0,1,2)	3.743	3.986	3.841	0.724	0.028	0.952	15.640	−0.981
4	(1,0,0,1,2)	3.743	3.986	3.841	0.724	0.028	0.952	15.640	−0.981
5	(1,0,0,1,2)	3.743	3.986	3.841	0.724	0.028	0.952	15.640	−0.981
6	(1,0,0,1,2)	3.743	3.986	3.841	0.724	0.028	0.952	15.640	−0.981
7	(1,0,0,2,2)	3.749	4.020	3.858	0.715	0.934	0.887	14.165	−0.960
8	(1,0,0,2,2)	3.749	4.020	3.858	0.715	0.934	0.887	14.165	−0.960
9	(1,0,0,2,2)	3.749	4.020	3.858	0.715	0.934	0.887	14.165	−0.960
10	(1,0,0,2,2)	3.749	4.020	3.858	0.715	0.934	0.887	14.165	−0.960
11	**(1,0,0,8,2)***	**3.736**	**4.006**	**3.837**	**0.503**	**0.220**	**0.726**	**13.578**	**−0.929**
12	(12,12,12,11,10)	3.355	5.149	4.076	0.758	0.008	0.633	3.793	0.541

Source: Author's calculation using Eviews 10.

The long-run coefficients of the variables are reported in Table 5.

Table 5: **Long-run Coefficients of ARDL (1,0,0,8,2) Model**

Long-run Coefficient (Total Effect)			
Variable	**Coefficient**	**Std. Error**	**Prob.**
Openness	2.20*	1.82	0.04
Exchange Rate	− 0.40	3.21	0.17
Export Price	3.57*	4.38	0.06
Wage	− 2.74***	4.91	0.00
Constant	8.21*	14.44	0.05

Notes: ***, ****, and * denote significant at 1%, 5%, and 10 % levels, respectively. Results obtained from Eviews 10.

The coefficient of *ExchangeRate* is insignificant, but the other explanatory variables are found to be significant with signs consistent with expectations. The degree of openness, *Openness*, which is measured as a trade index, is positive and significant at the 5 per cent level. Thus, a change in trade openness index by 1 per cent leads to an increase in FDI flows for the food product industry by 2.20 per cent, all other things equal. This result suggests that openness is an important factor in explaining FDI inflows for the food product sectors in Turkey, supporting previous findings (e.g. Jordaan 2004; Demirhan, 2008; Sridharan *et al.* 2010; Blonigen and Jeremy, 2011; Guris and Gozgor 2015).

[5] ARDL (1,0,0,8,2) indicates that 1 lags for *FDI*, 8 lags for *Exchange Rate*, 0 lags for both Export Price and *Openness*, and 2 lags for *Wage*.

The Price of Exports is significantly different from zero at the 10 per cent significant level with a coefficient value of 3.57 and a p-value of 0.06. This result suggests that holding everything else constant, a change in the export price index by one-percent increases the level of FDI flows for the food product industry in Turkey by 3.57 percent increase. This result is consistent with Makki at.al. (2003).

Lastly, the coefficient of *Wage* was found to have a negative sign in the line with expectations of this study and is statistically significant at the 1%. From the result, a one-percent increase in wage rate is associated with a 2.74 percent decrease on inward FDI for the food product sectors in Turkey.

Table 6: **Short-run Coefficients of ARDL (1,0,0,8,2) Model**

Variable	Coefficient	Std. Error	Prob.
D(ExportPrice)	-6.60	5.81	0.26
D(Openness)	4.76**	1.82	0.01
D(*ExchangeRate)*	- 4.44***	3.32	0.00
D(*ExchangeRate* (-1))	11.86	6.37	0.13
D(*ExchangeRate* (-2))	-7.45*	4.19	0.08
D(*ExchangeRate* (-3))	6.81*	3.65	0.06
D(*ExchangeRate* (-4))	-3.18	1.32	0.12
D(*ExchangeRate* (-5))	-7.58	5.97	0.21
D(*ExchangeRate* (-6))	1.07	6.55	0.87
D(*ExchangeRate* (-7))	4.91	6.39	0.01
D(*ExchangeRate* (-8))	-9.76	7.25	0.14
D(Wage)	3.18	2.26	0.16
D(Wage (-1))	7.94***	2.29	0.00
D(Wage (-2))	-8.10	6.02	0.18
ECT(-1)	-0.92	0.10	0.00

Notes: ******** and ** denote significant at 1% and 5 % levels, respectively. Results obtained from Eviews 10.

The findings of the short-run dynamic estimates associated with the long-run relationship derived from the ECM equation (4) are presented in Table 6. The coefficient on the lagged error correction term is highly significant at the 1 percent level with the expected sign which suggests that the error correction model is well fitted. More precisely, the coefficient of ECT is estimated to −0.92 (0.00) which indicates that approximately 92 per cent of the disequilibrium in FDI from the previous period's shock will converge to the long-run equilibrium.

According to the short-run estimates, *ExportPrice* and *Wage* are not statistically significant while *ExchangeRate* and Openness are statistically significant at 1% and 5%, respectively. At lag 1, *Wage* has a positive coefficient and statistically significant at 1%, which indicates one percent change in *Wage* brings a change of about 7.94 percent in the level of FDI inflows while one percent change in *ExchangeRate* leads to a change in the level of FDI inflows by 11.86 percent.

At lag 2, the sign of *Wage* is negative but it is not statistically significant at any significance levels. However, the coefficient of *ExchangeRate* is negative and statistically significant at 10%, which implies a one-percentage point increase in *ExchangeRate* prompts 7.45 percentage point decrease in the level of FDI inflows for the food production industry. Furthermore, at lag 3 and lag 7, the coefficient of *ExchangeRate* turns to a positive sign but both lags are statistically significant at 10%. These result suggests that a one-percentage point increase in *ExchangeRate* will cause 6.81 and 4.91 percentage points decrease in the level of FDI inflows for the food production sector, respectively.

Several diagnostic tests were performed to verify the stability of the model. The results of these tests are given in Table 6.

Table 6: **Diagnostic Tests for ARDL Regression**

Test Statistics	Test Applied	Prob.	Chi-Square	F-statistics
A: Serial Correlation	Lagrange multiplier test of residual serial correlation	0.84	0.68	0.58
B: Normality	Test of Skewness and Kurtosis	0.50	0.47	2.37
C: Heterocedasticity	Breusch-Pagan-Godfrey Test	0.76	0.72	0.71

Source: Output of Eviews 9.

In serial correlation, the probability of the F-stat value for the Breusch-Pagan Lagrange Multiplier (BPG LM) test is 0.84 which is greater than the 5 per cent significant levels and it implies that there is no serial correlation in the long run relationship. Further, the probability of the data is higher than the 5 per cent significant level, which shows that the data used for the model is normally distributed. Finally, we use BPG test to check whether the model suffers from a heteroscedasticity problem or not, and we conclude that there is no heteroscedasticity problem in the model.

To determine the goodness of fit of the ARDL model, the stability tests proposed by Borensztein *et al.* (1998) and suggested by Pesaran and Pesaran (1997), and Pesaran and Shin (1999) have been employed to examine the stability of long-run coefficients. In addition, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMQ) stability tests have been performed to assess the parameter constancy based on the AIC-based error correction models. Figures 2 and 3 confirm that the parameters are stable over the sample period since the plot of the CUSUM and CUSUMQ statistics stay within the 5 per cent level of significance.

Figure 2: **Plot of the cumulative sum (CUSUM)**

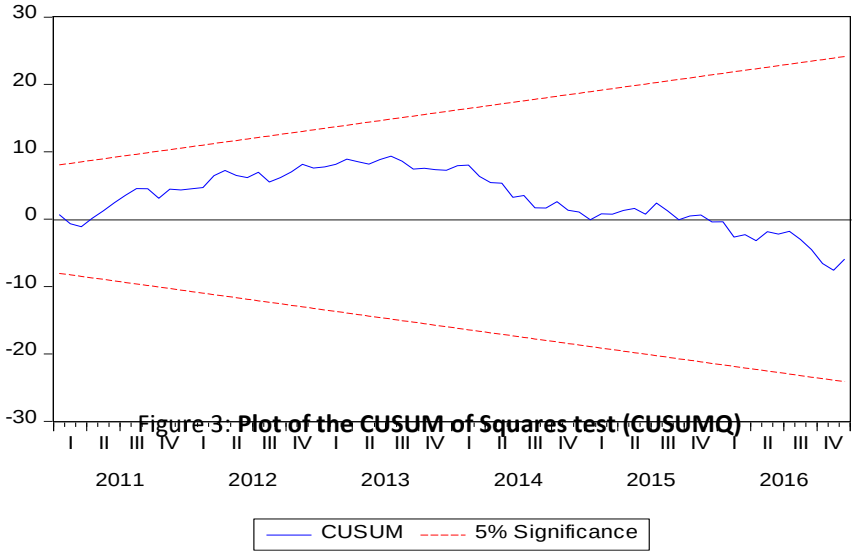
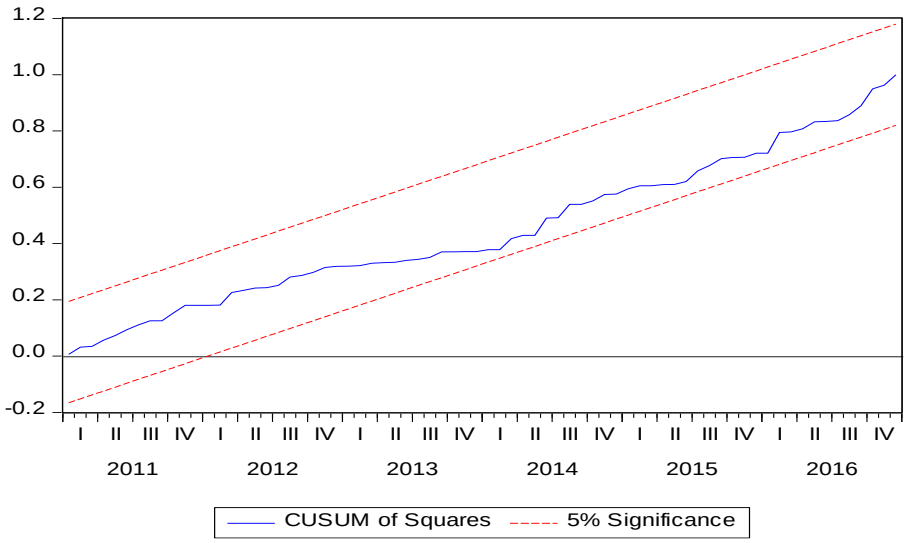


Figure 3: **Plot of the CUSUM of Squares test (CUSUMQ)**



6. Concluding Results

In the literature, few empirical studies investigate the determinants of FDI inflows for the food product industry, and no previous study exists for Turkey. Therefore, this paper attempts to fill this gap. Based on review of previous studies, we have identified four important determinants that influence FDI. They are trade openness, export price, and wage rate. This study has tested the long-run cointegration relationship between the variables by using an Error Correction Model (ECM) based on the ARDL bound test approach over the period of January 2009 to December 2016. The significance of the F-statistic of the ARDL model confirms the presence of a long-run relationship among variables.

We found that the variable trade openness, which is measured as the trade index, has a positive relationship with FDI in the long-run. We conclude that trade openness is a crucial factor in promoting Turkey's food product FDI. As argued earlier, on the basis of this result, countries with an efficient investment environment and greater trade liberalization policies promote FDI inflows into the host country.

The export price has a positive effect on Turkish food processing industry. This finding means that when export prices increase, MNEs make an effort to invest more in the host country in order to raise their profits. This result is further supported by Makki et.al. (2003).

The empirical results show that wage rate has a negative effect on FDI inflows for the food processing industry in Turkey. This conclusion implies that a higher wage rate in food processing sector would reduce the level of FDI inflows to Turkey.

Moreover, other results show that the error-correction coefficient, which determines the speed of adjustment, had the expected negative sign and is significant. The finding suggests that deviations from long-term disequilibrium in FDI inflows are corrected by approximately 92 per cent in each of the following period. In addition to those results, the model passes all of the diagnostics and stability tests.

Based on the conclusions above, these empirical findings have important key recommendations to policymakers. Since 2002, based on the 2023 vision that is the 100th anniversary of the Republic of Turkey, Turkish government has introduced four different incentive schemes in 2003, 2006, 2009, and 2012 to provide economic and financial stability, to expand the local economy, and to regulate its investment climate for more FDI inflows into the country. Yet, none of these incentive schemes help

Turkey's food processing sector as a desirable level. Thus, the Turkish government should prepare a specific program to protect the foreign investors in this industry. Further, the Turkish government also needs to formulate and implement prudent policies to enhance Turkey's dynamics such infrastructure, human capital quality, financial sector intermediation, and labor market performance.

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