Journal of Applied Finance & Banking, vol.1, no.4, 2011, 185-199
ISSN: 1792-6580 (print version), 1792-6599 (online)
International Scientific Press, 2011

Foreign Direct Investment and Productivity Spillovers: Evidence from Turkey*

Aysa Ipek Erdogan[1]

Abstract

This article analyzes the horizontal productivity spillover effects of foreign ownership on Turkish firms that are among the top 500 industrial enterprises in Turkey. Using a panel of 215 firms over the period 2004-2008, we find that domestic firms benefit from productivity spillovers from foreign-owned firms. However, absorptive capacity does not matter for productivity spillover benefits.

JEL classification numbers: D24, F21, F23, O30

Keywords: Foreign direct investment, Productivity, Spillovers

---

* An earlier version of this paper was presented at the International Research Conference on Interaction of Theory and Practice: Key Problems and Solutions, Burgas Free University, Burgas, Bulgaria, 24-25 June 2011.

[1] Faculty of Economics and Administrative Sciences, Department of Banking and Finance, Okan University, Istanbul, Turkey, e-mail: aysa.erdogan@okan.edu.tr

Article Info: *Revised* : November 23, 2011. *Published online* : December 30, 2011

1 Introduction

Proponents of foreign direct investment (FDI) believe that it brings benefits over and above the additional investment to the host country. In particular, foreign-owned firms are seen as being vehicles for inflow of technological know-how, innovation capability, and marketing and management skills which may spill over to domestic firms and increase their productivity.

Productivity spillovers that may occur due to the presence of foreign-owned firms in the same industry are called horizontal spillovers. Horizontal spillovers arise through channels such as demonstration effects, competition effects and labor mobility. Through demonstration effects, domestic firms get to know the superior technologies, marketing and managerial practices used by foreign firms. Consequently, spillovers take place in the form of imitation of what is observed in foreign-owned firms. The presence of foreign-owned firms can also have a competition effect by exerting pressure on domestic firms to operate more efficiently and to adopt new technologies earlier. As a result, the productivity of domestic firms is expected to increase. Spillovers through labor mobility take place when employees of foreign firms establish their own businesses or move on to domestic firms which will gain from the improved quality of the workers.

There is mixed empirical evidence concerning positive spillovers from foreign-owned firms. While there are several studies that find evidence in favor of horizontal spillovers (e.g. Karpaty and Lundberg [13] for Sweden; Thangavelu and Pattnayak [20] for India; Wang and Zhao [21] for China), there are also studies that find no support for such spillovers (e.g. Aitken and Harrison [1] for Venezuela; Djankov and Hoekman [10] for Czech Republic; Barbosa and Eiriz [3] for Portugal). Mixed evidence in the literature denotes that the existence of spillover effects can depend on the absorptive capacity of domestic firms. A large number of empirical studies find that absorptive capacity aids the accumulation of positive spillovers (e.g. Konings [16] for Bulgaria and Poland; Barrios and Strobl [4] for Spain; Karpaty and Lundberg [13] for Sweden).

This paper examines whether foreign-owned firms generate productivity spillovers in Turkey. The data consist of a panel of 215 domestic firms that are among the top 500 enterprises in Turkey over the period 2004-2008. The results suggest that spillovers from foreign-owned firms benefit domestic firms. However, absorptive capacity does not matter for productivity spillover benefits.

The paper is structured as follows: Section 2 reviews the literature on productivity spillovers, while section 3 describes our sample. Section 4 depicts the research methodology. Section 5 discusses the empirical results of the study and section 6 concludes.

2 Literature Review

To analyze whether foreign-owned firms generate spillovers to domestic firms, econometric models are derived from the log-linear Cobb-Douglas production function augmented by other firm and industry characteristics. In these models, the dependent variable is generally the log of labor productivity. In spillover studies, labor productivity is usually taken as the ratio of the value added to the number of employees. Certain firm specific factors (age, size, capital intensity, etc.) that are known to affect and suspected to affect productivity are added as control variables. Analysis to find out whether horizontal spillovers exist is generally done by different proxy variables that represent the foreign presence in different industries.

Previous studies have failed to find consistent evidence to support the existence of positive horizontal spillovers. While there are several studies that find evidence in favor of horizontal spillovers (e.g. Padibandla and Sanyal [18] for India; Karpaty and Lundberg [13] for Sweden; Thangavelu and Pattnayak [20] for India; Haskel, Pereira and Slaughter [12] for UK; Keller and Yeaple [14] for US; Wang and Zhao [21] for China), there are also studies that find evidence of no

horizontal spillovers (e.g. Khawar [15] for Mexico; Hale and Long [11] for China; Barbosa and Eiriz [3] for Portugal) and negative horizontal spillovers (e.g. Aitken and Harrison [1] for Venezuela; Djankov and Hoekman [10] for Czech Republic). Blomström and Sjöholm [5] find evidence in favor of horizontal spillovers from both minority foreign-owned firms and majority foreign-owned firms in Indonesia. The degree of spillovers does not change with the degree of foreign ownership. Dimelis and Louri [9] find that spillover benefits stem only from firms with minority foreign ownership in Greece.

Mixed evidence in the literature denotes that the existence of spillover effects can depend on the absorptive capacity of domestic firms, which is defined as the ability to utilize spillovers to improve productivity. Konings [16] shows that absorptive capacity aids the accumulation of horizontal spillovers in Bulgaria and Poland. Barrios and Strobl [4] and Karpaty and Lundberg [13] also find that absorptive capacity has a positive effect on the accumulation of spillovers in Spain and Sweden. Borensztein, De Gregorio and Lee [6] demonstrate that FDI increases economic growth only when absorptive capacity of domestic firms is high. Damijan, Knell, Majcen and Rojec [8] analyzed ten transition countries and find that absorptive capacity enhances spillovers from FDI in the least developed transition economies. However, it is an obstacle for accumulation of horizontal spillovers in the more developed ones.

There is also contradictory evidence on whether foreign-owned firms generate horizontal spillovers to domestic firms in Turkey. Aslanoglu [2] and Lenger and Taymaz [17] find evidence showing that there is no contribution of FDI on the productivity of Turkish firms. Pamukcu and Taymaz [19] find that there are negative spillovers from foreign-owned firms. On the other hand, Cincera and Pamukcu [7] show that there are positive horizontal spillovers from FDI.

3 The Sample

Our sample is composed of 215 domestically-owned private firms that are among the biggest 500 companies in Turkey. Firms with majority domestic ownership (and certainly without a minority foreign ownership) are labeled as domestically-owned firms.

The empirical analysis is conducted with panel data analysis techniques and the unbalanced panel covers the period of five years from 2004 to 2008. Financial data are provided by Istanbul Chamber of Industry and data on patents and trademarks are provided by Turkish Patent Institute.

Firms included in the sample are chosen according to the criteria that the owner of the controlling interest has not changed from a foreign owner to a domestic owner during 2001-2003 and 2004-2008 so that the effect of foreign ownership is removed. For the same reason, firms whose minority interest is acquired by foreign owners during the same period are not included in the analysis.

Table 1: Distribution of the Sample According to Industry

Industry	Number of Domestically-owned Firms
Mining and Quarrying	3
Food, Beverages and Tobacco	42
Textile, Wearing Apparel, Leather and Shoe	30
Forest Products and Furniture	9
Paper, Paper Products and Printing	7
Chemicals, Petroleum Products, Rubber and Plastic Products	28
Non-Metal Mineral Products	20
Basic Metal	38
Metal Products and Machinery	17
Automotive Industry	11
Other	3
Electricity	7
Total	215

After their establishment, firms can underperform the existing firms due to lack of experience and knowledge about the market. It might take some time before firms fully overcome these obstacles. Therefore, firms that are established during 2001-2008 are not included in the analysis.

The distribution of the sample according to industry is presented in Table 1.

4 Research Methodology

To analyze whether foreign-owned firms generate spillovers to domestic firms, we use econometric models which are derived from the log-linear Cobb-Douglas production function augmented by other firm and industry characteristics:

$$\ln Y_i = \gamma_0 + \alpha \ln K_i + \beta \ln L_i + \sum \gamma_j X_{ji} + e_i \quad (1)$$

where Y_i stands for value added, K_i and L_i stand for capital and labor inputs of firm i, and e_i is unobserved influence on firm productivity. α and β are the elasticities of output with respect to capital and labor. X_{ji} variables represent other firm and industry characteristics that affect Y_i.

Equation (1) is transformed to obtain its labor intensive form:

$$\ln \frac{Y_i}{L_i} = \gamma_0 + \alpha \ln \frac{K_i}{L_i} + \sum \gamma_j X_{ji} + e_i \quad (2)$$

where (Y_i/L_i) is labor productivity.

Based on Equation (2), the following econometric equation is constructed for panel data:

$$\ln \frac{Y_{it}}{L_{it}} = \gamma_0 + \alpha \ln \frac{K_{it}}{L_{it}} + \sum \gamma_j X_{jit} + h_t + e_{it} \quad (3)$$

where h_t captures the time fixed effects.

When total assets is a proxy for capital input and the number of employees is a proxy for labor input, our general model is in the following form:

$$\ln\frac{Y_{it}}{L_{it}} = \gamma_0 + \alpha\ln(CI_{it}) + \gamma_1 TA_{it} + \gamma_2 AGE_{it} + \gamma_3 EI_{it} + \gamma_4 PI_{it} + \gamma_5 TI_{it} + \gamma_6 SPOV_{it} + \gamma_7 SPOV_{it} CI_{it} + \sum \beta_m ID_{im} + h_t + e_{it} \quad (4)$$

The dependent variable is value added per employee, which is a measure of labor productivity. CI represents capital intensity and is calculated by dividing total assets by the number of employees. We expect to find a positive regression coefficient for CI. TA is total assets, which is a proxy for firm size. TA is expected to positively affect productivity because larger size allows realizing scale economies. AGE is firm age. Firm age is also expected to have a positive effect on productivity because of the effects of learning by doing. EI, which is calculated by dividing total exports by net sales, represents export intensity. Since export intensive firms may have a stronger incentive to improve their productivity as a result of facing international competition and can learn about more sophisticated technologies through trading partners, export intensity is expected to have a positive relationship with productivity. PI, which is calculated by dividing patent applications made in the last four years by total assets, is a proxy for patent intensity. Patent intensity should also positively affect productivity because patents indicate innovation. TI, which is calculated by dividing trademark applications made in the last four years by total assets, is a proxy for trademark intensity. Trademarks are an indicator of marketing activity and product differentiation strategy. Eventually, trademark intensity should positively affect productivity. ID denotes industry dummies in our regression equation.

The variable we use to capture the effects of horizontal spillovers is SPOV. SPOV is the proxy we use for foreign presence in the related industry and it is calculated by the ratio of foreign-owned firms' employment to total employment in the industry. Employment data for the top 1000 industrial enterprises in Turkey, which is provided by Istanbul Chamber of Industry, is used for the calculation of this ratio. We run our regressions separately for two different SPOV variables. For the calculation of our SPOV1 variable, firms are considered foreign-owned if 10%

or more of the shares is held by a foreign investor. In other words, both minority and majority foreign-owned firms are considered foreign-owned. For the calculation of SPOV2 variable, a firm is considered as a foreign-owned firm if foreign owners have majority ownership.

Because there are studies that show that the existence of spillover effects can depend on the absorptive capacity of domestic firms, we include an interaction effect between SPOV and CI in our regression equation where capital intensity is a proxy for absorptive capacity.

Description of the variables used in panel data regressions is given in Table 2.

Table 2: Description of the Variables Used in Panel Data Regressions simultaneously

Dependent Variable	Description
Labor Productivity	Gross Value Added / Number of Employees (million TL, 2004 prices)
Independent Variable	**Description**
Capital Intensity	Total Assets/Number of Employees (million TL, 2004 prices)
Size	Total Assets (million TL, 2004 prices)
Age	
Export Intensity	Exports/Net Sales
Patent Intensity	(Number of patent applications made in the last four years/Total Assets)×1,000,000. * (2004 prices)
Trademark Intensity	(Number of trademark applications made in the last four years/Total Assets)×1,000,000. *(2004 prices)
Spillover Variable 1	Minority and majority foreign-owned firms' employment/Total employment in the industry
Spillover Variable 2	Majority foreign-owned firms' employment/Total employment in the industry
Industry Dummies	

Inflation adjustment is done by calculating the change in wholesale price index, 2003=100

* The ratio shows us the number of applications per 1 million TL of assets.

Table 3 presents the SPOV1 and SPOV2 variables for each industry for 2004 and 2008.

Table 3: Horizontal Spillover Variables by Industry

	Year	SPOV1	SPOV2		Year	SPOV1	SPOV2
Mining and Quarrying				Non-Metal Mineral Products			
	2004	0.006	0.006		2004	0.086	0.052
	2008	0.020	0.020		2008	0.160	0.076
Food, Beverages and Tobacco				Basic Metal			
	2004	0.148	0.103		2004	0.074	0.020
	2008	0.181	0.090		2008	0.072	0.038
Textile, Wearing Apparel, Leather and Shoe				Metal Products and Machinery			
	2004	0.048	0.025		2004	0.281	0.196
	2008	0.047	0.040		2008	0.293	0.195
Forest Products and Furniture				Automotive Industry			
	2004	0.056	0.056		2004	0.664	0.357
	2008	0.038	0.038		2008	0.674	0.415
Paper, Paper Products and Printing				Other			
	2004	0.148	0.067		2004	0.110	0.000
	2008	0.320	0.166		2008	0.102	0.000
Chemicals, Petroleum Products, Rubber and Plastic Products				Electricity			
	2004	0.388	0.230		2004	0.004	0.004
	2008	0.360	0.282		2008	0.026	0.000

We obtain estimates of the parameters of interest using the least squares panel data estimator. Eviews 7.0 software package is used to conduct the analysis. Period fixed effects are included in the models because they are jointly significant. Parks coefficient covariance estimator method (Period SUR), which simultaneously allows period heteroskedasticity and general correlation of observations within a given cross-section, is used for the analysis.

The Central Limit Theorem implies that with a large sample, the regression solution and associated tests will be robust to departures from normality. Therefore, we do not perceive any problem that can arise from the violation of the normality assumption. Because presence of high multicollinearity among the independent variables inflates standard errors, we do not include any variable that causes multicollinearity in our estimation.

5 Empirical Findings

Table 4 presents the coefficient estimates of our equations. Column 1 presents the result of model 1 where SPOV1 variable is used as a proxy for foreign presence. Column 2 shows the result of model 2 where we check whether absorptive capacity, which is proxied by capital intensity, has a moderator effect on the relationship between SPOV1 variable and productivity. Column 3 presents the result of model 3 where SPOV2 variable is used as a proxy for foreign presence. Column 4 shows the result of the model where we check whether absorptive capacity has a moderator effect on the relationship between SPOV2 variable and productivity.

The R^2 value of our four models, which is 0.33, shows that 33% of the variation in the dependent variable is explained by the regression models. In all of the models, we see that the coefficient of capital intensity is significant at 0.01 level and the coefficient of export intensity is significant at 0.05 level. The positive coefficient for capital intensity is in line with our expectation. Counter to

our expectation, export intensity is found to have a negative relationship with productivity. The negative relationship may be the result of low markups caused by intense price competition in export markets.

Table 4: Panel Data Estimation Results: Productivity Spillovers

Dependent Variable: ln (Yi/Li)				
Independent Variables	[1]	[2]	[3]	[4]
Constant	-2.02***	-2.12***	-2.02***	-2.11***
	(-16.38)	(-15.85)	(-16.48)	(-16.10)
$\ln(K_i/L_i)$	0.57***	0.49***	0.56***	0.47***
	(11.56)	(7.19)	(11.50)	(7.18)
Size	0.00007	0.00007	0.00007	0.00007
	(1.13)	(1.16)	(1.14)	(1.16)
Age	0.003	0.003	0.003	0.003
	(1.40)	(1.47)	(1.38)	(1.46)
Export Intensity	-0.34**	-0.35**	-0.34**	-0.35**
	(-2.16)	(-2.24)	(-2.16)	(-2.22)
Patent Intensity	-0.1	-0.14	-0.08	-0.07
	(-0.04)	(-0.06)	(-0.03)	(-0.03)
Trademark Intensity	-0.01	-0.05	-0.01	-0.05
	(-0.08)	(-0.28)	(-0.08)	(-0.31)
SPOV1	0.83**	1.32***		
	(2.07)	(2.63)		
SPOV1×(Ki/Li)		0.42		
		(1.64)		
SPOV2			1.04**	1.90***
			(2.02)	(2.78)
SPOV2×(Ki/Li)				0.73**
				(1.97)
R^2	0.33	0.33	0.33	0.33
F-Statistic	20.83	20.17	20.74	20.18
Prob(F-Statistic)	0.000	0	0	0.000
Total panel (unbalanced observations)	1070	1070	1070	1070

All estimates include industry dummies.
The null hypothesis that each coefficient is equal to zero is tested.
T-values in brackets.

*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

The significantly positive coefficient of SPOV1 that is reported in column 1 indicates that there is a positive relationship between industry presence of minority and majority foreign-owned firms and labor productivity of domestic firms. This suggests that spillovers from foreign-owned firms benefit domestic firms. Column 2 shows that capital intensity does not have a moderator effect on the relationship between foreign-presence within an industry and labor productivity. This result implies that absorptive capacity does not matter for productivity spillover benefits.

The significantly positive coefficient of SPOV2 that is reported in column 3 indicates that there is a positive relationship between presence of majority foreign-owned firms within an industry and labor productivity. This implies that spillovers from majority foreign-owned firms benefit domestic firms. Column 4 shows that the coefficient of the moderator effect of capital intensity on the relationship between presence of majority foreign- owned firms within an industry and labor productivity is significantly positive. However, there is not a statistically significant change in R^2 between model 3 and model 4 and the significance of the moderator effect is a result of the multicollinearity between one or more of the old variables and the new moderator term. As a result, a significant moderator effect is not present. This suggests that absorptive capacity of domestically-owned firms does not have an effect on the accumulation of spillovers.

Consequently, our results show positive impacts of foreign presence on the productivity of domestic firms for both of our proxy variables that represent foreign presence. However, absorptive capacity is not important in determining whether or not domestic firms benefit from productivity spillovers.

6 Conclusion

The proponents of FDI argue that foreign-owned firms have the potential to benefit the domestic firms by the spillover of their technological know-how,

innovation capability, and marketing and management skills. These spillovers are expected to result in an increase in the productivity of domestic firms. Productivity spillovers that may occur due to the presence of foreign-owned firms in the same industry are called horizontal spillovers. This paper examines whether horizontal spillovers from foreign-owned firms benefit domestic firms in Turkey. We use a panel data set of 215 domestic firms for the period 2004-2008. The results imply that domestic firms benefit from productivity spillovers from foreign-owned firms. However, the magnitude of spillovers does not depend on the absorptive capacity of the domestically-owned firm. As a suggestion for future research, it seems of interest to analyze whether other proxies of absorptive capacity have an effect on the accumulation of spillovers.

References

[1] B. Aitken and E. Harrison, Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela, *American Economic Review*, **43**(1-2), (1999), 103-132.

[2] E. Aslanoglu, Spillover Effects of Foreign Direct Investment on the Turkish Manufacturing Industry, *Journal of International Development*, **12**(8), (2000), 1111-1130.

[3] N. Barbosa and V. Eiriz, Linking Corporate Productivity to Foreign Direct Investment: An Empirical Assessment, *International Business Review*, **18**(1), (2009), 1-13.

[4] S. Barrios and E. Strobl, Foreign Direct Investment and Productivity Spillovers: Evidence from the Spanish Experience, *Review of World Economics*, **138**(3), (2002), 459-481.

[5] M. Blomström and F. Sjöholm, Technology Transfer and Spillovers: Does Local Participation with Multinationals Matter?, *European Economic Review*, **43**, (1999), 915-923.

[6] E. Borensztein, J. De Gregorio and J. Lee, How Does Foreign Direct Investment Affect Economic Growth?, *Journal of International Economics*, **45** (1), (1998), 115-135.

[7] M. Cincera and T. Pamukcu, Foreign Firms and Technology Spillovers in Developing Countries: The Turkish Case, *Proceeding*, UNU/MERIT Conference on Micro Evidence on Innovation in Developing Economies, (2007).

[8] P. Damijan, M. Knell, B. Majcen and M. Rojec, Technology Transfer through FDI in Top-10 Transition Countries: How Important are Direct Effects, Horizontal and Vertical Spillovers?, William Davidson Institute *Working Paper*, **549**, (2003).

[9] S. Dimelis and H. Louri, Foreign Direct Investment and Technology Spillovers: Which Firms Really Benefit?, *Review of World Economics*, **140**(4), (2004), 230-253.

[10] S. Djankov and B. Hoekman, Foreign Investment and Productivity Growth in Czech Enterprises, *World Bank Economic Review*, **14**(1), (2000), 49-64.

[11] G. Hale and C. Long, What Determines Technological Spillovers of Foreign Direct Investment: Evidence from China, Yale University Economic Growth Center, *Discussion Paper*, **934**, (2006).

[12] J.E. Haskel, S.C. Pereira and M.J. Slaughter, Does Inward Foreign Direct Investment Boost the Productivity of Domestic Firms?, *The Review of Economics and Statistics*, **89**(3), (2007), 482-496.

[13] P. Karpaty and L. Lundberg, Foreign Direct Investment and Productivity Spillovers in Swedish Manufacturing, Trade Union Institute for Economic Research *Working Paper*, **194**, (2004).

[14] W. Keller and S. Yeaple, Multinational Enterprises, International Trade, and Productivity Growth: Firm-Level Evidence from the United States, Bundesbank Research Centre *Discussion Paper*, **07**, (2005).

[15] M. Khawar, Productivity and Foreign Direct Investment- Evidence from Mexico, *Journal of Economic Studies*, **30**(1), (2003), 66-76.

[16] J. Konings, The Effect of Direct Foreign Investment on Domestic Firms: Evidence from Firm Level Panel Data in Emerging Economies, LICOS *Discussion Paper*, **8699**, (1999).

[17] A. Lenger and E. Taymaz, To Innovate or To Transfer? A Study on Spillovers and Foreign Firms in Turkey, *Journal of Evolutionary Economics*, **16**(1-2), (2006), 137-153.

[18] M. Padibandla and A. Sanyal, Foreign Investment and Productivity: A Study of Post-Reform Indian Industry, Copenhagen Business School *Working Paper*, **1**, (2002).

[19] T. Pamukcu and E. Taymaz, Spillovers in the MENA Region: The Case of Turkey, Economic Research Forum *Working Paper*, **463**, (2009).

[20] S.M. Thangavelu and S.S. Pattnayak, Linkages and Spillovers from Foreign Ownership in the Indian Pharmaceutical Firms, SCAPE *Working Paper*, **2006/05**, (2006).

[21] C. Wang and Z. Zhao, Horizontal and Vertical Spillover Effects of Foreign Direct Investment in Chinese Manufacturing, *Journal of Chinese Economic and Foreign Trade Studies*, **1**(1), (2008), 8-20.