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Multinational Corporations as a Vehicle for Productivity Spillovers in Turkey

by

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Abstract:
This paper examines the role of multinational corporations (MNCs) as the creator and diffuser of new and superior technologies. If these firms fulfil this attributed role, then they are expected to generate some spillovers to domestic industries in host economies. Theoretical and empirical studies propose that domestic technological capability is also important in this process. Our study addresses the question of productivity spillovers from the activity of MNCs, whether size of the recipient firms and the R&D intensity matter in this respect, and do spillovers change by time. The analysis utilizes a longitudinal data for the Turkish manufacturing industry in 28 3-digit level industries over the 1983-2000 period. Our results suggest that the spillovers from MNCs for the domestic sector of the Turkish manufacturing industry differentiate with respect to size of the recipient domestic firms and by time. Despite that, the evidence tends to speak in favor of negative spillovers in the Turkish manufacturing industry.

Key words: Productivity spillovers, Multinational Corporations, Turkey.
JEL Codes:

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Introduction

The objective of this paper is to evaluate empirically the role of Multinational Corporations (henceforth MNCs) as the creator and diffuser of new technologies in the context of the Turkish manufacturing industry. We will discuss this issue with respect to the spillover effects those firms create on domestically owned firms. MNCs tend to be more R&D intensive compared to their competitors (Cantwell, 1994). Therefore, these firms are regarded as the dominant agents of international technology diffusion (Findlay, 1978; Cantwell, 1994; Mansfield, 1994; Pack and Saggi, 1997) due to their transnational activities, -not only their direct investment but also some other forms of their activities (Helleiner, 1989). These technologies are deemed to spill to other firms, and to cause an increase in the productivity of domestic firms in a host economy in which the MNCs operates. This role of MNCs is acknowledged to be a positive contribution to host economies on account of demonstration of newer technologies and products. Domestic firms adopt these newer technologies through reverse engineering, imitation, and R&D. However, this positive contribution may not be materialized since the adoption of newer technologies and products is not an automatic process, and requires a purposive domestic technological effort as we pointed out in the theoretical discussion below. The literature on productivity spillovers, as we extensively discuss in the next section, mentions three additional mechanisms, which may turn out to be also negative for domestic economies. So, we can summarize the productivity spillover mechanisms (drawing on Blomstrom and Kokko, 1998 and the theoretical models discussed in the next section) as; i) demonstration effect: demonstration of new technologies and products to domestic firms, ii) competition effect: increased competition forces domestic firms to be more productive, or suppress their productive activities, iii) the transfer of labor to domestic firms previously employed by MNCs, and iv) vertical linkages as materialized by input and output relations, where in some cases these relations take the forms of subcontracting between MNCs and domestic firms.

Thus, the resulting outcome of these mechanisms, that might sometimes be countervailing, remains as an interesting investigation issue; and a good deal of the empirical literature examined it. However, what is more interesting is an investigation that leads one to understand that these spillovers might differentiate with respect to some industry and firm specific characteristics. For example, the size of the firms is an important source of differentiation in this respect. In the specific context of R&D spillovers, Acs, Audretsch and Feldmann (1994) proposed that spillovers might differentiate with respect to the size of the recipient firms. Aitken and Harrison (1999) found for Venezuela that small size firms face with positive spillovers whereas for the whole sample of firms no such effect exists. We will address the same issue here. R&D intensity of the industries in which firms are operating might also matter. For low tech industries competition effect might be more important compared to demonstration effect, and vice versa for high-tech industries. Haddad and Harrison (1993) analyzed the Moroccan manufacturing industry by focusing on high-tech and low-tech industries and found that MNCs are more beneficiary for low technology sectors. Empirical studies also point out the role of ownership structure. Liu, et al. (2001) and Liu (2002) for example, found positive

spillovers for state owned firms in China. Furthermore, as Aitken and Harrison (1999) suggest, the realization of positive spillover might take some time due to learning effects, etc. So, a dynamic analysis might be more appropriate here. In this paper, we will analyze horizontal productivity spillovers flowing from MNCs in the Turkish manufacturing industry. The contribution of this study will be to provide a dynamic analysis of the issue as well as providing a more extensive account of industry specific characteristics, such as R&D of industries and size and ownership of enterprises.

The empirical investigation draws on a longitudinal data over the 1983-2000 period consisting of 28 industries in three-digit level in various categories such as public firms, and private small, medium and large sized firms in Turkey. The data set used in this study was obtained from State Institute of Statistics (SIS) of Turkey. The paper is organized as follows: the next and the third section review the models and empirical studies on productivity spillovers in the relevant literature, though not exhaustive at all. The fourth section is devoted to the description of the potential horizontal spillovers for the Turkish manufacturing industry. The fifth section consists of an econometric analysis of the productivity spillovers in the Turkish manufacturing industry arising from the presence of foreign firms and their market performance. The final section concludes.

Theoretical Framework

Most of the earlier theoretical models in this issue share some common features[1]. It is assumed that transferred technologies would be fully beneficiary to a country (or, to a firm in this country), assuming, on one hand, that technologies can be transferred without facing any institutional/local difficulties; and on the other hand, this country (or, a firm there) can upgrade their existing technological level without paying any extra cost of adjustment (Lall, 1992). It is true that technology and knowledge have a public good nature to a certain extent as emphasized by the recent R&D growth models. However, evolutionary theorists of technological change elaborated that knowledge has also a 'tacit' character as well as a codified one, that can be neither codified in blueprints, nor easily transferred to recipients (Nelson and Winter, 1982; Dosi, 1988; Pack and Saggi, 1997). In addition, technology transfer is not a costless process. This sort of models assures their analytical convenience "…at the expense of abstracting from cost and characteristics of transfer process itself" (Wang and Blomstrom, 1992). Teece (1977), for example, has shown that the cost of technology transfer accounts for approximately 20% of total investment, which can reach, sometimes to 60%, depending on the capabilities of the parties. Similarly, the generation of spillover effects is not cost-free, either. For example, in an earlier work of 48 product innovations and their corresponding imitations, Mansfield et. al., (1981) showed that the imitation of products is not a costless and timeless activity. The cost of imitation is around 65 % of the cost of an original innovation.

So it is true that, for example, demonstration effect generates positive spillover for domestic firms, but there is no an automatic spillover arising from MNCs activity. A purposeful technological activity is

required for positive spillovers. The competition effect can be a better example to understand this point. Without any domestic effort this effect would turn out to be negative.

This brief discussion makes the role of technological capabilities in the process of generating positive spillovers from MNCs industrial activity. The most important dynamics observed in such a process is the reaction of the other side, which is also considered to be the trigger of a spillover mechanism for a domestic economy. This kind of transfer induces local technological effort and domestic firms might become more competitive. This peculiar characteristic of technology transfer was underlined in a model developed by Wang and Blomstrom (1992). This cost also shared by local firms due to the nature of technology absorption efforts. The authors argue that the effects of technology transfer process will be more lethargic depending on, among the others, the efficiency of learning activities of domestic productive agents. MNCs respond to domestic competition by introducing newer technologies in order to keep their technological leadership in the domestic market.

Dosi (1988) elaborated an important part of technologies and knowledge is embedded in human skills and in their tacit capabilities and the circulation of labor across firms. Therefore, the transfer of human capital constitutes in some cases a way of cost-free knowledge diffusion, if firms are not paying a premium over their current average of wage to employ such individuals in their firms, and if they do not commit themselves to a costly process of gathering information about such personnel. But, generally this is not the case. MNCs tend to pay higher wages to their workers to prevent labor transfer to other firms. The wage premiums paid by an MNC can provide a rough estimate of the value it places on the knowledge it transfers to its workers (Saggi, 2002: 212) In line with this, all models of productivity spillovers through labor circulation assume that MNCs try to prevent such spillovers by offering higher wages to their workers. For example, in a simulation model, Kauffman (1997) proposes that MNCs' activity can either generate, or "frustrate" spillovers for domestic economy depending on relationship of wage level in MNC and technological capabilities of domestic firms. Clearly, higher wages paid by MNCs (and lower domestic technological capability) prevent labor turnover, and thus, generation of spillovers in a domestic economy.

This wage differential generally tends to be larger in developing countries (Glass and Saggi, 2002) raising the expectation of negative spillovers. Glass and Saggi (2002) argue that this wage differential is purely directed to control technology diffusion[2]. However, an interesting point that Glass and Saggi (2002)'s model put forward is that when there is no technology transfer, production costs will be higher for both MNC and domestic firms compared to the case of technology transfer, in an oligopolistic market structure. There is an expectation for demonstration effect due to technology transfer which drives the cost of MNCs down. Despite this fact, a wage premium paid by MNCs can increase the MNC's profits by preventing the cost reduction for the host firm and increase MNC's profits. Therefore, wage premiums paid by MNCs are aimed at preventing labor turnover, and thus controlling technology diffusion. The ability of MNC to control diffusion will be more as the demand of host firm for labor informed about the superior technology of MNC increase.

In brief, technological spillover models through labor circulation reach more or less the same conclusion: A lower domestic capability and higher wages in MNCs prevent the generation of technological spillover through labor circulation[3].

These spillovers are materialized in the form of a variety of mechanisms that are outlined and discussed in Blomstrom and Kokko (1998). The mechanisms to produce technological spillovers for domestic industries can be summarized as follows: demonstration effect, competition effect, labor circulation, linkage effects. First, the set of available technologies and products is enhanced by the existence of MNC. Domestic incumbent firms can adopt these technologies either by reverse engineering, or simply imitate the products introduced by MNC. Or, new firms can enter to market by inspiring the technologies brought by MNCs. These effects are called 'demonstration- contagion effect'. Second, the circulation of the labor force enables some original knowledge embedded in the labor to be transferred to other firms. Third, by competition increased in the marketplace, MNCs can either foster, or suppress the domestic productive forces. Domestic firms compete with the superior technologies, or products of MNCs, and therefore, indigenous efforts might increase. In this case, we can mention about a 'positive spillover' since MNCs force domestic firms to be more competitive. However, this 'competition effect' can be negative, too. If markets were populated by inefficient domestic firms, then foreign entry to market would sweep out these inefficient firms from market[4]. MNC transfer some of their technology, or knowledge, to other firms they interact. But, such kind of spillovers are materialized as long as MNCs integrate to domestic economies, in other words, participate to a network. In this study we will be concerned with only horizontal spillovers, generated by the first three mechanisms, and exclude the vertical ones.

We would also like to draw reader's attention to the fact that these spillovers can be differentiated with respect to some firm characteristics, such as size. For example, Acs et al., (1994) found that small firms exploit the knowledge created in public research institutes and universities, therefore benefits such spillovers whereas large firms benefit from their own research rather than such spillovers flowing from public universities. This empirical finding might also have to do something with spillovers from MNCs activities. The size of the firm might be important to benefit spillovers from MNCs, for example, because of vertical relations. Small sized firms might be more tended to engage in supplier type of relations. On the other hand, demonstration of newer technologies might be more beneficiary for larger firms. Competition effect can also work in reverse direction for small and large firms.

Empirical Evidence

There is no consensus on the spillover effects of MNCs in empirical studies. Some studies extremely optimistic on the role of MNCs for the performance of domestic firms whereas some other studies are quite skeptical about it. As Kokko, et al. (1996) and Gorg and Strobl (2001) noted, these studies inevitably use different econometric models because of different approaches to the issue as well as the use of data in different periods for different countries. Moreover, the qualities of data used in these studies are

questionable. Haddad and Harrison (1993), for example, make an extra effort in order to control such kind of heterogeneity, in their study, which found negative spillovers for Moroccan manufacturing industry. They replicate their analysis based on the same approach of some studies reporting positive spillover effects, -i.e. with the same specification in econometric model, but still they cannot produce positive spillovers. Therefore, even though methodological approaches have something to do with it, we think that such kind of differences can be explained better on the basis of another factors rather than the approaches studies take. In what follows, we will try to do it when we are discussing the results reported in the earlier empirical investigations[5] with a particular emphasis on technological capability.

We can distinguish empirical evidence for host economies on the basis of the relative development level of the countries. Some of the empirical studies investigate the spillover effects from MNCs for developed countries. These studies generally find evidence in favor of positive spillovers. For example, Globerman (1979) found that labor productivity differences in Canadian manufacturing industry are positively correlated with various measures of FDI, *inter alia*, i.e. capital intensity, scale of economies, etc. Globerman (1979) states that those spillovers were even underestimated in his study. A more recent study for the UK covering 1973-92 period by Haskel, Pereira and Slaughter (2001) reports that the TFP level of domestic plants are significantly correlated with the share of foreign firm's employment in that industry. Keller and Yeaple (2003) also take the employment share in total employment as a measure of foreign industrial activity in their study for the US owned manufacturing industries in the 1987-96 period. Their analysis includes imports as well as foreign direct investment as the channel of such spillovers and lends support for positive spillover effects for domestic firms. In addition, they propose that technological spillovers from FDI are much related to the relatively high technology industries compared to lower technology ones[6]. The only pessimistic empirical study for developed countries focusing only on the effects of MNCs on labor skills, Bloningen and Slaughter (1999) are skeptical about the contribution of MNCs for the USA. They state that MNCs has not contributed to the skill upgrading in the US, and actually, inward FDI is associated with less skilled intensive industries[7].

The empirical studies focusing on developing countries directly, or indirectly, point out the crucial role of technological capabilities in the process of generating positive spillovers in a much more explicit way. Admittedly, technological capabilities in these countries are lower in comparison to those of developed countries. So, empirical evidence for these countries is expected to be negative theoretically. Despite that, some studies provided mixed results: some of them found positive, while some others found negative effects. Another group of empirical studies suggest both positive and negative spillover effects working for same host country.

Regarding the ownership structure of the firms Liu, et al. (2001) found in their cross section analysis for 1995 that there are spillovers for state owned enterprises due to increased competition, whereas private and collectively owned (with state) firms benefit from spillovers through demonstration and contagion effects. Another interesting result this study yielded is reported as market oriented MNCs have increased the competition and thus seem to produce spillover effects whereas export oriented MNCs have not induced any

increase in the competition. Liu (2002) also investigates the spillover effects of MNCs in Chinese manufacturing industry for the 1993-98 period for the intra and inter industry types of spillovers. Liu (2002), in his study of Chinese manufacturing industries for the period 1993-98, found a positive external effect on domestic industries from FDI. The empirical results refer to the importance of ownership structure to benefit from FDI in Chinese manufacturing industry. For example, state owned sector and joined (with foreign capital) owned get positive spillovers to a great extent from FDI whereas it is detrimental for collective (with private) owned sector. An interesting result Liu (2002) reports is that foreign sector does not benefit from other foreign investments.

In Mexico, Blomstrom (1986) suggested that industries with higher share of foreign activities were more efficient than the others. This positive contribution of foreign firms was considered to work through the competition effect in the market since the analysis in this study revealed a positive correlation between Herfhindahl index and increased efficiency of the manufacturing industry. However, the analysis does not support the proposition as to any increase in technology transfer to Mexico. In addition to this result, this study found that, in overall, productivity change is positively correlated with foreign entry, but this correlation disappears for the less efficient firms. This last point is of importance regarding the message we are trying to emphasize from earlier studies, that technological capability is important determinant in the generation of positive spillovers.

Similar evidence supporting the technological capability argument is related to the Uruguayan manufacturing industry. In their cross section analysis in 1988, Kokko, et al. (1996) found no evidence in favor of positive spillover effects for the whole sample of manufacturing industry in this country. However, this result turns out to be positive spillover for the firms whose technological capability is not very behind the foreign owned firms. The insignificant spillover effects for the firms with larger technology gaps are permanent, though.

Another attempt to disentangle the potential contradicting effects at work in a whole sample by investigating those effects in sub samples was made by Aitken and Harrison (1999). In their panel data analysis of more than 4000 Venezuelan firms for 1976-89 period, they found that increases in foreign ownership has a large negative effects on the wholly domestically owned firms. However, the sign of spillover effects from foreign ownership turns to positive for the medium small sized firms (less than 50 employees). Another interesting result this study produced is that the confirmation of the existence of benefits from foreign investment. But, these benefits seemed to accrue to joint ventures in the same economy. We interpret this result as one of supporting technological capability argument, assuming that firms with foreign equity perform better, regarding technological capabilities compared to the firms wholly domestically owned.

Costa and de Queiroz (2002) also provide suggestive evidence in favor of technological capability argument given the difference Brazilian and foreign firms in the generation of complex capability. The authors argue that foreign firms score slightly better than domestic firms, but these firms have no particular role for the learning system in Brazil. Another example, partially supporting the technological capability

argument is delivered by Haddad and Harrison (1993). In their study, the authors divide the sample into high-tech and low-tech industries and interpret the result they found as to "the influence of foreign investment in reducing the dispersion of productivity was greatest in the low technology sectors" (Haddad and Harrison, 1993: 64) as spillovers are materialized if productivity gap between domestic and foreign firms is moderate. However, they do not find such a relation for the productivity growth of domestic firms, instead of the dispersion of it, which is negatively affected by the foreign presence in the sector even after controlling the technology gap differences[8].

Kinoshita (2000) proposes that the indirect effect of R&D via developing domestic absorptive capacity is more important in productivity growth, for the role of intra-industry spillovers[9]. Foreign presence in the industry and joint ventures has no contribution in the form of spillover effects for the Czech manufacturing industry in the 1995-98 period. However, when R&D (both for domestic and foreign) is allowed to interact with foreign variables, the analysis delivers significant and positive results (Kinoshita, 2000).

Another group of studies points out to the role of indigenous technological efforts undertaken by local firms, in order to benefit from MNCs, -a relevant issue for the technological capability. For example, Pack and Saggi (1997) emphasize the extraordinary complementarity between international technology transfer and domestic technological efforts. Aw and Batra (1998) also provide empirical support to this issue. Domestic technological effort is more important in improving the efficiency whereas the presence of foreign capital is generally not significantly correlated with technical efficiency in Taiwanese manufacturing industry. Kathuria (2000, and 2002) stated that spillovers are not a by-product result of foreign firms referring the relation between own level of R&D investment and spillovers. In the analysis of spillovers for Indian manufacturing industry for the 1989-90 period, Kathuria (2000) reports a negative spillover effects for the sectors in which foreign firms are close to technological frontier. However, foreign capital in these sectors has a positive impact. Kathuria (2000) states that the firms actively engaged in R&D benefits from the knowledge spillover because of positive and significant contribution of the interaction term in the regression. For the firms without R&D there is no evidence for knowledge spillover, though. Kathuria (2002) replicates the exercise for the firms with and without R&D for the 1989-90 period and reaches the same conclusion that the spillover affects only the firms who are actively engaged in R&D. The productivity of the firms without R&D investment have depressed in the same period.

These studies emphasize the domestic efforts to benefit from spillovers rather than staying in a passive absorber position. Blomstrom and Sjoholm (1999) focus on the role of active participation in order to examine the same issue from a different point of view. They analyze whether majority versus minority ownership of foreign firms makes a significant contribution to the performance of Indonesian manufacturing industry. They report positive spillovers from foreign firms flowing to domestic ones, but they found no evidence for the degree of ownership as a determinant factor in producing these spillovers. On the contrary, Djankov and Hoekman (2000) provide fully contrasting evidence for the Czech Republic for the 1992-96 period. The authors found negative spillover effects for the domestic industry due to foreign firms, and in

addition, they conclude that this negative spillover arises mainly from joint ventures because for the wholly foreign owned firms this negative spillover effect is smaller and insignificant[10].

An Overview of the Turkish Manufacturing Industry

The specific characteristics of foreign industrial activity in a host economy are important factors for spillovers. In this respect, *a priori* a better productivity performance for foreign firms is expected in the process of generating positive productivity spillovers. We will try to understand in this section if there is a potential for such kind of spillovers. Our analysis on the productivity spillovers in the Turkish manufacturing industry is based on a dataset consisting of 1983-2000 period and 28 3-digit industries, which was obtained from SIS in Turkey. We define foreign firms as the firms with at least 10% foreign ownership. Therefore, when we mention foreign firms here, we also mean not only totally or majority foreign owned firms but also minority owned joint ventures.

The pattern of productivity of both foreign and domestic industries in the 1983-2000 period, increased, with a slightly stronger positive trend for the foreign firms[11]. The labor productivity in the foreign side had increased 216 % in 2000 compared to 1983. This increase in the domestic side is 130 %. Nevertheless the pattern for labor productivity is of an erratic character in the foreign sector, whereas it was more stable for the domestic side. We observe many declines in the trajectory of the productivity of MNCs followed. Despite the declines observed in some years, MNCs had always higher productivity compared to their domestic counterparts. Foreign firms in the Turkish manufacturing industry outperformed their domestic counterparts in terms of labor productivity measured as the real value added per employee (Figure 1 below). One can observe the gap between domestic and foreign firms in the figure. The labor productivity of foreign firms was 1.8 times higher than that of domestic firms in the beginning of the period. This ratio jumped to 2.5 in the end of the period. This means that their superior performance had increased especially after 1993. This gap can be interpreted in different ways: First, it can be an indication of technological opportunities to be exploited by the domestic firms. Second, there might be a potential for positive productivity spillovers for the domestic industry. On the other hand, this increasing gap can also be a result of competition effect which resulted due to negative spillovers. In other words, this huge gap between domestic and foreign small industries can be a reflection of, either suppressed domestic productive forces, or a great potential for positive spillovers.

<Figure 1 here>

Perhaps, a part of this gap can be attributed to the size distribution of foreign and domestic industries. MNCs are generally tended to be large firms and therefore, this might contribute to the observed superior productivity of foreign industries. However, Figure 2 below shows that the highest productivity was

measured in the whole period in small sized foreign firms. The labor productivity was almost approximately 2.8 billion TL whereas the same figure is only 0.26 billion TL in the domestic small industries in the whole 1983-2000 period. This means that foreign small industries were ten times more productive than domestic ones. Therefore, the superior productivity of foreign firms in Turkey cannot be explained by the scale of economies from which large firms benefit more than small ones. In other private size categories foreign industries are also more productive than domestic ones, but the gap is not as striking as in the small industries. However, this gap is still remarkable. Foreign medium sized firms are three times more productive than domestic ones. The large industries follow the small industries in productivity. On the other hand, the highest productivity was measured in the public industries in the domestic sector[12]. Of the remaining size categories of private industries, large domestic ones have the highest labor productivity. Medium and small industries follow, respectively. In other size categories, the gap between the two groups are not very dramatic giving rise to the expectation for positive spillovers since it might also be a reflection for domestic technological capability, -that is, precondition for generating positive spillovers from MNCs.

<Figure 2 here>

Since the production scale cannot explain the whole gap between domestic and foreign industries, still some differential remains to be explained. We consider that this differential can be the indication of the superior technologies and better managerial capabilities of MNCs implying a positive demonstration spillover. In this sense, limited technological capability of the domestic side of the manufacturing industry would ban to benefit such an effect, -in small domestic industries perhaps. On the other hand, the better practices and superior technologies of MNCs draw a sort of technological capability frontier for the domestic side of the industry. Therefore, we can argue here that the gap between domestic productivity and 'frontier' productivity levels can be regarded as the technological opportunities.

<Figure 3 here>

This huge gap can also be examined on the basis of R&D intensity of the industries. Figure 3 displays the labor productivity by the R&D intensity of the industries[13] and suggests that the productivity of the domestic industries is not very much different in domestic industries; on the other hand it varies somewhat for the foreign industries. But, the productivity of foreign industries is at least twice larger than domestic ones in each category. The productivity of foreign medium tech industries is around 1.7 billion TL in real terms for the whole period, and it is around 1.5 billion TL and 1.2 billion TL in the low and high tech industries, respectively. The productivity in medium tech firms is around 0.72 billion TL and it is slightly over the productivity of low tech firms, which is 0.68 billion TL. The labor productivity of high tech firms recorded as the lowest performance among domestic industries. These remarks posit that there might be a huge potential for spillovers, either positive, or negative, in each category. As we noted before, this gap can

be a reflection of a suppressed domestic productive forces or it can also be regarded as technological opportunities. One can also expect some positive spillovers for medium and high tech industries since the gap is not dramatically huge.

<Figure 4 here>

Also, foreign firms must occupy an important part of the overall industrial activity, in order to generate any kind of spillover effect. The industrial activity of foreign firms had increased in the Turkish manufacturing industry over the period 1983-2000, and had constituted increasingly an important part. Market share of MNCs over this period clearly lends support to this remark. The market share of MNCs had increased from 9.7 % in 1983 to circa 21.5 % in 2000, exhibiting a very strong positive trend (Figure 4). This sharp increase in the foreign market share emphasizes the high competence of MNCs as well as a probable negative competition effect, or potential for positive productivity spillovers. This increased market share also carries some potential demonstration of product technologies. The net effect of these countervailing influences will be strictly dependent on the response given by domestic side of the manufacturing industry. This implies that those industrial activities of foreign firms were reached to a magnitude large enough to create spillover effects, either positive or negative, for domestic firms.

<Figure 5 here>

The market share of large foreign firms is large extraordinarily high compared to other size categories in the period of 1983-2000 (Figure 5). The share of these firms reached an average of 32%; whereas the share of medium sized and small foreign were 8% and 2% in the period. This ramifies a high potential horizontal spillover for the large domestic firms. However, the reverse is also true. This market share might have been achieved at the expense of negative competition effect. This potential is quite limited for domestic firms in other size categories[14]. The inverse relation between productivity and market share of foreign firms in various sizes can be explained on the basis of the population of the firms. The low market shares of small and medium sized foreign firms cannot be a reflection of high competence of domestic firms when the poor performances of small and medium sized domestic firms in labor productivity are concerned. Recall that the productivity of small foreign firms is outstanding. The dominance of domestic small firms in the market can be explained by the large number of domestic firms compared to in the market place. In the period considered, there were around 4094 domestic small firms versus 11 foreign small ones, on annual average. This figure is 4372 for medium sized domestic firms and 103 for foreign firms. However, ratio of the number of domestic firms to the foreign ones is relatively smaller in large industries. There were around 930 domestic large firms versus 126 foreign ones, on annual average in the 1983-2000 period.

<Figure 6 here>

Foreign firms had the highest market share in the Turkish manufacturing industry in high tech and medium tech industries (Figure 6). The market share of foreign high tech firms was around 44 % for the whole period. The market performance of foreign firms in medium tech industries was not far behind that of high tech ones. Their market share was also around 42 %. These figures were quadrupling that of low-tech firms in the 1983-2000 period. These observations also give way to the expectations for the potential horizontal spillover effects for medium and high tech industries whereas it limits the expectations for low tech ones. The striking share of foreign firms in high tech industries indicate that high tech markets are dominated by foreign firms. The productivity records of foreign firms vary to a great extent, neither in absolute, nor in the relative terms. Though, the market share does. The population of domestic firms has something to do with the explanation in this respect here, too. The number of domestic firms in low tech industries was around 7258, on annual average whereas there were 119 foreign firms in the same category. This explains the lowest market share of foreign firms in these industries. These figures were around 2046 and 92 firms for domestic and foreign sector in medium tech industries, respectively. In high tech industries there were 465 domestic firms versus only 31 foreign firms. Therefore, even though the productivity gap over various categories of R&D intensity varies to a very limited extent, the market share of foreign firms varies greatly and the numbers of domestic and foreign firms play a role in this respect.

<Table 1 here>

In brief, foreign firms are much more productive than domestic ones by every kind of reference point we considered here. However, they cannot takeover the whole market due to the large population of domestic firms, even though their productivity levels are lower, and thus, technological capability are limited. Domestic firms concentrated mostly in small and medium sized and low and medium tech industries, and especially in small industries these poor performing domestic firms can dominate the market. The existence of inefficient domestic firms versus efficient foreign ones leads one to think about no competition effect takes place either in negative, or in the positive direction. The huge gap between domestic and foreign industries might refer to the existence of potential for positive spillovers that can be materialized in the future. However, as we pointed out before, the theoretical and empirical literature, emphasize the role of indigenous technological effort and capability in reaping the benefits from the potential spillovers generated by foreign firms. Therefore, to generate positive spillover for the Turkish manufacturing industries, increasing the indigenous technological effort and enhancing technological capability appears as precondition for such an exploitation process.

The Empirical Model

The following production function is assumed for the analysis of the spillover effects arising from foreign industrial activity:

$$Q = A\, f(K, L, E, M)$$

where Q is real output, K, L, E, M is real capital, labor, input energy consumption, respectively; and A is the baseline productivity level. We can express this relationship explicitly in the following way:

$$ln(Q/L)_{ijt} = \beta_0 lnA_{ijt} + \beta_1 ln(K_{ijt}/L) + \beta_2 lnL_{ijt} + \beta_3 ln(E/L)_{ijt} + \beta_4 ln(M/L)_{ijt} + \varepsilon_{ijt};\quad i = 1,\ldots,m;\ j = 0,\ldots,n;\ t = 1,\ldots,T \qquad [1]$$

where i stands for 3-digit industries, j stands for ownership and size categories; and t for time[15]. We can raise a plenty of other factors that are effective on the productivity of industries which can be introduced to this model simply by using a baseline productivity term, as Haddad and Harrison (1993) and Kinoshita (1999) did for their own models:

$$ln(A)_{ijt} = \sum_p \delta_{(p+1)} ln(MS)_{ijt-p} + \sum_j \sum_p \delta_{4(p+1)j} ln(DMS_j)_{it-p} + \delta_{4(p+1)+1} ln(W/L)_{ijt};\quad p = 0,\ldots,T-1 \qquad [2]$$

where W/L is wages per employee, MS is market share of foreign firms, and DMS is the variable to capture the effects of foreign market share on the different ownership and size categories that was defined as

$$(DMS_j)_{it} = (MS)_{ijt} \text{ if } j=n;\ 0 \text{ otherwise.}$$

Of course, one can think variants of [1]. However, for the purpose of our study, the above equation seems quite sufficient. If we combine [1]' and [2], we obtain the following that will serve us in analyzing spillover effects in the Turkish manufacturing industry due to foreign firms.

$$ln(Q/L)_{ijt} = \sum_p \delta_{(p+1)} ln(MS)_{ijt-p} + \sum_j \sum_p \delta_{(p+1)j} ln(DMS_j)_{it-p} + \delta_3 ln(W/L)_{ijt} + \beta_1 ln(K/L)_{ijt} + \beta_2 lnL_{ijt} + \beta_3 ln(E/L)_{ijt} + \beta_4 ln(M/L)_{ijt} + \varepsilon_{ijt} \qquad [1]'$$

This equation is our general model and will be made use of to analyze spillover effects of MNCs in the Turkish manufacturing industry. We use capital, labor, energy, and input used in production to control the variation of the productivity of the industries. We have already mentioned the relevance of wages in this context; therefore, wages are likely to serve in the explanation of the dispersion of the productivity of industries. We are concerned with the rest of the variables. We also use the one period lagged value of foreign market share following the suggestion raised by Aitken and Harrison (1999). The dynamic analysis of spillovers might be relevant because of learning effects of firms and other factors that create delays to materialize the positive spillovers. The possible different spillover effect of foreign firms on the various size categories is due to Acs, et al (1994).

Empirical Results

The estimation results of the variants of equation [1]' are presented in the tables below for each category of R&D intensity and for the manufacturing industry in general. In addition to our base model, the

model I includes the current values of the *MS*, whereas the model II excludes the current value of *MS* but includes lagged values of *MS*. The model III includes current and lagged values of *MS* variables. The model IV and V excludes both the current and lagged values of *MS* and includes only current and lagged values *DMS* variables, respectively. Finally, the model VI includes both the current and the lagged values of *DMS* variables. We estimated these models using Arellano-Bond type of GMM estimation method (Arellano and Bond, 1991) because the coefficient of the lagged dependent variable in each model is always significant. We used only one period lagged values of foreign market share *(p=1)* as an explanatory variable because, after one period the coefficient of this variable becomes insignificant, even though we do not report them here[16].

The estimated coefficients in model I suggest that, after controlling some source of the variation, there is a considerable negative effect of foreign market share on the productivity of the Turkish manufacturing industries, in general, in the 1983-2000 period. However, when the dynamic effects are considered, we can say that this marginal negative effect turns out to be positive. The effects of foreign market share in the previous year, positively contributes to the productivity of the manufacturing industries. The estimated coefficient of the lagged foreign market share is around 0.324, which is almost half of the current effect of the same variable. This implies that the overall effect of the current and the lagged values of foreign market share is again negative. The joint significance test reported in the last row of the Table 2 also implies that there is a net negative effect. The null hypothesis is rejected at 5% level[17]. Although positive spillover effect may be materialized by the course of time, it is insufficient to compensate the negative spillover effect (possibly due to competition effect) of MNCs in the context of the Turkish manufacturing industry. Therefore, we can infer that even though there is countervailing effect in the long run, that effect is far beyond to compensate the current negative effect of foreign market share.

The models IV, V and VI allow us to check the effects of foreign activity on the different size categories and ownership structures. We expect different spillover effects in terms of both magnitude and the direction for different size of firms. Public firms would also probably differentiate from private industries. Therefore, we consider here public enterprises and private enterprises separately, and in turn, we analyze the spillover effects of MNCs on different size categories of private enterprises. We define industries small sized, medium sized, and large sized[18]. In the tables below, *DMS0, DMS1, DMS2, DMS3* stand for the spillover effect of market share of foreign firms on public enterprises, and private industries populated by small, medium and large sized enterprises, respectively. We estimated significant negative spillover effects at 5% and 10 % level respectively for the small and large sized firms in the Turkish manufacturing industry due to their foreign rivals in the same size (Model IV). When the dynamic effects are considered, there is only a positive contribution for large firms which amounts to almost twice of the negative effect (Model V). However, Model VI suggest that their joint significance is not different from zero since the null hypothesis is rejected. Therefore, in dynamic terms there is no negative or positive spillovers for large firms in the Turkish manufacturing industry. In other size categories and in public firms no dynamic spillover effects were

estimated. The dynamic effect of foreign market share has no significant contribution to the productivity of domestic industries, even though there were some delayed positive spillovers.

These empirical results provided here for the Turkish manufacturing industry in general might differentiate with respect to some other characteristics. We grouped the industries as high tech if these industries are R&D intensive, and as low tech if they are non-R&D intensive following the OECD classification[19]. Our estimation results show that the generation of spillover effects does not differentiate in low tech and high tech industries to a great extent. The current effect of foreign market share is negative both for low and high tech firms. No significant dynamic spillover effect was generated for high tech and low tech industries. Even, the negative spillover for low tech industries is strengthened in the second period. The joint significance of current and one period lagged, and one and two periods lagged spillovers are different from zero, neither for low tech, nor for high tech industries. In low tech industries, only large firms get negative spillovers. There is no significant effect for other categories. But there is a negative spillover for medium sized industries from the previous year. This means that there is no positive spillover effect of MNCs on low and high tech industries in dynamic terms.

Our estimation results suggest that there is no evidence in favor of spillovers in all categories of industries for public firms. The estimated negative coefficients of current and lagged values of foreign market share variable are always insignificant. For small industries, on the other hand, we found evidence in favor of negative spillover effects for all industry categories. These remarks on small industries are somewhat valid for medium sized industries in low tech and overall industries. There is evidence in favor of negative spillover effects due to the current value of foreign market share for medium enterprises in low-tech industries as well as overall industry. The lagged value of foreign market share has a positive effect for these medium enterprises but it is statistically insignificant. The negative coefficient of lagged variable is also insignificant for low-tech industries. The estimated coefficients of current and lagged variables for medium sized enterprises in high tech industries are both negative but insignificant. Therefore, we infer from these results that MNCs have negative spillovers and it is not compensated in the following period even at moderate levels.

The most interesting result we obtained in this exercise is about the spillover effects on the large sized enterprises. We found negative and significant spillover effects from the current value of the foreign market share for the large firms for all industry categories. The negative coefficients turn to positive ones in the following period, individually significant for low tech and overall industries. However, joint significance is not different from zero. In other words, foreign market share in the previous period positively contributes to the current productivity of large firms.

Conclusion and Discussion

Our descriptive analysis showed that domestic firms possess a market power against foreign firms despite the fact that the foreign firms are superior in terms of their business practices. However, domestic

manufacturing industry owes its market power to the large population, not to their superior performance. This might leads us to remark that domestic industries are populated by inefficient firms, or in other words, with technologically less capable firms. One of the most important conclusion we derived from the theoretical and empirical literature review is that technological capability is the major determinant in the process of benefiting productivity spillovers potentially available in Turkish manufacturing industry. Therefore, this intuitive thinking lend some support to the interpretation of the gap between productivity of domestic and foreign industries such that the domestic firms were exposed to negative spillover effects. Our econometric analysis precisely and strongly supported this argument.

Our analysis in this study showed that spillover effects of MNCs activities can differentiate with respect to time and to some industry specific characteristics. For example, foreign market share has a negative and significant spillover effect on all industries but the sign of this spillover turns to positive when one period lagged value of market share of MNCs employed. In other words, the current negative spillover effect is compensated by the lagged positive spillover effect. This is possibly due to learning effects of domestic side of the industry. One candidate explanation is that; the demonstration effect has increased the availability of superior technologies and products to domestic industries and their purposeful activity to use them, and this can be materialized in the longer run rather than instantaneously. However, even though we have evidence on positive dynamic spillovers, the magnitude of these positive spillovers is insufficient to compensate the initial negative spillovers, or when it is sufficient, they are jointly insignificant.

Similarly, our study suggests that spillover effects can vary with respect to ownership structure, size categories and R&D profile of industries. For example, small and large firms get negative spillovers from the activities of MNCs whereas we have no evidence any kind of spillover for public firms and medium sized firms. However, this general remark does not hold in the case of low tech medium sized firms that are exposed to negative competition effect. There might also be effects of the labor turnover in this positive spillover; however, our analysis is unable to display such an effect due to lack of data on this particular issue.

In brief, any aggregated analysis of spillover effect of MNCs on a host economy, should take into consideration that there might be some different mechanism at work and the resulting spillover might be an outcome of these countervailing effects of the very mechanisms. We should note here that these effects are only horizontal ones, and thus when vertical spillovers included in the analysis the results can change dramatically. Therefore, it remains as an interesting issue for further research.

Endnotes

[1] See, for example, Findlay (1978).

[2] Fosfuri, et al. (2000), on the other hand, propose that this differential is mainly based on the cost of training. Beacuse, in their model they assume that the superior technology of a MNC is applicable only after training the workers. In their model technological spillovers occurs through the labor transfer by domestic firms. MNC pay higher wages to their workers to keep them in the firm.

[3] Fosfuri, et al. (2000) add to the above conditions, a high competition in a market. They state that MNCs and domestic firms must operate in different sectors not to be direct competitors to ever generate technological spillovers. Besides knowledge spillovers, this remark refers to the vertical relations of generating spillovers rather than horizontal ones. This mechanism was also modeled in the spillover literature. For example, Rodriguez-Clare (1996) analyzes the effects

of MNCs on host country in a two-country framework with a particular emphasis on creating linkages with domestic economy. This study shows that as long as MNCs are involved in an interaction with host economy, we should expect positive spillovers from MNCs' activities. To this end, for example, high communication costs between headquarter and production plant are required in order to achieve favorable effects from MNC for host country. Only in this way, these firms are encouraged to interact with domestic firms, -ie, to buy their inputs from domestic economy. Second, the gap between host and home countries should be acceptable, in the sense that, the markets in host country must be deep enough to provide an incentive for procurement of inputs domestically, which is also an emphasis to domestic technological capability. However, the condition this model postulates contrasts with the incentives to invest in those countries in which communication costs are higher. This is not to deny, there is no MNC in countries with high communication costs, but the share of foreign firms there will be limited, so the spillovers generated via linkages. Similarly, Markusen and Venables (1997) also focus on interaction between firms to produce spillovers effects. In their model, MNC activity in host economy affects domestic firms through backward-forward linkages. The entry of an MNC, may increase the demand intermediate goods industry, thus increase the output of that industry. As in the Rodriguez-Clare (1996) model, the effect depends on the extent to which MNC is intensive user of domestically produced intermediate goods.

[4] Saggi (2002) replaces the competition effect by 'vertical linkages', arguing the effects mediated by market structure should be taken as 'pecuniary externalities', and spillovers should cover only 'pure externalities'.

[5] This literature was exhaustively reviewed in Blomstrom and Kokko (1998). The survey here is by no means exhaustive.

[6] It is implicitly assumed in the above empirical studies that the proxy for the presence of foreign firms in an industry would capture all types of spillover effects. However, Gorg and Ruane (2001) focus only on the linkage effects as a channel for spillover mechanism in Irish manufacturing industry and found positive spillover effects from this channel for the Irish owned firms. Gorg and Strobl (2002) also focus on the linkage effects of MNCs and reports a positive correlation between linkages with foreign firms and the incidence of the entry of domestic firms to the Irish manufacturing industry

[7] If we leave aside this one exception, all of these reported positive spillovers from MNCs are not very surprising given the implication of the theoretical models reviewed above. Because, technological capabilities of all these counties are well established. Therefore, the overall domestic sector of manufacturing industries in these countries benefited various types of spillover effects from MNCs. Some of the remarks made by the authors lead us not to discard the importance of technological capability in generating positive spillovers even in these countries, albeit the well accumulated capability background. For example, Gorg and Ruane (2001) mention the lack of necessary scale of indigenous suppliers to provide appropriate quantity and quality of inputs to the large electronics MNCs in Ireland, and therefore large MNCs do not establish backward linkage with local firms. This implies that this limited technological capability in this respect prevents to benefit from some potential spillovers. However, a contrary evidence reported by Haskel, Pereira and Slaughter (2001). They found that positive spillover effects for less well performed firms are larger in the UK manufacturing industry implying a sharp contrast with the former evidence.

[8] Obviously, this last evidence does not support technology capability gap argument whereas the previous one provided by the authors is clearly in favor of it.

[9] In another study, on the other hand, Kinoshita (1999) provides evidence in favor of "catch-up" argument. In his cross section analysis of Parente-Prescott investment equation found that productivity growth of a firm increases just because its productivity level lags behind the leader firm in Chinese manufacturing industry. This remark is in favor of technological capability argument. Recall that the evidence of Haskel, Pereira and Slaughter (2001) as to positive spillovers are larger for the less efficient firm stands by the latter evidence for developing countries.

[10] Most of the empirical studies aforementioned employ a variable in the analysis, i.e. foreign employment, share of ownership in the sector, etc expecting that variable would capture all kind of spillover effects. Some other group of studies focuses either only one, or more than one possible channel of spillovers. In this way those studies distinguish various types of spillover channels. Of them, Kinoshita (1999), for example, reached an interesting result by taking such an approach. As we noted earlier, in the analysis of Parente-Prescott type of investment equation, Kinoshita (1999) found a catch-up effect, which can be interpreted as a positive spillover. However, when the effects of foreign joint venture, foreign linkages, and foreign stock in the industry were distinguished, this result changes. Kinoshita (1999) states that after various types of foreign activity is considered, traditional measure of FDI (catch-up effects here) turns out to be insignificant. The estimation results in this study reports no significant contribution from foreign variables. Besides, for the whole sample Kinoshita (1999) found very marginal contribution of training activities. Kinoshita (1999) argues that domestic firms trained their workers more than foreign firms did, therefore, it appears that foreign firms has no share even in this marginal contribution.

Similarly, Damijan, et al., (2003) allow determining various avenues for spillover effects through linkages in their analysis for the manufacturing industries of ten transition economies in the 1995-99 period. They report that horizontal effects (competition and demonstration) are positive and significant for domestic firms in Czech Republic, Poland, Romania, and Slovakia. Of these countries, only three, except Romania, benefits from spillovers working through backward linkage effects. In Bulgaria only foreign affiliates benefit from both kinds of spillovers. But, Lithuania and Latvia face with negative spillovers from vertical linkages. Damijan, et al., (2003) argues that vertical

spillovers are more important than horizontal spillovers for these countries. Spillovers from linkage effects were also analyzed by Castellani and Zanfei (2002) for electronics industry in a set of countries including both developing and developed. They provide positive effects on the electronics industries due to MNCs linkages.

[11] We define foreign firms as the firms with at least 10% foreign ownership. Therefore, when we mention foreign firms here, we also mean not only totally or majority foreign owned firms but also minority owned joint ventures.

[12] The large scale of public firms might have a role in this performance of domestic public industries. The petrochemical industry which is public owned is a good example here.

[13] The industries in low tech, medium tech and high tech were defined according to the OECD classification.

[14] The vertical productivity spillovers can be generated by large foreign firms, though. But our analysis below will not include this sort of spillovers.

[15] Note that $\beta 2$ will be 0 if there are constant returns to scale.

[16] We only reported the two period lagged value of market share for low tech industries.

[17] $H0 : \delta MS + \delta MS\_1 = 0$

[18] The firms were classified as small, medium and large firms employing less than 25 people; between 25 and 50 people and more than 250 people, respectively.

[19] Since the relative importance of high-tech industries in the Turkish manufacturing industry is limited, we classified high and medium-tech industriers together and labeled them as ‘high-tech industries’.

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Figures:

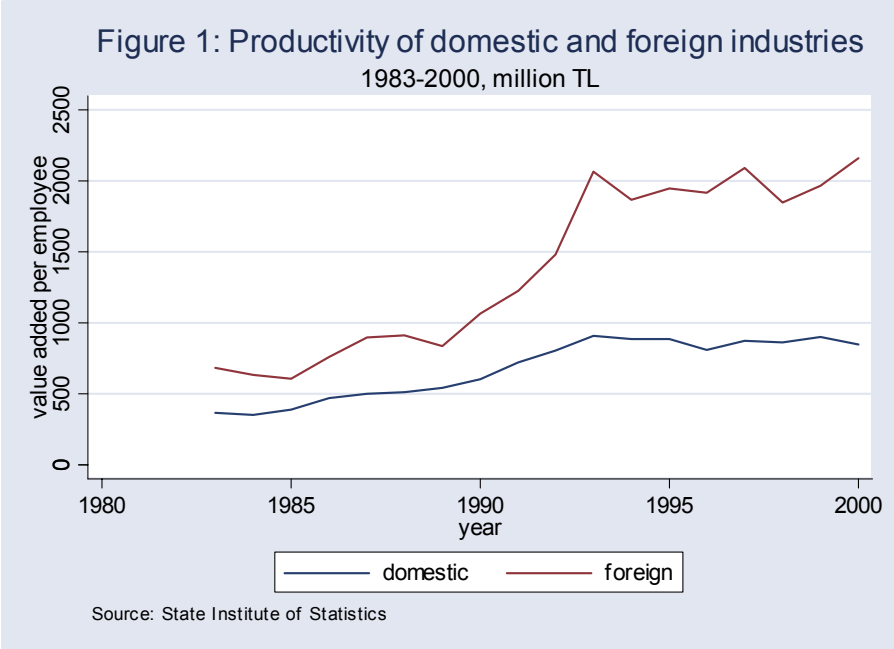


Figure 1: Productivity of domestic and foreign industries
1983-2000, million TL
value added per employee
0
500
1000
1500
2000
2500
1980
1985
1990
1995
2000
year
domestic
foreign
Source: State Institute of Statistics

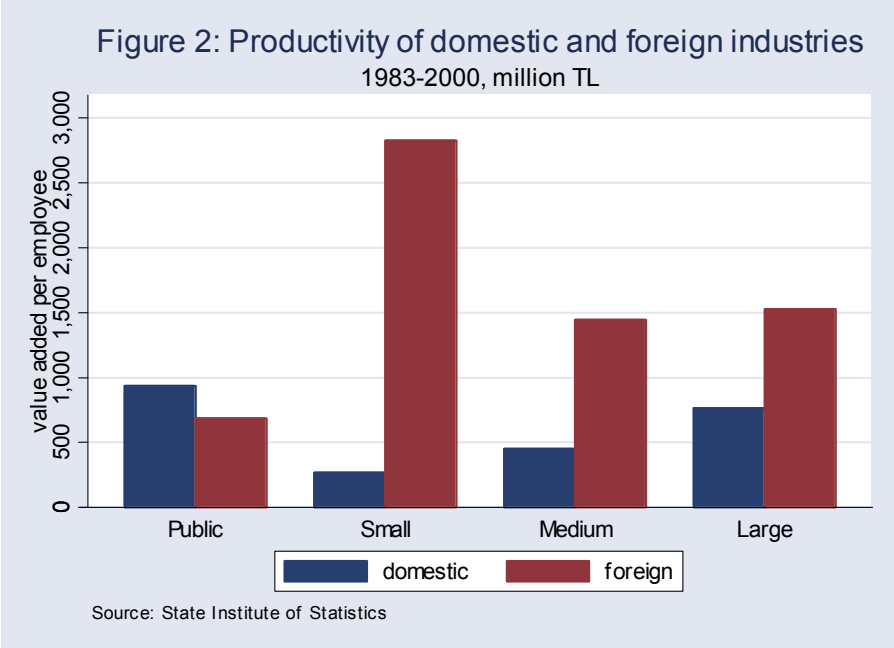
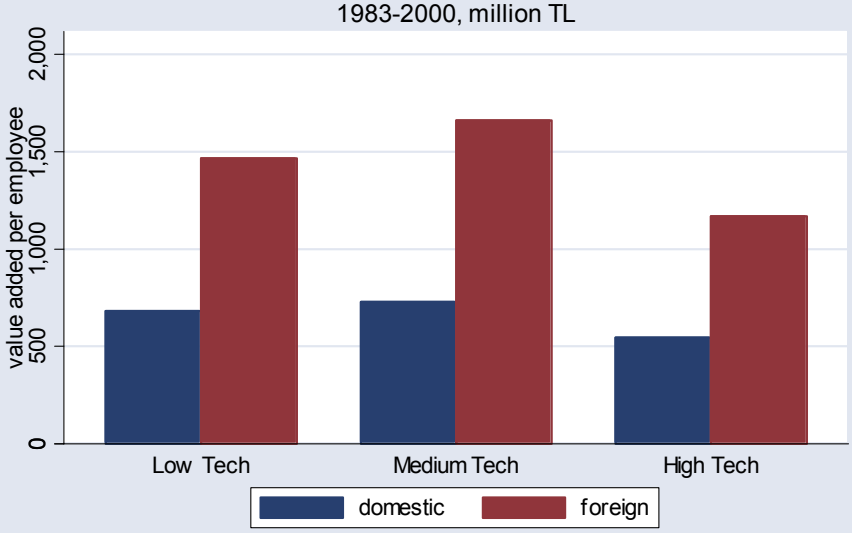


Figure 2: Productivity of domestic and foreign industries
1983-2000, million TL
value added per employee
0
500
1,000
1,500
2,000
2,500
3,000
Public
Small
Medium
Large
domestic
foreign
Source: State Institute of Statistics

Figure 3: Productivity of domestic and foreign industries

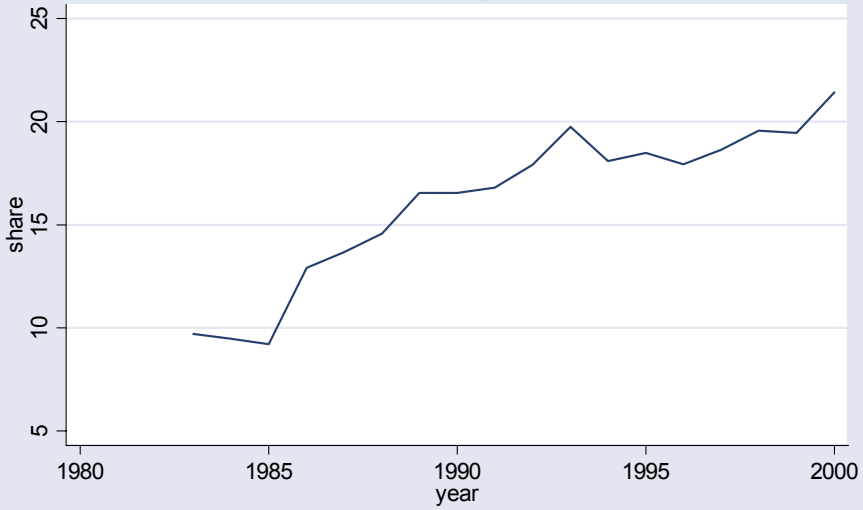
1983-2000, million TL



Source: State Institute of Statistics

Figure 4: Market share of foreign industries

1983-2000, percent



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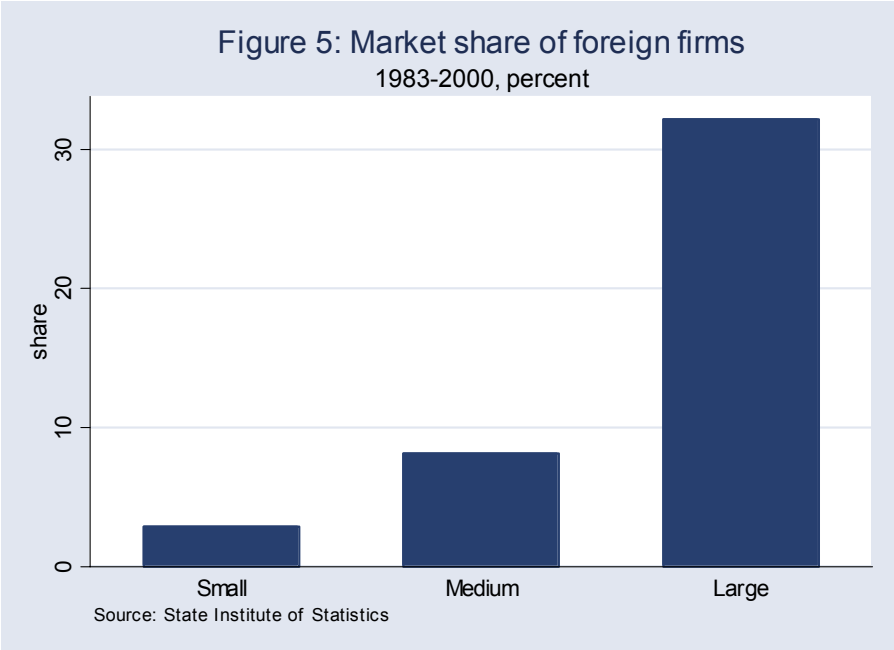

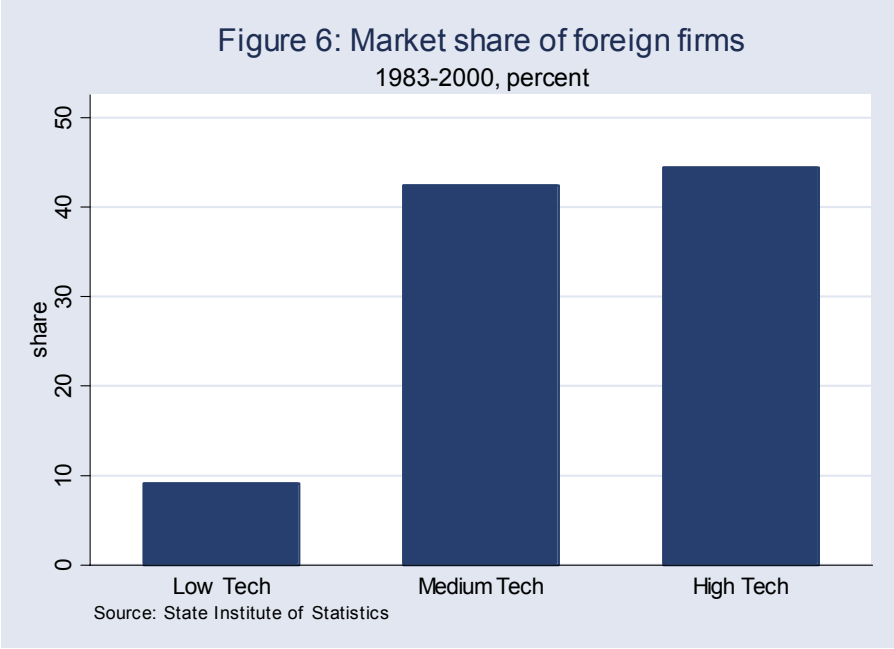

Tables:

Table 1: The Number of Firms by Various Characteristics

Categories	Domestic Firms	Foreign Firms
Public	373	1
Small	4094	11
Medium	4372	103
Large	930	126
Low Tech	7258	119
Medium Tech	2046	92
High Tech	465	31

Table 2: The Effects of Foreign Market Share on the Productivity of Domestic Industries in Turkey, Overall Manufacturing Industry 1983-2000.

Explanatory Variables	Model I	Model II	Model III	Model IV	Model V	Model VI
Cons	-.000 (.003)	-.006 (.003)*	-.002 (.003)	-.001 (.003)	-.003 (.003)*	.000 (.003)
ΔQ/L_1	.127 (.025)*	.150 (.027)*	.146 (.027)*	.123 (.025)*	.150 (.027)*	.140 (.027)*
ΔK/L	.114 (.019)*	.108 (.020)*	.113 (.019)*	.109 (.019)*	.106 (.020)*	.107 (.019)*
ΔL	.027 (.035)	.070 (.035)*	.040 (.035)	.030 (.035)	.076 (.035)*	.047 (.035)
ΔE/L	.029 (.014)*	.028 (.015)**	.027 (.015)**	.029 (.014)*	.027 (.015)**	.026 (.014)**
ΔM/L	.453 (.028)*	.467 (.028)*	.450 (.028)*	.454 (.028)*	.461 (029)*	.441 (.028)*
ΔW/L	.355 (.028)*	.367 (.029)*	.356 (.028)*	.351 (.028)*	.365 (.029)*	.348 .(028)*
ΔMS	-.529 (.127)*	.	-.567 (.126)*	.	.	-
ΔMS_1	.	.324 (.123)*	.282 (.120)*	.	.	-
ΔDMS0	.	.	.	-.625 (.425)	.	-.549 (.406)
ΔDMS0_1	.	.	.	.	-.097 (.356)	-.086 (.339)
ΔDMS1	.	.	.	-1.61 (.322)*	.	-1.619 (.310)*
ΔDMS1_1	.	.	.	.	.031 (.324)	-.188 (.304)
ΔDMS2	.	.	.	-.263 (.191)	.	-.314 (.192)
ΔDMS2_1		.	.	.	.174 (.194)	.149 (.192)**
ΔDMS3	.	.	.	-.390 (.206)**	.	-.470 (.206)*
ΔDMS3_1	.	.	.	.	.683 (.186)*	.645 (.182)*
Obs	1653	1653	1653	1653	1653	1653
Wald χ^2	849.36	810.52	844.80	871.13	823.21	896.15
Sargan χ^2	454.50 (.000)	436.11 (.000)	443.23 (.000)	454.08 (.000)	432.93 (.000)	440.91 (.000)
Null $\chi^2(1)$	.	.	.	.	.	.52 (.47)

Notes: Standard errors in brackets. * (**)significant at %5 (%10). Null Hypothesis is $\Delta\delta_{DMS3} + \Delta\delta_{DMS3\_1} = 0$. p values in brackets in the last two rows.

Table 3: The Effects of Foreign Market Share on the Productivity of Domestic Industries in Turkey, Low Tech Industries 1983-2000.

Explanatory Variables	Model I	Model II	Model III	Model IV	Model IV	Model V	Model VI
Cons	-.007 (.004)*	-.014 (.004)*	-.008 (.004)*	-.011 (.004)*	-.005 (.004)	-.012 (.004)*	-.004 (.004)
ΔQ/L_1	.067 (.027)*	.090 (.029)*	.081 (.029)*	.140 (.032)*	.054 (.027)*	.086 (.030)*	.065 (.029)*
ΔK/L	.112 (.023)*	.105 (.023)*	.112 (.023)*	.105 (.024)*	.102 (.023)*	.101 (.023)*	.101 (.023)*
ΔL	.022 (.038)	.057 (.039)	.032 (.039)	.054 (.039)	.029 (.038)	.072 (.039)**	.051 (.038)
ΔE/L	.065 (.030)*	.073 (.030)*	.060 (.030)*	.044 (.031)	.059 (.030)*	.061 (.030)*	.046 (.030)
ΔM/L	.443 (.032)*	.467 (.032)*	.438 (.032)*	.434 (.033)*	.451 (.032)*	.465 (.032)*	.444 (.032)*
ΔW/L	.424 (.034)*	.441 (.034)*	.422 (.034)*	.429 (.035)*	.415 (.034)*	.425 (.035)*	.400 (.034)*
ΔMS	-.638 (.153)*	.	-.674 (.154)*	-.644 (.154)*	.	.	.
ΔMS_1	.	.174 (.147)	.222 (.144)	.428 (.152)*		.	.
ΔDMS_2	.	.	.	-.283 (.132)*	.	.	.
ΔDMS0	.	.	.	.	4.0 (7.63)	.	3.94 (7.62)
ΔDMS0_1	.	.	.	.	.	.	.110 (.638)
ΔDMS0_2	.	.	.	.	.	.	
ΔDMS1	.	.	.	.	-1.74 (.314)*	.	-1.64 (.314)*
ΔDMS1_1	.	.	.	.	.	-.371 (.315)	-.300 (.301)
ΔDMS2	.	.	.	.	-.407 (.196)*	.	-.414 (.199)*
ΔDMS2_1	.	.	.	.	.	-.051 (.202)	.021 (198)
ΔDMS3	.	.	.	.	-.330 (.283)	.	-.547 (.289)**
ΔDMS3_1	.	.	.	.	.	.833 (.239)*	.758 (.236)*
Obs	1101	1101	1101	1101	1101	1101	1101
Wald χ^2	682.04	641.37	677.12	689.83	712.73	668.00	745.24
Sargan χ^2	367.27 (.000)	365.27 (.000)	360.93 (.000)	334.93 (.000)	366.10 (.000)	358.72 (.000)	357.98 (.000)
Null χ^2	.	.	5.82 (.016)	6.03 (.014)	.	.	.45 (.501)

Notes: Standard errors in brackets. * (**)significant at %5 (%10). Null Hypotheses are $\Delta\delta_{MS} + \Delta\delta_{MS\_1} = 0$; $\Delta\delta_{MS} + \Delta\delta_{MS\_1} + \Delta\delta_{MS\_2} = 0$; $\Delta\delta_{DMS3} + \Delta\delta_{DMS3\_1} = 0$. p values in brackets in the last two rows.

Table 4: The Effects of Foreign Market Share on the Productivity of Domestic Industries in Turkey, High Tech Industries 1983-2000.

Explanatory Variables	Model I	Model II	Model III	Model IV	Model V	Model VI
Cons	.004 (.005)	.000 (.005)	.003 (.006)	.004 (.006)	.004 (.006)	.000 (.006)
ΔQ/L_1	.368 (.045)*	.374 (.046)*	.373 (.046)*	.368 (.046)*	.363 (.047)*	.366 (.048)*
ΔK/L	.160 (.011)*	.152 (.032)*	.155 (.031)*	.159 (.032)*	.157 (.032)*	.151 (.032)*
ΔL	-.160 (.065)*	-.156 (.065)	-.165 (.065)*	-.164 (.065)*	-.158 (.065)*	-.154 (.066)*
ΔE/L	.020 (.016)	.021 (.016)	.020 (.016)	.021 (.016)	.021 (.016)	.022 (.016)
ΔM/L	.348 (.052)*	.355 (.053)*	.346 (.052)*	.345 (.052)*	.350 (.053)*	.347 (.053)*
ΔW/L	.198 (.046)*	.215 (.047)*	.202 (.046)*	.203 (.046)*	.203 (.046)*	.201 .(047)*
ΔMS	-.573 (.195)*	.	-.577 (.200)*	.	.	.
ΔMS_1	.	.073 (.198)	.191 (.200)	.	.	.
ΔDMS0	.	.	.	.519 (.436)	.	.518 (.445)
ΔDMS0_1	.	.	.	.	.125 (.403)	-.112 (.465)
ΔDMS1	.	.	.	-.510 (.431)	.	-.549 (.422)
ΔDMS1_1	.	.	.	.	-2.71 (1.28)*	.479 (.436)
ΔDMS2	.	.	.	-.166 (.453)	.	.016 (.434)
ΔDMS2_1	.	.	.	.	-.001 (.551)	.806 (.446)*
ΔDMS3	.	.	.	-.655 (.398)**	.	-.659 (.413)
ΔDMS3_1	.	.	.	.	.125 (.248)	.331 (.420)
Obs	552	552	552	552	552	552
Wald χ^2	362.54	347.06	360.05	359.62	354.23	363.35
Sargan χ^2	269.28 (.000)	271.10 (.000)	268.32 (.000)	271.24 (.000)	269.17 (.000)	272.52 (.000)

Notes: The initial letters of each variable mean that the difference of that variable. Standard errors in brackets. * (**)significant at %5 (%10).
Null Hypothesis is $\Delta\delta_{DMS3} + \Delta\delta_{DMS3\_1} = 0$ respectively. P values in brackets in the last two rows.