9-1-2015

# Determinants of Foreign Direct Investment To Turkey

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*Topics in Middle Eastern and African Economies*
*Vol. 17, Issue No. 2, May 2014*

# DETERMINANTS OF FOREIGN DIRECT INVESTMENT TO TURKEY: A SECTORAL APPROACH

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**Keywords:** Foreign Direct Investment, Panel Data, Manufacturing Sector, Manufacturing Sub-sectors, Multinational Firms

**JEL Codes:** C23, F21, F29

**Abstract:** Despite the growing interest in foreign direct investment (FDI), substantial uncertainty still exists regarding what stimulates foreign investors to operate in a foreign market. Besides, previous studies have attributed the determinants of direct investments to locational and firm-specific factors. However, firm-specific and locational factors may vary across industries and their sub-sectors, as proposed by Dunning (1998). Using panel data for the 2007 to 2012 period, the major determinants of foreign investments into the manufacturing subsectors in Turkey are analyzed in this study. Strong evidence is found that turnover indices and new investment incentives introduced in 2009 have a positive impact on FDI; conversely, taxes, the country risk index of the USA, and the price of coking coal have a negative effect. The study fails to establish a significant impact of Country Risk index on Turkey and the price of natural gas.

## 1. Introduction

International trade and foreign direct investment (FDI) flows have stood out as the fastest-growing economic activities in the global environment in the last two decades. A critical analysis of the global FDI flows data issued by the UNCTAD (United Nations Conference on Trade and Development) (2008) announced that global FDI inflows have increased gradually over the years

and reached a peak level of $1.833 billion in 2007, with a 30% increase. Despite the growing interest in FDI inflows, the major reasons behind foreign investors seeking a country in which to invest and the uneven spatial distribution of FDI across countries remain unknown in both the theoretical and the empirical international business (IB) literature. Moreover, an analysis of the FDI literature reveals that most of the previous works have concentrated on firm-specific and locational factors in determining FDI. However, the "ownership–location–internalization" (OLI) paradigm developed by Dunning (1998) indicated the significance of industry characteristic differentials in determining FDI, and claimed that firm-specific and locational factors may vary across industries and sub-sectors. Accordingly, this research is built explicitly on Dunning's OLI paradigm. Furthermore, the main objective of this study is to seek the major determinants of the FDI inflows into the sub-sectors of manufacturing in Turkey separately for the 2007-2012 periods.

We contribute to the literature in several respects. First, to our knowledge, we are the first to examine the determining factors of FDI in the manufacturing sub-sectors in Turkey simultaneously by employing the panel data technique. Second, even though the dependence of FDI on energy prices is vitally essential, there are few papers emphasizing its significance. Given the significance of energy prices in the FDI literature, this study is the first FDI work that employs most of the important energy prices in the manufacturing sector of Turkey. Third, with appropriate data, we are able to show that FDI in manufacturing sub-sectors responds to sector-specific variables and risks in the market of the host country (Turkey) and the home country (the US).

The remainder of this paper is organised as follows. In Section 2, a review of the theoretical and applied works is presented. This is followed by section 3 describing sectoral breakdown of FDI

inflows in Turkey. The last section provides the presentation of the study and results with some concluding remarks.

## 2. Sectoral Determinants of FDI Inflows

Even though there is a huge body of literature investigating the factors that affect foreign capital, only a few studies have engaged in identifying the determinants of FDI at the sectoral level. In fact, as it appears from Dunning's (2000, p.165) OLI paradigm:

> 'It may be hypothesized that some sectors, e.g. the oil and pharmaceutical sectors, are likely to generate more FDI than others, e.g. the iron and steel or aircraft sectors, because the characteristics of the former generate more unique O advantages, and/or because their locational needs favor production outside of their home countries, and/or because the net benefits of internalizing cross-border intermediate product markets are greater.'

The factors responsible for motivating foreign investors to invest in a country may vary by the type of industry. Hence, we divided the sectors into three groups: the primary, secondary, and tertiary sectors. Doing so enabled us to explain the industry-specific factors debated in the FDI literature.

### 2.1. Primary Sector

Since this type of investment is resource-driven, there are almost no empirical studies that have investigated the factors pulling FDI toward the primary sector in the host country. One of the a handful of studies in the literature that can be mentioned here belongs to Walsh and Yu (2010), who argued that the relationship between the macroeconomic variables and primary-sector FDI is minimal due to the nature of investments that are aimed to extract resources. They concluded that the primary sector is generally capital-intensive, such as mining and petroleum, rather than labor-intensive, and the output in this sector is priced in dollars rather than the domestic currency with

little or no relation to the domestic financial system. Therefore, it is not surprising that the primary sector is not related to macroeconomic variables such as production cost and labor cost in the host country. The other empirical study on this sector belongs to Nauwelaerts and Beveren (2005), who claimed that FDI directed toward the primary sector is concentrated in a small number of countries that are rich in terms of natural resources.

### 2.2. Secondary and Tertiary Sectors

FDI inflows into the secondary and tertiary sectors show more linkages to macroeconomic and qualitative variables than FDI toward the primary sector. However, the secondary and tertiary sectors' responsiveness may vary according to each factor responsible for explaining FDI flows. Yeo et al. (2008, p.3) stated, "Most of FDI in service industry tends to be market-seeking, implying that the determinants of inward FDI in the service industry may differ from those in the manufacturing industry." Therefore, a quick summary of the differences between the two sectors is presented in terms of the possible impact of the explanatory variables that have been debated in the literature so far.

**Market Size**. The market size shows the demand side in the host market and is accepted as a key factor affecting FDI. But some researchers, like Yeo et al. (2008), have argued that the impact of the market size on FDI inflows may vary with the type of industry, requiring market-seeking FDI or resource-seeking FDI. They confirmed that the market size is a major determinant of FDI inflows into the Korean service sector rather than the manufacturing sector, since the service sector is mostly market-oriented rather than export-oriented. However, Awan, Khan, and Zaman (2011); Karim et al. (2003); and Xing (2006) also found a positive relationship between market

size and FDI in the manufacturing sector because the foreign investors in this sector were also market-oriented rather than export-oriented.

**Regulations**. The legal restrictions associated with business activities comprising various taxes, regulations on trade like tariffs, incentive policies aimed to attract FDI, or sector-specific restrictions on foreign ownership and entry might be considered important determinants of FDI in the host country. However, since FDI policies are generally sectoral in nature, sector-specific regulations may be much more important in explaining FDI flows than the host country's general policies. Shapiro and Globerman (2003) stated that sector-specific policies or regulations deter FDI flows more than general policies, and the importance of these regulations may vary for each sector.

**Political Stability**. Most of the previous studies have argued that political uncertainty affects the overall FDI inflows negatively. However, this impact may vary in terms of its significance and its direction across sectors and sub-sectors. For example, Desbordes (2007) explained in his study of a sectoral analysis of the US's FDI in developing countries that political uncertainties regarding FDI are largely dependent on industry-specific characteristics. He claimed that FDI in both capital-intensive and vertically integrated industries is affected negatively by political instability based on two approaches: the real options (RO) approach and the supply chain risk management (SCRM) approach. However, labor-intensive industries and horizontally integrated industries are less affected by political uncertainties in the host country, since multinational firms (MNFs) can shift their production from one place to another in the case of a horizontally integrated industry and do not need to make irreversible investments in the case of a labor-intensive industry. In addition, Kundu and Contractor (1999) found that political stability, which is valid as a

determinant for the manufacturing sector, is not valid for global hotel chains, which are among the world's largest service sectors.

**Macroeconomic Stability**. Since MNFs are subject to extra costs to ensure protection against risk occurring due to economic instability, macroeconomic stability can be regarded as another core factor that foreign firms take into consideration when investing in a country. Most of the empirical studies have proxied inflation as an indicator of economic stability in a host country since there is a strong positive linkage between these variables. Desbordes (2007) showed that FDI in vertically integrated industries deteriorates as a result of macroeconomic uncertainties more than FDI in horizontally integrated industries due to the inability of MNFs to sustain their operations in their home country because of an impediment to one stage of production located in the host country. He also argued that capital-intensive industries are much more exposed to macroeconomic risks than labor-intensive industries due to the nature of irreversible investing.

**Labor Market Flexibilit**y. Radulescu and Robson (2013, p. 582) stated, "In the literature, flexibility refers to the ability of employers to adjust the level of employment in response to the changing economic conditions." Therefore, in principle, tight job protection through labor market regulations is generally thought to affect FDI inflows into a country negatively. However, empirical studies examining the impact of this explanatory variable on FDI suggest that this impact may vary in each sector to some extent based on the structure of these sectors. For example, while Javorcik and Spatareanu (2005) claimed that labor market flexibility is a more important factor in the service sector than in the manufacturing sector, Radulescu and Robson (2013) argued the opposite point of view.

**Labor Cost and Quality**. A lower labor cost is another motive for a certain level of foreign capital movement, particularly in labor-intensive industries that do not require highly educated employees. However, capital-intensive industries generally require a well-educated workforce rather than cheaper labor. For example, Liu, Daly, and Varua (2012) investigated the locational determinants of FDI in China by dividing the manufacturing sector into two groups: low-tech and high-tech. They concluded that, while labor cost has a significant negative effect on the low-tech manufacturing sector, it does not play an important role in the high-tech manufacturing sector. Moreover, Yeo et al. (2008) concluded that labor cost is the major determinant of the Korean service sector, which is mostly labor-intensive.

**Clusters**. "Cluster" or "agglomeration" refers to "the geographic proximity of groups of companies and associated institutions in a particular field, engaged with partnerships and integrations." Clusters are crucially important for potential future FDI since they are assumed to be a signal to foreign investors of a good business climate in the host country, to accelerate the diffusion of know-how and technology, to create economies of scale, and to generate a network for customers and suppliers. Therefore, the existence of an agglomeration increases the comparative advantage of a certain sector, and in doing so, will pull more FDI to that sector. For example, Gross, Raff, and Ryan (2005) found that the existence of Japanese firms in the manufacturing sector of Europe attracted FDI in both the manufacturing and service sectors. Furthermore, Pelegrın and Bolance (2008) showed that, even though the agglomeration effect matters for the manufacturing sector of Spain, the degree of this effect may vary with the specific need of each industry, such that, while industries with a high degree of intra- and inter-industry connections are likely to be attracted to regions featuring the same industrial activity, cost-oriented industries are not affected significantly by the agglomeration effect. Moreover, Barrell

and Pain (1999), Walsh and Yu (2010), Wheeler and Mody (1992), and Yeo et al. (2008) all found strong evidence of clustering effects on future potential FDI flows.

**Real Effective Exchange Rate**. The effect of the exchange rate level on FDI inflows varies across industries due to each industry's own specific characteristics. For example, the manufacturing sector is thought to be more closely related to exchange rate movements than the service sector, because FDI toward this sector is mostly export-oriented. For example, Walsh and Yu (2010) showed that, while a depreciated real effective exchange rate is good for the manufacturing sector, the opposite is true for the service sector. They substantiated this by stating that FDI is related to a low labor cost, which is also associated with a depreciated host currency, but the service sector is associated with higher wages and profits.

**Exchange Rate Volatility**. Uncertainty or fluctuations experienced in the exchange rate play a role in shaping the investment decision of MNFs. In other words, fluctuations in the host country's exchange rate create a risk factor for MNFs due to uncertainty about the future benefits and costs of irreversible investment projects and the flexibility of investment timing. But the sensitivity of FDI to exchange rate variations may differ across industries and sub-sectors. For example, most of the empirical studies have suggested that the manufacturing sector has a stronger reaction to exchange rate movements than non-manufacturing sectors. Since FDI in the manufacturing sector is mainly associated with importing capital and exporting production in the international market, whereas non-manufacturing sectors mostly aim to serve the domestic market, FDI in the manufacturing category is highly exposed to exchange rate uncertainties. For example, Aranyarat (2012) found that the FDI in each sector fluctuates to different degrees with the exchange rate risk, such that these differences emerge because of operational differences in the sectors.

**Openness to Trade**. In principle, an open economy is most likely to be linked to vertical FDI, since its main objective is to export production abroad or re-export production to the home country. Conversely, if MNFs intend to invest in a foreign market when there is a trade barrier that imposes a considerable cost on the firm, a high degree of openness may also have an undesired negative effect on horizontal FDI. In principle, FDI directed to the manufacturing sector is often export-oriented and, therefore, most likely to be affected by the openness index. However, this may not hold for FDI in the service sector, which is generally market-seeking. For example, Awan, Khan, and Zaman (2011) found that a high degree of openness is a key determinant of higher FDI inflows into the commodity-producing sector of Pakistan. Feng (2011) and Walsh and Yu (2010), however, showed that FDI in the service sector may also be positively related to the degree of openness to trade due to the greater liberalization of this sector.

**Institutions**. The quality of institutions also plays an important role in attracting foreign investors to direct their operations toward a foreign market. Countries with a low level of corruption and a high level of protection of property rights are preferred by MNFs due to the diminished risk and cost of conducting business. Moreover, poor governance is an indicator of low economic growth, which can be an unfavorable signal to foreigners regarding FDI activity. However, due to the lack of an appropriate proxy or reliable data material to represent the quality of institutions, empirical studies that relate FDI to the quality of institutions are scarce. Wei (2000) employed different measures of corruption, but concluded that corruption has a deterring effect on FDI inflows. The sectoral study by Ivarsson and Jonsson (2003) also emphasized the quality of institutions for FDI inflows. They also suggested that the development of institutions creates an incentive for foreigners to establish technological linkages to improve their own firm-specific competencies, not only in the manufacturing sector, but also in the service sector.

## 3. Sectoral Breakdown of FDI Inflows into Turkey

As it appears from both Table 1 and Figure 1, the analysis of the sectoral distribution of FDI inflows into Turkey reveals that the service industry is the main sector in terms of receiving the most FDI inflows into the country between 2003 and 2012. Following the service sector, the manufacturing and energy sectors (electricity, gas, and water supply) received the highest FDI inflows between these years.

Table 1

*Sectoral Distribution of FDI Inflows, 2003–2012 (in millions of USD)*

| **Sector** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Manufacturing** | 347 | 206 | 865 | 1,701 | 4,131 | 3,971 | 1,642 | 923 | 3,573 | 4,392 |
| **Construction** | 8 | 2 | 81 | 215 | 287 | 337 | 209 | 314 | 301 | 1,453 |
| **Financial intermediation** | 54 | 127 | 3,856 | 6,954 | 11,717 | 6,136 | 817 | 1,620 | 5,882 | 1,443 |
| **Electricity, gas, and water supply** | 87 | 63 | 2 | 1,164 | 567 | 1,055 | 2,153 | 1,823 | 4,244 | 924 |
| **Health and social work** | 3 | 0 | 26 | 71 | 176 | 147 | 105 | 112 | 231 | 545 |
| **Administrative and support service activities** | 0 | 0 | 17 | 30 | 2 | 25 | 6 | 0 | 47 | 242 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Wholesale and retail trade** | 177 | 36 | 78 | 456 | 234 | 2,088 | 390 | 435 | 709 | 219 |
| **Mining and quarrying** | 13 | 74 | 41 | 123 | 336 | 145 | 89 | 135 | 146 | 214 |
| **Real estate renting and business activities** | 0 | 1 | 216 | 79 | 448 | 453 | 210 | 241 | 300 | 179 |
| **Transportation and storage** | 0 | 6 | 21 | 453 | 679 | 96 | 230 | 182 | 223 | 131 |
| **Telecommunication** | 2 | 670 | 3,263 | 6,353 | 472 | 97 | 173 | 36 | 36 | 114 |

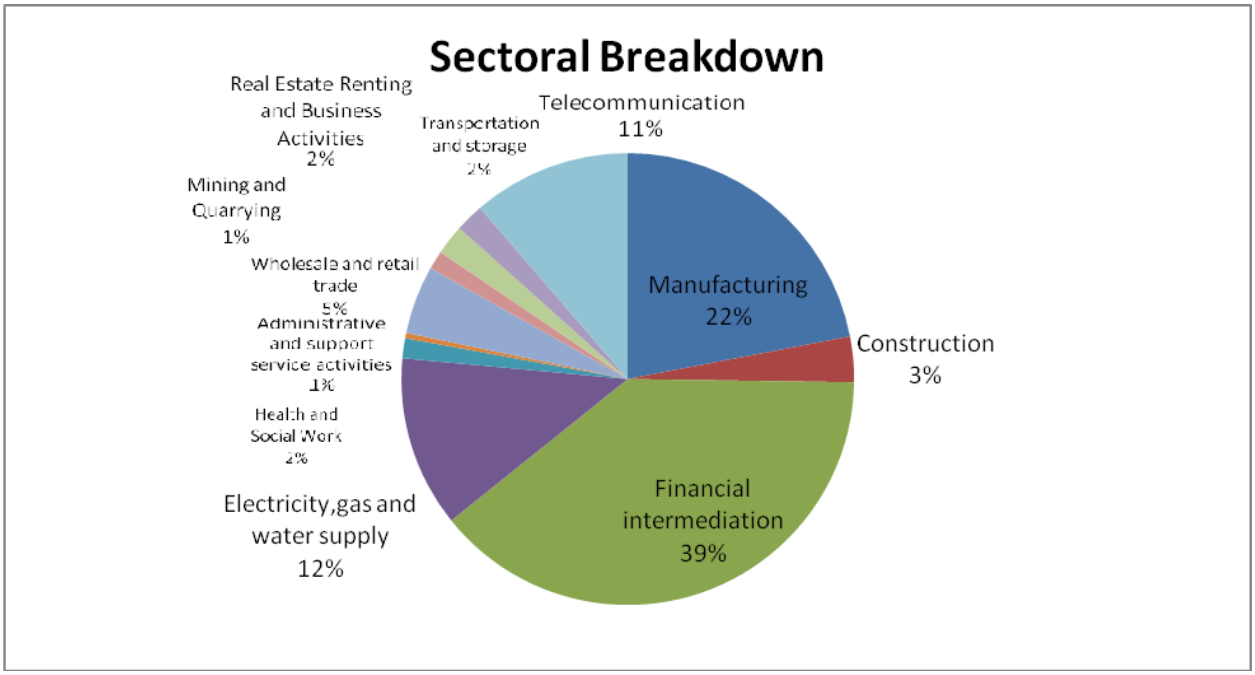
Source: Data derived from the Republic of Turkey Prime Ministry Undersecretariat of Treasury.

(http://www.treasury.gov.tr/

Financial intermediation is the major sub-sector of the service industry that has attracted the most FDI inflows. It has been increasing since 2005 as a result of the implementation of the new foreign investment law, 4875; the EU's negotiation for accession, and the good performance of the Turkish financial sector recently. Growing interest in Turkey as an appropriate investment destination led FDI inflows to reach a peak level, 11,717 million USD in 2007. However, a sharp drop in 2009 took place, from 6,136 million USD to 817 million USD, due to the 2007 global financial crisis. As the second-largest sector, manufacturing has also attracted a good amount of FDI inflows into the country. It has been gradually increasing since 2005 and reached a peak level, 4,131 million USD, in 2007. In contrast with the service sector, the manufacturing sector continued to receive high volume of FDI in spite of the financial crisis. FDI inflows into this sector constituted 1,642 million in 2009, and it was ranked as the largest sector of that year.

*Figure 1*

Sectoral breakdown of FDI inflows, 2003–2013 (in millions of USD).




Source: Data derived from the Republic of Turkey Prime Ministry Undersecretariat of Treasury.

(http://www.treasury.gov.tr/)

Moreover, electricity, gas, and water supply ranked as the third-largest sector by a 12% share in total FDI between these years. The main reason for the greater FDI in this sector is attributed to the growing interest in renewable energy resources and relevant advantages provided by the new Electricity Market Law, 4628. Finally, the telecommunications sector is the fourth-largest sector as a sub-sector of the service industry. This sector has ranked as the second-largest sector of 2006 and attracted 3,263 million USD in 2005 and 6,353 million in 2006.

## 4. The Presentation of the Study and Results

### 4.1. Data

**4.1.1. Dependent Variable**. FDI inflows into the manufacturing sub-sectors for the 2007-2012 periods were determined as the dependent variable. We obtained FDI inflow data for 13 sub-sectors of manufacturing from the *Central Bank Republic of Turkey* data dissemination server (http://www.tcmb.gov.tr/). The classification of manufacturing sub-sectors as follows: food products, beverages and tobacco; textiles and textile products; leather and leather products; wood and wood products; pulp, paper, paper products and publishing and printing; coke-refined materials; rubber and plastic products; other non-metallic mineral products; basic metals and fabricated petroleum products and nuclear fuel; chemicals, basic pharmaceutical products and metal products; machinery and equipment not elsewhere classified (n.e.c.); computers, electronic-electrical and optical equipment; and transport .

**4.1.2. Independent Variables**. We determined the following to be the most important macroeconomic and sector-specific explanatory variables. While the country risk (CR) indices of Turkey and the US are determined to be macroeconomic risk factors of both the host and home countries in the analysis, the turnover indices of each sub-sector, energy prices, and tax rates on commercial profits are specified as the most important sector-specific explanatory variables in the manufacturing industry. Moreover, a dummy variable is included in the model to account for the 2009 investment incentive system. As detailed below, the country risk (CR) index is a composite of the financial, economic, and political risks that emerge in both host and home countries. The CR indices for Turkey and the US come from the Political Risk Service (PRS) Group's *International Country Risk Guide 2012* (http://www.prsgroup.com/). Furthermore, while

the turnover of each sub-sector is attained from the *Turkish Statistical Institute*'s data dissemination server (http://www.turkstat.gov.tr/), we obtained energy prices from the data dissemination server of the *Organization for Economic Co-operation and Development* (OECD) (www.oecd.org). Additionally, tax rates levied on commercial profits are obtained from the World Bank (http://www.worldbank.org/). Definitions of data and expected signs of the coefficients are given below.

**Country Risk Indices for Turkey and the US.** The CR is a composite index of the financial risk, political risk, and economic risk indices of Turkey and the US for the period between 2007 and 2012. Due to the dominant share of FDI inflows into Turkey sourced from both the EU area and the US, we included the CR index of the US to account for risks originating in the home country.[1] [See the study of Bilgili et al. (2012)]. Economic risk ratings are used as a means to assess a country's economic weaknesses and strengths. With respect to risk factors, those taken into consideration as an economic risk measure are the GDP per head of population, real annual GDP growth, annual inflation rate, budget balance as a percentage of the GDP, and current account balance as a percentage of the GDP. The financial risk rating is used to assess a country's financial weaknesses and strengths. The risk points to be assessed for financial soundness are foreign debt as a percentage of the GDP, foreign debt service as a percentage of the exports of goods and services (XGS), current accounts as a percentage of XGS, net liquidity as months of import cover, and exchange rate stability. Furthermore, the political risk rating is used as a means to assess the political stability of a country. The factors of interest to be assessed are government

[1] The CR indices of both the USA and the EU area could not be employed together due to high correlation between the CR indices of these countries. This result is not surprising because the USA and EU are developed countries having similar CR rates.

stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, the military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. Overall, the data points of the CR index range from very high (00.0–49.5) to very low risk (80.0–100), which means that, as the points are lower, the risks are higher. In other words, the higher the value of the CR index, the lower the aggregated FDI risk for Turkey. Therefore, we expect that an increase in Turkey's CR index may have a positive effect on FDI inflows; however, the CR index of the US is expected to have a negative effect on FDI in Turkey.

**Turnover Index of Manufacturing Sectors**. The turnover index is calculated based on the Laspeyres index method (weighted) with a fixed base year (2005). The data used in the calculations of the index are derived from the Monthly Industry Production Questionnaire. Since the turnover index here is taken as a proxy for the profitability of each manufacturing sub-sector, a positive effect on FDI is expected.

**Dummy Variable to Account for the July 2009 Measures**. A new incentive system that includes a variety of new implementations to improve the investment conditions in Turkey came into effect on July 16, 2009. Based on this, new additional reinforcements have begun to be implemented on a sectoral and regional basis. According to the Undersecretariat of Treasury, General Directorate of Foreign Investment (2009), "out of the total investment amount of USD 6.5 billion, USD 1.9 billion was evaluated within the scheme of Large Scale Projects (6 certificates) and 97% of the six incentive certificates was issued for manufacturing sector." Therefore, it will be appropriate to include a dummy variable that takes the value of 1 after July 16, 2009, and 0 for previous years in order to capture the effect of this new incentive system for FDI inflows in manufacturing sub-sectors. Since the main objective of this new incentive system

is to improve the FDI inflows and reduce the aggravating effect of the global economic crisis, a positive impact of this variable on FDI is expected.

**Energy Prices.** Energy prices can be regarded as another prominent factor to explain movements in FDI flows into the manufacturing sub-sectors. Turkey Electricity Production Inc (Elektirik Üretimi Anonim Şirketi) (EÜAŞ ) (2011, p. 10) reports, "Total electricity production in Turkey by 2011 sourced mainly from natural gas by 44.7%, domestic coking coal by 18.2%, hydraulic resources by 22.8%, imported coking coal by 10%, fuel oil by 1.7% and wind by 2.1% and finally geothermal and biogas by 0.5%." As it appears, the main contribution of electricity production comes from coking coal and natural gas by around 72.9%. Given the fact that electricity is the major input in total manufacturing industry and each sub-sector, the inclusion of the prices of coking coal and natural gas into the model is warranted. [See the study of Bilgili et al. (2012).]

**Total tax rates (% of Commercial Profits).** The World Bank defines total tax rates as "…the amount of taxes and mandatory contributions by businesses after accounting for allowable deductions and exemptions as a share of commercial profits. Taxes withheld (such as personal income tax) or collected and remitted to tax authorities (such as value added taxes, sales taxes or goods and service taxes) are excluded." Since higher tax rates on commercial profits are an extra cost factor reducing profitability for foreign investors, this type of tax can be regarded as among the principal determinants of FDI inflows in manufacturing industry. Thus, its inclusion in the model is essential. [See the studies of Swenson (1994) and Hartman (1984).]

Table 2

*Expected Signs of Coefficients*

| Variable | Effect |
|---|---|
| **CR index of Turkey** | + |
| **CR index of the USA** | - |
| **Dummy for 2009 Measure** | + |
| **Manufacturing Turnover Indices** | + |
| **Tax Rates** | -/+ |
| **Price of Coking Coal** | - |
| **Price of Natural Gas** | - |

### 4.2. Methodology

To estimate the determinants of disaggregated FDI into the sub-sectors of manufacturing industry in Turkey for 2007 and 2012, balanced panel data were obtained from a pool of 13 manufacturing sub-sectors. The main reason for collecting a panel data set is generally to allow unobserved factors (here, sector-specific factors, denoted by $a_i$), to be correlated with the explanatory variables. In panel data analysis, unobserved factors are allowed to affect the dependent variable with the existence of two types. The first ones are those that are constant over time, and the

others are those that change over time. Consider an unobserved effect model with k explanatory variables:

for each $i$ ,

$$y_{it} = \beta_1 x_{it1} + \beta_2 x_{it2} + .....\beta_k x_{itk} + a_i + u_{it}, t = 1, 2....., T.$$

Here the parameters of interest, $\beta_k x_{itk}$ , cannot be estimated by pooled Ordinary Least Squares (OLS) , because OLS assumes that $a_i$ is uncorrelated with the explanatory variables. Therefore, the results will be biased and inconsistent with OLSand the resulting bias is called heterogeneity bias. However, there are two panel data models that are used to eliminate the problem of heterogeneity bias in pooled OLS. These are called fixed-effect transformation (FE) and random-effect (RE) models. We are able to eliminate the unobserved effect, $a_i$ , from the equation and therefore the problem of heterogeneity bias by averaging the unobserved effect model over time for each $i$ , by using the time demeaning on each explanatory variable and then subtracting it from the first equation. The aim of the fixed-effect transformation is to eliminate $a_i$ since it is thought to be correlated with the explanatory variables. However, in the case of the random effect, this is not the case, such that $a_i$ is assumed to be uncorrelated with each explanatory variable in all the periods. The superior side of the random effect across the fixed effect is to allow us to include unobserved variables in the model that are constant over time.

Prior to the estimations, consistent with econometric theory, the Lagrange multiplier (LM) test and Hausman (1978) test are carried out to determine the existence of a random effect and to ascertain which model is superior to the other, respectively. The LM test is conducted to test for the presence of heterogeneity by testing the null hypothesis $H_0 = \sigma^2_a = 0$ against the alternative

$H_1 = \sigma^2_a > 0$. If one rejects the null hypothesis, this means there is a random effect. Otherwise, failing to reject the null hypothesis implies that $a_i = 0$ for every sector and there are no sectoral differences and no heterogeneity to account for. On the other hand, to check for the presence of any correlation between the unobserved factors, $a_i$ and regressors in the random effect, we can use the Hausman test. The idea underlying the Hausman test is that the estimators of both RE and FE are consistent and converge to the true parameters $\beta_k$ in large samples, if there is no correlation between $a_i$ and the explanatory variables $x_{itk}$. That is, in large samples, if we fail to reject the Hausman test, the RE and FE estimates are similar; otherwise, rejecting the Hausman test means that $a_i$ is correlated with any $x_{itk}$ and the random-effect estimator is inconsistent while the FE estimator remains consistent.

Overall, to capture the impact of determinants of FDI on each sector of industry, the model can be formulated as follows:

$$y_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k x_{itk} + u_i + \varepsilon_{it}, \qquad t=1, 2\ldots T, \quad i=1,2\ldots N \quad (1)$$

where the i and t subscripts account for the sector and period indexes, while $X_{itk}$ represents the set of explanatory variables described above and $u_i$ and $\varepsilon_i$ represent the unobserved sector-specific factors and random error term, respectively.

### 4.3. Empirical Results

Prior to the estimation, we must decide whether the pooled model across each sub-sector under the same slope and intercept assumption or a model allowing sector-specific effects is valid. Since the former implies that variance of the country-specific effect is zero under the null

hypothesis, we first carry out the Lagrange Multiplier (LM) test (Breusch and Pagan, 1980) by adopting a random effects (RE) specification to determine the existence of an RE against no effect. Once the pooled model is rejected, we must choose between the fixed effects (FE) and RE specification by using the Hausman test. To implement this, the models are first estimated by FE and then by RE, and the results are stored in each turn. Under the null hypothesis, the RE is both efficient and consistent; otherwise, it is inconsistent. The test statistics and p-values are presented in Table 3.

Table 3

*Estimation Results*

| | **Coef.** | **Std. Err.** | **Z** | **P>Z** |
|---|---|---|---|---|
| **Constant** | 34.09938 | 25.44837 | 1.34 | 0.180 |
| **Compturk** | .3652115 | .218395 | 1.67 | 0.094 |
| **Compusa** | -.6936654 | .2858596 | -2.43 | 0.015** |
| **Dummy for 2009** | 1.772729 | .8187501 | 2.17 | 0.030* |
| **Measure** | | | | |
| **Manturn** | .0532919 | .0200335 | 2.66 | 0.008** |
| **Tax** | -1.281503 | .6307402 | -2.03 | 0.042* |
| **Price of Coking** | -.0241177 | .0115289 | -2.09 | 0.036* |
| **Coal** | | | | |

| | | | | |
|---|---|---|---|---|
| **Price of Natural Gas** | .0426987 | .0547439 | 0.78 | 0.435 |

| | | | | | |
|---|---|---|---|---|---|
| **LM Test Statistics** | 10.62 (0.0006) | **Hausman Test Statistics** | (0.29) (0.9999) | **Sample Size** | 68 |

** denotes the 1% significance level, while * denotes the 5% significance level. While Compturk and Compusa denote the CR indices of Turkey and the USA respectively, Manturn represents the turnover indices of each sub-sector of the industry. Both dependent and independent variables are in US millions except indices.

As shown in Table 3, there are five explanatory variables significant in driving FDI in each sector. These are, namely, CR index of the USA, turnover indices, the dummy for the 2009 measure, taxes, and the price of coking coal. All the variables have expected signs.

The results can be explained as follows: The CR index of the US has a 1% significance level and a negative effect as well. As the confidence index of the US increase, potential FDI inflows into each sector in Turkey decrease since foreign investors may feel much more confident about investing in the parent country. In other words, US investors are likely to hold their investments at home or draw back substantial ones when they are more optimistic about the home market. Conversely, US investors are unresponsive to the CR index of Turkey. That means that US investors still see Turkey as an ideal destination for investment during times of contraction.

Furthermore, the turnover indices of each manufacturing sector are highly significant with a 1% significance level, and they also have the expected sign. Foreign investors are much more likely to invest in the sector with a high turnover index. This result demonstrates that FDI movements into each industrial sector depend on the profitability degree of that sector.

Moreover, the dummy variable for the 2009 measure is again significant and has the expected sign. This result is not surprising in that the aim of the new investment incentive system of 2009 was to offer new implementations that please more investors at the sectoral and regional bases. Most of the emphasis was given to the manufacturing sector such that 97% of USD 1.9 billion of the Large Scale Projects was issued for that sector. Hence, a positive relationship between FDI and the 2009 measure, a prominent goal of the government, has been confirmed with this study.

Tax rates, which are a primary cost factor reducing profitability, are a significant and expected sign. That means foreign investors are sensitive to the taxes on profits, and they are likely to decrease investments in an industry to avoid higher tax payments. This result points out that investors in an industry are explicitly profit-oriented and they are less willing to move to the sectors with high tax payments.

Additionally, energy prices are the most prominent variables in explaining movements of FDI in an industry. The main inputs of electricity production come from coking coal and natural gas. Hence, given the dependence of the manufacturing sector on electricity, these are the most prominent energy prices to be correlated with FDI in the industry. According to the results, the price of coking coal is significant and has the expected negative sign. This means that, as the price of coking coal increases, investors are less willing to invest into the industry to avoid higher primary resource costs. This result again points out the fact that investors are mainly profit-oriented and motivated by lower primary production costs. However, the price of natural gas is insignificant with an unexpected positive sign. One possible explanation of the unresponsiveness of investors to natural gas prices might be that the share of natural gas in the production of electricity and, therefore, demand gradually decreases over time. EÜAŞ (2011, p. 9) reports that

the share of the application of natural gas in the industrial electric sector decreased from 36.1 million $m^3$ to 32.4 million $m^3$ in 2009 and 31.6 million $m^3$ in 2010.

### 4.4. Summary and Concluding Remarks

In the last two decades, the cross-border activities of MNFs and the FDI concept have become a priority for both developed and developing countries due to their vital role in the globalization of international trade and national economic growth. Despite the growing interest in FDI, substantial uncertainty still exists regarding what stimulates foreign investors to operate in a foreign market. In addition, most of the previous studies have attributed the determinants of FDI to locational and firm-specific factors. However, these factors may vary across industries and their sub-sectors. Therefore, this research was built explicitly on Dunning's OLI paradigm. Accordingly, the main objective of this study was to seek the major determinants of the FDI inflows into the sub-sectors of manufacturing in Turkey separately to avoid a distorted empirical prediction concerning the total FDI, which is greatly neglected in the FDI literature.

The novelty of the present paper is threefold: In the first place, the determinants of total FDI inflows into the manufacturing sub-sectors of Turkey were investigated for the first time. Second, the effect of unconventional push factor variables such as the CR index of the US as well as country-specific CR index is taken into consideration. Third, although the study of Bilgili et al. (2012) is the first in terms of looking for the correlation between FDI and energy prices in Turkey, they have failed to decompose the total industry into its sectors. Since energy prices are primary inputs of the manufacturing sector, a better way to capture the real effect on FDI is, therefore, to consider only the manufacturing sector. Inclusion of the service sector with different

features may give misleading results. Hence, this study fills the gap in this field, and for the first time, the dependence of FDI on energy prices is analyzed for only the manufacturing industry.

Furthermore, there are several important implications of the findings. Despite the likelihood of potential reversals in FDI inflows during economic expansion times at home, foreign investors are unresponsive to the political, economic, and financial structure of Turkey. In other words, they disregard the risk in the host market. However, tax rates, energy prices, turnover indices, and the 2009 measure have the power to explain movements in the industry. These findings show that foreign investors are highly profit-oriented and motivated negatively by the primary cost factors of production such as taxes and energy prices and positively with high turnover indices and 2009 measure. Thus, the positive reaction of investors to the 2009 measure is not a surprise, which provides several implications such as tax reductions, custom duty exemptions, and a value-added exemption. Accordingly, this study's suggestion to FDI policymakers could be to improve or create new investment incentive programs that have the power to attract investors. Additional advice may be to re-regulate tax systems and the energy market and re-adjust energy prices to please existing and potential future investors.

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