

COMPETITION AND PRODUCTIVITY IN THE TURKISH MANUFACTURING INDUSTRY*

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Abstract:

This paper analyzes the impact of changes in the competitive market structure on industry productivity growth. The aim of the paper is to examine the determinants of productivity in Turkish manufacturing industries, by elaborating particularly at the impact of competition policy on productivity. Using a newly available panel data in Turkish manufacturing industry for the years 1992-2001, it is shown that competition (as measured by lower level of industrial price-cost margin) enhances productivity growth.

Keywords: *Competition, Price-cost margin, Manufacturing industry.*

Özet:

Bu makale, rekabetçi piyasa yapısında meydana gelen değişmelerin sanayi sektörü verimlilik artışları üzerindeki etkisini incelemektedir. Makalenin amacı, özellikle rekabet politikasının verimlilik üzerindeki etkisini dikkate alarak, Türkiye imalat sanayinde verimliliği belirleyici faktörleri incelemektir. Buna göre, Türkiye imalat sanayi 1992-2001 dönemi verileri ile panel veri tekniği kullanılarak, daha düşük düzeydeki imalat sanayi fiyat-maliyet aralığı ile ifade edilen rekabetin verimlilik artışlarına neden olduğu sonucuna ulaşılabilmektedir.

Anahtar kelimeler: *Rekabet, Fiyat-maliyet marjı, İmalat sanayi.*

*This study is a short synopsis of the PhD dissertation of the author defended on 6 February 2009, Marmara University European Union Institute, Department of European Union Economics.

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1. Introduction

Casual argument generally asserts that competition, both domestic and international, may enhance the productivity of firms or industries by exerting downward pressure on costs, reduces slack, provides incentives for the efficient organization of production, and even drives innovation forward.

However, the theoretical literature on the effect of market competition does not clearly match with this casual argument. One of the reasons for this is that there are various definitions of competition in the theoretical literature. Market competition is captured by several proxies; the change in the mode of competition, from monopoly to perfect competition and from cartel to Cournot to Bertrand competition; increase in the number of firms; the number of other managers to whom each manager is compared; increase in the price elasticity of demand; reduction of the size of demand; decrease in profits; increase in the substitutability between products; reduction in the gap between a leader and a follower; the increase in the ratio of entrepreneurial firms relative to managerial firms; existence of a potential rival.

These models analyze how the optimal incentive scheme changes in response to the change in the extent of market competition. Since the definitions of competition are so diverse and, furthermore, the results rely on factors incorporated into these models. Not surprisingly, it is not theoretically evident whether the intensification of market competition would induce managers to exert more efforts.

In spite of the ambiguity of theoretical predictions, empirical studies have tried to test the hypothesis that market competition would increase productivity. Empirically, the extent of competition has been captured by several variables; price-cost margin, concentration ratio, and market share. In this paper, the price-cost margin is used to capture the change in the level of competition. A firm's profit above normal level (higher price cost margin) may feel less competitive pressure and thus make less effort, leading to lower productivity.

With regard to the effect of market competition on productivity, several rigorous empirical studies have been done. Nickell, Wadhvani and Wall (1992) show that the increases in the market share of a firm reduce its productivity growth. Baily et al. (1995), while explaining the international productivity differences in manufacturing industries across Germany, Japan and the US, show that there is a positive relation between the nature of

competition and relative productivity levels in a given industry in a given country. Nickell (1996) uses panel data on 670 UK manufacturing industry firms for the period 1972- 1986 to examine the relationship between competition and productivity performance by measuring competition in several ways, including measures of monopoly rents, concentration, import penetration, and number of competitors. He shows that there is clear evidence on the degree of competition to generate the productivity growth. Nickell, Nicolitsas and Dryden (1997) obtained the result that higher average rents normalized on value added tend to reduce productivity growth.

Economists also claim that deregulation, which is expected to intensify competition, raises productivity of firms. For example, Olley and Pakes (1996) show that in telecommunications equipment industry in the US, productivity growth accelerated after the deregulation of the industry. Similarly, the positive impact of deregulation in transition economies was shown by Li (1997) for China, by Djankov and Hoekman (2000) for Bulgaria, and by Grosfeld and Tressel (2002) for Poland.

On the other hand, there are many studies examining the productivity and the trade liberalization that is expected to intensify competition. For example, by using a large sample of Italian firm level data, Bottasso and Sembenelli (2001), find that the EU Single Market Program, which contains some deregulations, has led to a decrease in the price-cost margin (markup) and an increase in productivity for those firms that were more sensitive to the abolition of external barriers. Pavnick (2002) also finds that reallocation of resources after trade liberalization in Chile significantly contribute to the productivity in tradable markets. Similarly, in an empirical study, Salgado (2002) investigates the potential impacts of reforms in trade, product markets and labor markets on productivity performance with an analysis based on panel data for 20 OECD countries during 1965-98. The results suggest that especially reforms in trade and product markets could explain improvements in trend productivity growth, even though the impact of such reforms on productivity may be weak or negative in the short run due to, for instance compliance costs. Nicoletti and Scarpetta (2003) show two main effects of regulatory reform of entry and state control by using cross-country data. They find that countries with entry liberalization (lowering barriers to entrepreneurship) and reduced state control catch-up more the frontier in manufacturing industries and adopt best-practice technologies more quickly. Moreover, the process of privatization is found to involve direct productivity gains.

Recent empirical studies have pointed to a positive effect of product market competition on productivity growth, particularly at low levels of competition. Aghion et al (2006) assess the effect of increasing product market competition on productivity growth in South Africa. They find that higher past mark-ups are associated with lower current productivity growth rates. Okada (2005) examines the impact of product market competition on productivity by using panel data on around ten thousand firms in Japanese manufacturing industry for 1994-2000 periods. Okada found that product market competition (as measured by lower level of industrial price-cost margin) enhances productivity growth. Kahyarara (2004) analyze the role of competition policy on productivity, investment and export performance of Tanzanian manufacturing firms by focusing on the hypothesis that fair competition has a causal impact on productivity, investment and manufactured exports. In the study, competition policy was used as a dummy variable and it is found that there is a positive relationship between competition policy and productivity, investment and exports. Thus, competition policy enhances a firm's economic performance by increasing productivity.

On the other hand, there are also the empirical studies for Turkey on the relationship between competition and productivity. For example, Foroutan (1991) examines how the trade liberalization of 1980s in Turkey has affected the performance and competitiveness of the Turkish manufacturing industry for the period 1976-1985. The study shows that, international competition has decreased the price-cost margin and increased the rate of growth of productivity in the private sector during the period considered. Levinsohn (1993) also finds that trade liberalization, using firm level data from 1983 to 1986, was associated with lower industry markups in Turkish manufacturing industries where pricing above marginal cost was previously significant.

While analyzing the relationship between price-cost margin and trade liberalization in Turkish manufacturing industry for the period 1983-1994, Yalçın (2000) finds that while import penetration leads to a decrease in the price-cost margins in the entire private manufacturing industry, the price-cost margins in the highly concentrated private manufacturing industries increase by the import penetration. Bayar (2002) investigates the effects of foreign trade liberalization of Turkey after 1980 on the productivity of industrial sectors. The relationship is tested using panel data of twenty-eight ISIC three-digit industrial sectors for the 1974-1994 period. He shows that there is a positive shift in productivity and a negative shift in industrial mark-ups after trade liberalization.

Utilizing three-digit Turkish manufacturing industry level panel data, Erzan et al. (2003) analyze how increasing openness to international markets (including the CU with the EU) have affected the structure and performance of Turkish manufacturing industry over the period 1980-1999 with special emphasis on the market disciplining role of imports. They find that changes in import penetration had a significant positive effect on price-cost margins with a one-year lag in high price-cost margin industries and concluded that imports do not seem to provide discipline for manufacturing industries.

However, there are some other studies that contradict these results. For example, Metin-Özcan et al. (2000) find that openness had very little impact on the levels of profit margins (mark-ups) and conclude that the manufacturing industry displays a resistance to increased competition despite the import discipline brought by the post-1980 liberalization program. Moreover, profit margins of trade adjusting sectors that were classified as inward looking in 1980, and became open by mid-1990s respond positively to openness. Similarly Kivılcım et al (2002) contrary to expectations, find that openness had very little impact on mark-ups within manufacturing industry for the period 1980-1996. Furthermore the trade-adjusting sectors show a positive relationship between the profit margins and openness. They also find that profit margins are positively and significantly related to concentration ratio. These results are also supported by Çulha and Yalçın (2005). They examine the determinants of the price-cost margins in the Turkish manufacturing firms for the period 1995-2003. Using panel data econometrics a large number of manufacturing firms by conditioning on their firm size, age, ownership and export orientation, they also find that import penetration seems to be ineffective to reduce the price-cost margins of large, high market share and foreign partner firms.

The recent empirical results support the view that openness and rivalry increases productivity in the Turkish manufacturing industry. According to a recent study on the impacts of the CU agreement, Akkoyunlu-Wigley and Mihci (2006) show that increasing imports from EU countries reduced the sectoral concentration ratio and thereby sectoral market power in Turkish manufacturing industry. Thus, increasing trade volume with EU countries during the CU period created beneficial effects on Turkish economy especially by means of increasing competitive pressure for falling mark-ups and market power. Hence, it is clear that there are welfare impacts as a result of such changes in the pricing behavior and market structure of the Turkish manufacturing industry. Taymaz and Yılmaz (2007) find a similar result in which productivity actually increased in the manufacturing sectors

along with increased import penetration rates after completion of the CU agreement in 1996. The study finds that productivity in import-competing sectors increased 14 % from 1995 to 2000 whereas it stagnated in export-oriented and non-traded manufacturing industries.

This paper mainly examines the behavior of labor productivity in the Turkish manufacturing in conjunction with other structural parameters such as price-cost margins, import penetration, export ratio and the impact of joining of Turkey to the customs union with the EU. Using industry-level panel data for Turkey from the Turkish Statistic Institute (TurkStat) Manufacturing Industry Annual Surveys for the period 1992-2001, we obtain three important empirical results. First, there is an inverse relationship between productivity and competition. Second the import penetration increases the productivity of the Turkish industry. Lastly, the empirical evidence points out that, on the contrary to the second result, Turkey's accession to the custom unions in 1996 led to a negative impact on the productivity of the Turkish manufacturing. This contradiction may result from the fact that along with the Customs Union Turkey also adapted a new competition policy law, which brings some stringent regulations on the manufacturing industries. Thus the change occurring with the customs union likely affected the productivity in Turkey but it is difficult to separate the impact of trade liberalization coming with the Customs Union from that of the new competition policy.

This paper is organized as follows. Section 2 presents a literature survey concerning the relationship between competition and productivity. Section 3 shows the general structure of the Turkish manufacturing industry. The rest of the paper includes a simple model to analyze the relationship between competition and productivity growth in Turkey. In this context, Section 4 presents the empirical methodology, the data sets and the measures used in the regressions. This section also considers the descriptive analysis about the determinants of the model and outlays some preliminary conclusions.

2. The General Structure of the Turkish Manufacturing Industry

Industrial development is considered as an essential element of both economic and social development of Turkey. Hence, in Turkey, industrial development strategies have always been one of the main priority areas. Since 1960s, industry based growth has been one of the main objectives in Turkey. Until 1980 Turkey implemented an import substitution policy and the industries where domestic production had been deemed sufficient, were subsidized in different ways by the state and protected from international competition (Emek, 2004:101). However, after 1980, significant progress

has been made towards establishing the principles and fundamentals of a free market economy through the introduction of an export oriented industrialization strategy. In other words, since 1980, the acceleration of industrialization period has been characterized in an export oriented way. Such developments made significant contributions to the dynamism of manufacturing industry in particular and Turkish economy in general.

The liberalization efforts of the 1980s made significant contribution to the dynamism of the private sector and improved the adaptability of national economy to internal and external impacts. In addition to the dynamism of the private sector, increased investments have been the main sources of industrial growth. Private sector has enhanced quality improvement-oriented modernization investments, thereby increasing the competitiveness of industry (SPO, 2003:38). In this context, it is also crucial to note that the share of public sector in the manufacturing industry has been decreased through privatization efforts in recent years. According to a report on Sector Profiles of Turkish Industry more than 80 % of production and about 95 % of gross fixed investment in the manufacturing industry is realized by the private sector. At the beginning of 1980s, these figures were 57 % and 63 % respectively (SPO, 2004b:1).

The start of accession negotiations with the EU has also been an important development in influencing the development of industrial policy. Thus, together with the export-oriented policy regime of 1980s, the CU agreement of 1996 has opened up the Turkish manufacturing industry to foreign competition. As a consequence of CU agreement, Turkey is almost part of the European single market with respect to trade in manufacturing goods.

Furthermore the EU process and the preparatory works had done during that process give an impetus to the Turkish economic reform process. The quality and productivity perception that changed along with the EU process make great contributions to the Turkish manufacturing sector. Further, the improvement of investment environment, along with an improvement in macroeconomic indicators after the crisis in 2001, urged both the foreign and domestic to invest more in the sector.

Table 1 presents the main indicators of Turkish manufacturing industry for the period 1992 and 2006. The share of manufacturing industry in GNP was around % 20,6 on average for the period considered. However, growth rate in manufacturing industry declined by 5 %, 7,5% and 7.5 % respectively during the 1994, 1999 and 2001 crisis. In 2006, the production of the manufacturing industry has grown by 7,4 %. In addition, it is

observed that the industrial production has increased since 2002. Indeed, for the period including the years between 2002 and 2006, manufacturing industry became the main source of the total national growth by growing 8,1 % annually. Within this period of 1992 and 2006, in manufacturing industry the value added was around 27,3 % on average. In the context of manufacturing industry, significant increases have been observed both in exports (from 83,5 % in 1992 to 93,8 % in 2006) and investments of manufacturing industry (from 18,4 % in 1992 to 31,9 % in 2005). Moreover, capacity utilization rate have been increased from 76,4 % in 1992 to 81,3 % in 2004.

Table 1: Main Indicators of Manufacturing Industry (%)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Share in GNP	21,6	20,8	22,1	22,6	21,1	21,6	19,4	19,2	19,2	20,6	20,1	20	20,4	20,8	-
Growth rate	5,9	8,2	-5,7	12,1	7,1	10,4	2,0	-5	6	-7,5	9,4	7,8	9,4	6,5	7,4*
Value added (% of GDP)**	23	21	23	23	23	22	36	33	31	30	29	29	29	29	29
Exports (% of total)	83,5	83,4	85,7	88,2	87,1	88,1	88,5	89,3	91,2	93,6	93,5	93,9	94,3	97,7	93,8
Share in gross fixed investments	18,4	18	19,6	22,6	21,6	18,2	18,0	17,5	19,4	17,8	23,8	28,2	33,2	31,9	-
Capacity utilization rate	76,4	79,6	72,9	78,6	78	79,4	76,5	72,4	75,9	70,9	75,4	78,4	81,3	-	-

Source: Data for 1992-2001 DPT Ekonomik ve Sosyal Göstergeler 1950-2003, Data for 2002-2006 DPT Ekonomik ve Sosyal Göstergeler 1950-2006, * Republic of Turkey, Pre-Accession Economic Programmes, ** World Bank, World Development Indicators Database (2007).

On the other hand, R&D, innovation and technology policies are determining factors in global competition. Turkey, however, has suffered from a low level of funding for R&D activities due to lack of political support and lack of resources to support the proper development of science and technology policies. The share of R&D expenditures in GDP, which was 0.58 % as of 2006, is quite low when compared to the EU-27 (1,84 %). The problem with the low share of R&D expenditures reflects into the export. As illustrated in Table 2 developments have been observed in industrial exports in medium and high technology sectors in 2005. On the other hand, although the share of medium and high technology sectors in the manufacturing industry rose significantly due to high increases in exports and production in automotive, machinery and electronics industries, when compared with the EU, the share of these sectors still remains low due to the lack of innovation activities (SPO, 2006b:44).

Table 2: Structure of Manufacturing Industry Production and Exports (%)

Technology intensity*	Turkey						EU Exports****
	Production			Exports			
	2000**	2002	2005	2000	2002	2005	2003
High	5,9	5,1	6,3	7,8	6,2	6,0	21,5
Mid-High	22,5	18,2	25,3	20,4	24,3	28,5	41,9
Mid-Low	30,4	26,7	27,0	20,5	22,8	26,9	15,9
Low	41,2	50,0	41,4	51,3	46,8	38,7	20,7
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: SPO (2006b) Ninth Development Plan 2007-2013, p.44

* OECD Science, Technology and Industry Scoreboard classification is taken as reference.

** It covers the businesses, which employ more than 10 people.

*** Forecast of SPO at 2002 prices

**** EU countries, which are OECD members.

Improvement in macroeconomic stability, positive effect of the EU membership negotiations on predictability, rigorous structural reform programmes and efforts of improving the investment environment has highlighted Turkey as an attractive investment location for foreign investors over the past years. For instance, Turkey has attracted high levels of FDI which is a significant sign of the improved macroeconomic environment in Turkey. In Turkey the total FDI inflow which was USD 1,7 billion in 2003 reached to USD 22 billion in 2007 (Undersecretariat of Treasury, 2008:14). In fact, FDI highly contributes to economic growth, employment, technological development and helps to create a more competitive business environment for manufacturing firms.

Another constituent to define the Turkish manufacturing is the state of the SMEs. The SMEs are a crucial part of the Turkish economy because of their large share in the total number of firms and in total employment. In Turkey, the number of SMEs (including SMEs in the service sector) constitutes 99.8% of total enterprises and 76.7% of total employment. The share of SME investments within total investments is around 38%, with a share of 26.5% of the total value added (SPO, 2004a:8; OECD, 2004:27).

The Turkish manufacturing industry has both weak and strong sides. One of the most serious problems of Turkey's industrialization process is that it has not been successful in achieving its structural transformation. The natural resources and labor constitute a big share in manufacturing. And

from the beginning of the 1980's, the Turkish manufacturing, along with outward-oriented economic policies, became an industry in which low-wage workers have been employed. The manufacturing industry also uses low and intermediate technology. The main reason for this is the insufficiency of private and public R&D expenditures. On the other hand, the Turkish manufacturing sector has problems in terms of input cost and production capabilities. To a large extent, the Turkish manufacturing has been dependent upon imported inputs.

However, looking at its positive sides, it is seen that manufacturing industry in Turkey has an experienced and dynamic entrepreneurship. In addition to this, the existence of flexible and dynamic SMEs in Turkey, the production capacity of goods that require intermediate technology and adaptability to changes in demand and the variety of products are among the strong sides of Turkish manufacturing industry. The geographical location and historical background of Turkey is also important factor in supply of resources, marketing and distribution of goods.

3. Empirical Evidence for the Case of Turkey

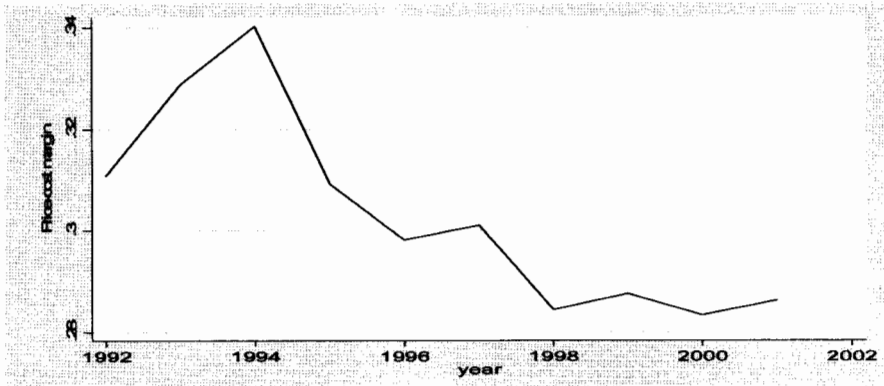
In the previous sections, the structure of manufacturing industry and the evaluation of competition policy are descriptively examined for Turkey. The main objective of this section is to test whether there is impact of price-cost margin (mark-up), import penetration, export/output ratio and customs union/competition policy on productivity in the Turkish manufacturing data for the period 1992-2001.

Before giving the estimation results of the econometric model, the variables that are used in the econometric model will be introduced descriptively. One of these variables is the price-cost margin, which is generally used as a measurement of performance and competitive level of the domestic industry. Since it is not possible to observe or measure competition directly, proxies have to be used instead. The extent of competition in an industry is proxied by the pricing power in the industry. There are alternative measures of pricing power. There exists a literature that devotes to the estimation of the size of the mark-up. We use a proxy of the Lerner index, one given by the differential between value added and the total wage payment as a proportion of gross output, which is

$$C = \frac{\text{Value added} - \text{Total wages}}{\text{Output}}$$

The data of the private manufacturing industry indicate that price-cost margins have increased significantly in the private sector in the period 1992-1994 (Figure 1). However after 1994 until 2001, it started to decline drastically.

Figure 1: Price-cost margin between the period 1992-2001

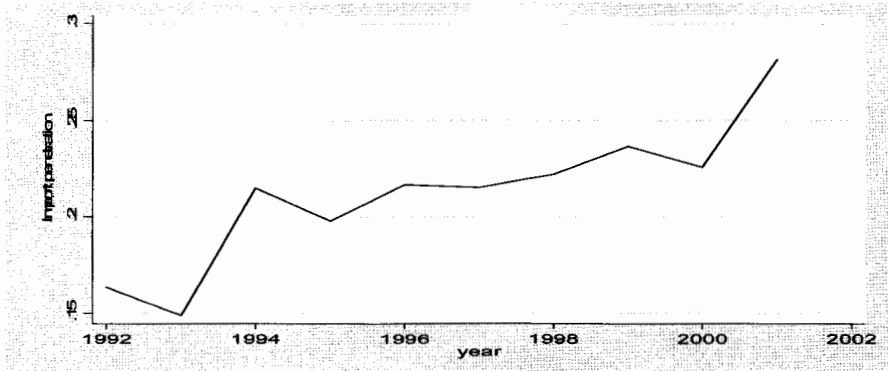


Source: Own calculations from TurkStat Manufacturing Industry Annual Surveys

In general, there are two alternative measures that can be used to represent foreign trade: exports and imports. Trade liberalization is likely to result in greater competition for domestic producers from imports. One indicator of this for the manufacturing industry is the share of imports in domestic demand, defined as imports plus domestic production, which is called import penetration rate, defined as;

$$M = \frac{\text{import}}{\text{import} + \text{output}}$$

Import penetration confirms that the degree of openness of the manufacturing industry arose considerably during the period 1992-2001 (Figure 2). This has accelerated with the CU with the EU in 1996.

Figure 2: Import penetration ratios between the period 1992-2001

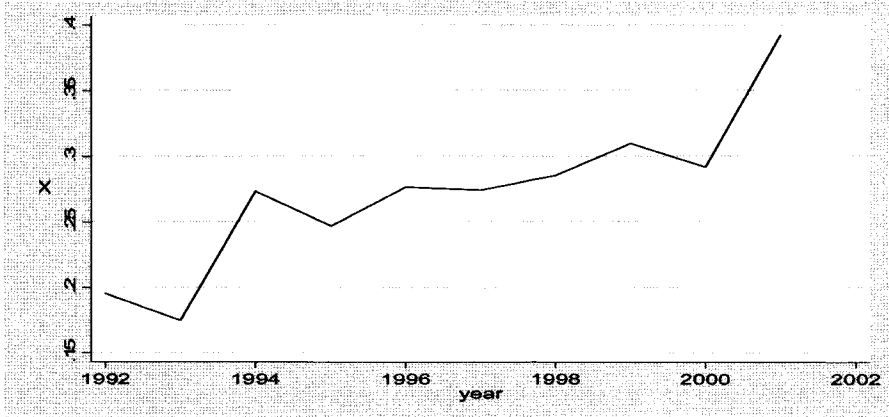
Source: Own calculations from TurkStat Manufacturing Industry Annual Surveys

Another indicator we use as the other explanatory variable for manufacturing industry is export/output ratio, X , which is defined as the total exports divided by the total output value of Turkish domestic industries;

$$X = \frac{\text{export}}{\text{output}}$$

As seen in the Figure 3, the export/output ratio (the share of exports in output) increased continuously as of 1992. This also implies the outward oriented development of the Turkish economy during the post-1980.

In this section, the linkage between productivity growth and competition variables in private manufacturing industries in the context of Turkey for the period 1992-2001 will be tested. For this an econometric model will be specified.

Figure 3: Export/output ratio between the period 1992-2001

Source: Own calculations from TurkStat Manufacturing Industry Annual Surveys

The econometric model employs industry-level panel data for Turkey from the Turkish Statistic Institute (TUIK) Manufacturing Industry Annual Surveys. The data employed for this study focus on the International Standard Industrial Classification (ISIC) four-digit manufacturing industries over 1992-2001. Since data for post-2001 has been conformed to the NACE standards, they have not been released yet. We prefer to examine private manufacturing industries since the public employment policy may not be rationally conducted. Our data covers the 1992-2001 period and consist of 102 industries, including Turkish manufacturing firms with ten or more employees, after excluding several industries due to lack of data. The methodology utilizes ordinary least square, fixed effect and random effects model for the estimation. We estimate the general empirical specification given by:

$$g_{it} = \alpha_i + \beta_1 C_{it-1} + \beta_2 M_{it-1} + \beta_3 X_{it-1} + \beta_4 D_t + I_i + I_t + \varepsilon_{it}$$

where g_{it} denotes a measure of productivity rate in sector i at time t , C_{it-1} is price cost margin with one year lag that is used as a measure of competitive pressure in sector i at time t , M_{it-1} is the import penetration

rate with one year lag in sector i at time t , X_{it-1} is the export/output ratio with one year lag in sector i at time t , D_t is the dummy variable takes the value of one for 1996 (Turkey's accession to the customs union) till 2001 otherwise zero. And I_i and I_t represent industry and year fixed effects.

This is the baseline model that is estimated in the coming empirical analysis. The most appealing feature of this methodology is its simplicity. Although its simplicity, it is a very easy model to understand the relationship between productivity, mark-up, trade structure and the competitive regime shift.

There are various possible measures of performance such as productivity, job creation or profitability. In this study, we employ an empirical measure of productivity growth: labor productivity growth, which is calculated as real value added divided by labor. Value added is deflated by the total price index taking the base year as 1994. Since calculation of the total factor productivity (TFP) is problematic due to the unreliability of capital stock, TFP is not used in this study. In fact, although there are some other indicators of productivity in the literature, the simplicity of labor productivity and its being operational are reasons for this indicator to be used by economists. However we follow Aghion et al (2006) in computing the extent of pricing power in an industry directly, by means of a proxy of the Lerner index.

In this study, the total penetration rate is used rather than the European import penetration rate. The difference between the total and European import penetration rates is the penetration rates for imports from non-EU countries. The non-EU import penetration rates remained at almost the same level (around 5 %) during the 1990s. Thus, it can be concluded that the EU increased its market share, but not at the expense of imports from other countries. In a simplistic manner it can also be claimed that this is an indication that at the aggregate level there was trade creation without trade diversion (Taymaz and Yilmaz, 2007: 132).

Concerning the econometric results, estimation procedure is carried out by using Ordinary Least Square (OLS) Fixed Effect (FE) and Random Effect (RE) Models in panel data analysis.

Table 3: Industry Evidence Dependent Variable: Labor Productivity Growth

	OLS	FE	RE
Independent variables			
Constant	0.306 (0.055)	0.688 (0.164)	0.306 (0.048)
Price-Cost margin (C_{it-1})	-0.915*** (0.161)	-2.559*** (0.314)	-0.915*** (0.129)
Import penetration (M_{it-1})	0.048 (0.044)	0.623*** (0.223)	0.048 (0.039)
Export/output ratio (X_{it-1})	0.099* (0.056)	0.146 (0.101)	0.099** (0.050)
Dummy variable (D)	-0.076*** (0.025)	-0.158*** (0.021)	-0.076*** (0.017)
Diagnostic statistics			
R-square	0.0777	0.0636	0.0777
Observations	918	918	918
Hausman test	158.51***		

Note: Significance level: *10%, **5%, ***1%. Standard errors are given in parenthesis.

Hausman specification (HS) test is the classical test that is used to compare the FE and the RE model. HS test compares the FE and RE model under the null hypothesis that the individual industry effects are uncorrelated with the other regressors in the model. If there is such correlation (the null hypothesis is rejected), the RE model would be inconsistently estimated and the FE model would be the model of choice. As shown in the results, the Hausman statistic is high enough to reject the null hypothesis so we adopt the estimates of the FE model.

As can be seen from the estimation results by the fixed effect model (FE) which captures the industry specificity, there is a negative and significant relationship between mark-up level and productivity. Thus, the competitive industries are more productive during the period considered. On the contrary, there is a positive and significant linkage between productivity growth and import penetration in Turkish manufacturing industry during the period 1992-2001. Thus, as expected, it seems that import penetration increases the productivity. In a similar manner, import penetration ratios are expected to affect productivity positively if industries lower costs and become more efficient when import competition increases. Thus, trade liberalization (opening up domestic markets to foreign competition) leads to improvements in the productivity of domestic industries in Turkey.

On the other hand, it is generally expected that increased export shares should associate positively with productivity. This is also true for Turkey that there is positive but insignificant relationship between productivity rate and export/output ratio. Thus, in the Turkish case, the export/output ratio had not any significant impact on productivity even though it was positively related to productivity.

However, Turkey's accession to the CU does have a negative impact on the productivity of the Turkish manufacturing. At this point it is necessary to indicate that the completion of the CU between Turkey and the EU did not lead initially to considerable increases in trade with the EU. One of the reasons behind this was that the formation of the CU did not lead to considerable reductions in trade barriers on the EU side, because the EU had abolished the nominal tariff rates on imports of industrial goods from Turkey on September 1, 1971, long before the formation of the CU (Togan et al., 2005:94).

4. Conclusion

This paper attempts to explain some portion of productivity growth through changes in the competitive structure of 4-digit Turkish manufacturing industries. In this context, some important linkages in the Turkish manufacturing industry concerning productivity, competition and trade (import penetration and CU) by using panel data econometrics have been examined. Estimations of specifications lead to a number of conclusions. The main findings of the econometric estimations are mainly: (i) There is a negative and significant relationship between mark-up level (competition) and productivity in the Turkish manufacturing during the period 1992-2001; (ii) it seems that import penetration increases the productivity; (iii) Turkey's accession to the customs union does have a negative impact on the productivity of the Turkish manufacturing during the period 1992-2001. Along with the Customs Union, Turkey also adapted a new competition policy law introduced in the year 1996. Thus the change coming with the customs union might affect the productivity in Turkey but it is difficult to separate the impact of trade liberalization coming with the CU from that of the new competition policy.

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