ARGUMENTA OECONOMICA
No 1 (22) 2009
PL ISSN 1233-5835

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THE IMPACT OF THE CUSTOMS UNION WITH THE EUROPEAN UNION ON TURKEY'S ECONOMIC GROWTH **

Since 1980 Turkey has undertaken a number of reforms targeting trade liberalization. The latest phase in that process was the establishment of Customs Union with the European Union in 1996. This study aims to analyze the effects of that Customs Union on technology-led growth in Turkey. A direct test of the technology-led growth induced by the Custom Union is performed by estimating total factor productivity and labor productivity equations for Turkish manufacturing industry sectors. An indirect test of technology led growth is also performed by estimating a sectoral production function which includes a trade variable. The data set used for the estimation is a panel of 12 manufacturing industry sub-sectors for the period 1994-2001. According to the estimation results of the labour productivity equation, import volume has a positive and significant effect on output per labour. In the total output equation estimation the import variable, volume of imports from EU countries, also implies a positive effect. It is concluded that productivity improving effects generated by manufacturing imports from EU countries can be regarded as one of the positive effects of the Customs Union on the Turkish economy.

Keywords: Customs Union; productivity growth, technology-led growth, Turkish manufacturing industry

1. INTRODUCTION

While traditional economic integration theory places considerable emphasis on the potential growth effects of economic integration, it mostly deals with the static allocation effects of economic integration. In fact, traditional theory has not been able to thoroughly investigate the growth impact of trade due to problems of empirical measurement. However, recently, the growth effects of trade liberalization and economic integration have received increasingly more attention, with the relationship between international trade and growth now more explicitly postulated. Baldwin

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** The earlier version of this paper was presented at the 8th ETSG Annual Conference (2006). We would like to thank anonymous referee and Burak Gunalp for his valuable comments.

(1992) focused on the medium-term growth effects of economic integration that follow from the static allocation effects. He shows that the increase in income following economic integration induces further capital formation by increasing savings and a higher marginal productivity of capital. This increase in capital stock following efficiency gains adds the estimated GDP effect. However, this induced capital formation will eventually stop because of the decrease in the marginal productivity of capital.

Novel developments in growth theory, from the early eighties onwards, more specifically, the endogenous growth theories, made it possible to identify mechanisms through which trade liberalization and regional integration may increase long-term growth rates. There are several studies illustrating the ways in which trade affects growth. Most studies have focused on two main channels, namely technology and investment, through which trade increases economic growth and productivity. Since the aim of this study is to focus on the technology-led growth induced by Turkey's Customs Union (CU) with the European Union (EU), studies on the effects of trade liberalization via investment channel will not be examined here. Details of the trade induced investment-led growth can be found in the works of Baldwin and Seghezza (1996a, 1996b, 1996c). As far as the technology channel is concerned, Grossman and Helpman (1990, 1991), Rivera-Batiz and Romer (1991a, 1991b) and Romer (1990) identify four different channels through which trade affects technology-led growth in the context of research and development activities. Firstly, international market provides international spillover of knowledge by opening access to intermediate inputs and by expanding the diffusion of knowledge. Secondly, there are economies of scale in the research and development sector. Due to the increase in the market size following free trade or economic integration there is an opportunity to reap economies of scale in the research and development sector. Thirdly, there is a reduction in the replication of research and development efforts across countries. And finally, a large international market provides higher profits to innovators and the reallocation of resources in the R&D sector.

In addition to the effects related with the research and development activities, the economies of scale effect of international trade may also cause productivity gains. Liberalization makes domestic firms produce for international markets and forces small inefficient firms out of the market. This leads to output increases and, under the assumption of increasing returns to scale, results in productivity gains. Moreover, increasing competition as a result of free imports, forces domestic firms to produce more efficiently.

A large number of studies have examined the effects of trade liberalization on economic growth. Based on cross-country growth regressions, Dollar (1992), Edwards (1992, 1993), Harrison (1996) and Vamvakidis (1998) find evidence that international trade positively affects economic growth. Although openness variables in some studies are not significant in growth regressions that include investment over GDP as an independent variable, they are significant in regressions that have the investment share as the dependent variable (Vamvakidis, 1999).

One strand of literature that investigates the impact of trade on productivity growth has generally found a positive impact of trade on productivity growth. Using time series growth regressions, Coe and Helpman (1995) and Coe, Helpman, and Hoffmaister (1997) show that trade affects growth via technological progress. Coe and Helpman (1995), by using total factor productivity as a proxy for a country's stock of knowledge suggest that there is a positive relationship between total factor productivity and the country's major trading partners' R&D activities which is an evidence for knowledge spillovers. Therefore, by showing that a country's total factor productivity is not only determined by its own R&D stock, but also by that of its trade partners, they have provided a rationale for technology-led growth. Similarly, Bayoumi, Coe and Helpman (1999) suggest that R&D spillovers and trade play an important role in increasing productivity growth both in industrial and developing countries. Within this context, Coe, Helpman, and Hoffmaister (1997) find that developing countries with limited R&D stock can increase productivity by trading with a more developed country that has a large stock of knowledge. Similarly, Cameron, Proudman and Redding (2005) and Economidou and Murshid (2007) suggested that trade has a positive impact on productivity growth. Within this vein, Ferreira and Rossi (2003) and Iscan (1998), by using industrial level data, found that tariff reductions and lower protection rates result in productivity gains. Similarly according to results of Marwah and Tavakoli (2004) imports as a factor of production, contributes to output growth in Asian countries (Levine and Renelt (1992), Baldwin and Seghezza (1996a) provide evidence for trade-induced investment led growth. Lee (1994) also shows that an increase in the ratio of imports in investment has a positive effect on growth. On the other hand there are also studies concluding that trade has no (Cheung and Pascual, 2004) or little effect on productivity growth (Griffith, Redding and Reenen, 2004).

Concerning the growth effect of economic integration, it can be said that the results of the economic integration-growth relationship are mixed. Henrekson, Torstensson, and Torstensson (1997), found positive dummy variable coefficient for participation in the European Union in cross-country growth regressions and suggest that regional integration may not only affect resource allocation, but also long-run growth rates. Baldwin and Seghezza (1996c) also find that foreign R&D increases domestic total factor productivity of EU countries and, therefore, they reached the conclusion that EU membership resulted in knowledge-led growth. Ben-David (1993) has shown that trade agreements in Europe have caused convergence. In a recent study, Badinger (2005) also found positive temporary growth effect of European integration using a panel of fifteen EU member states over the period 1950-2000.

On the other hand, Vamvadakis (2002) shows mixed evidence on the effects of economic integration on growth and De Melo et al. (1992) estimate a growth equation including dummy variables for each trade bloc and found no long-run growth effects of regional integration except the Southern African Customs Union. Similarly, Vanhoudt (1999) found no growth effect of European Integration.

The aim of this study is to test the technology-led growth induced by the CU with the EU both directly and indirectly for the Turkish economy. A direct test of technology led growth induced by the CU will be performed by estimating total factor productivity and labor productivity equations for Turkish manufacturing industry sectors. An indirect test of technology led growth will also be performed by estimating a sectoral production function which includes a trade variable. The data set used for the estimation is a panel of 12 manufacturing industry sub-sectors for the period 1994-2001.

The paper is organized as follows. Section 2 presents the trade liberalization and growth experience of the Turkish economy, as well as brief account of studies focusing on the affect of trade liberalization on growth in the Turkish case. In section 3, the findings of econometric estimates of direct and indirect test of technology-led growth for the Turkish manufacturing industry sectors are presented. The last section concludes the analysis.

2. TRADE LIBERALIZATION AND GROWTH IN THE TURKISH ECONOMY

1980 represented a milestone in terms of the trade strategies of the Turkish economy. Beginning in that year, Turkey changed its development strategy from import substitution industrialization to export-led growth. In this context, quantitative restrictions on imports were eliminated and consequently import tariff rates were gradually reduced. As a result of trade liberalization, the economy-wide nominal protection rate declined from 70.19% in 1984 to 28.25% in 1991 (Togan, 1993: 229). In spite of these liberalization efforts, the average nominal protection rate was still high, prior to the implementation of the CU with EU countries. Togan (1997) calculates that in 1994 it was equal to 10.22% in trade with EU and 22.14% in trade with third countries. The latest stage in the process of trade liberalization was the CU with EU countries that was put into effect on January 1996. As a result of the new import regime, the average 10% import tariff rate for the import of industrial goods from EU and EFTA countries was abolished. Other restrictions, especially quantity controls, were also lifted. Tariffs on the processed agricultural goods imported from EU countries were eliminated by 1999. Additionally, in order to adjust common external tariff rates for third countries, the average 16% industrial import tariff rate for third countries decreased to 4.5 % in 2002.

As a result of these trade liberalization attempts after 1980 and the CU with EU countries after 1996, trends in foreign trade variables changed considerably. The import-to-GNP ratio increased from 11.3% in 1980 to 17.7% in 1994 and to 27.2% in 2003 (SPO 2004). The share of EU countries in total imports increased from 44% in 1993 to 51.2% in 1997 and it became 48% in 2003 (SPO 2004). The average growth rate of total imports from EU countries between 1994 and 2005 were similar and approximately equal to 15 %.

After the trade liberalization efforts of 1980, the growth rate of the Turkish economy increased significantly. The average growth rate of 2.7% for the period 1975-1980 increased to 4.8% for the period 1981-1989. During 1989-1995 the average growth rate did not change considerably and was equal to 4.3 % on average. However, because of the economic crisis at the end of 2000 and at the beginning of 2001, the average growth rate for 1996-2001 fell to 1.9%. When we do not take into account the years of crisis, the average growth rate for the period 2002-2005 was equal to the average growth rate for the period 1996-1998, and was approximately equal to 8%. According to the calculations of İsmihan and Özcan (2006), the fluctuations in total factor productivity is the main determinants of ups and downs in the growth rate of Turkish economy. The negative contribution of total factor productivity to total growth, in particular, was responsible for the lower and negative growth rates during the 1990s (İsmihan and Özcan, 2006). İsmihan and Özcan (2006) indicate that the contribution of labour productivity to growth accounting is more stable in the Turkish economy.

Most studies exploring the economic effects of the CU on the Turkish economy concentrate on static resource allocation effects. There are also studies investigating the relationship between foreign trade variables and economic growth, for the post-1980 era of trade liberalization (Bahmani-Oskooee and Domac, 1995; Utkulu and Ozdemir, 2003; Filiztekin, 2001; Bayar 2002; Gökcekus, 1997). Bayar (2002) and Gökcekus (1997) show favorable impacts of trade liberalization on productivity of industrial sectors. Similarly, Bahmani-Oskooee and Domac (1995), Utkulu and Özdemir (2003) and Filiztekin (2001) found that international trade is one of the main determinants of economic growth in Turkey.

However, the studies cited above generally do not aim at unveiling the economic effects of the CU specifically either in terms of the period under study, or in terms of the types of foreign trade variables used in those studies.

3. MODEL AND ESTIMATION RESULTS

In this paper, our main focus is to investigate the effect of trade between EU countries and Turkey on the productivity of Turkish manufacturing industry sectors, especially after the implementation of the CU with EU countries. By this means, we aim at observing the effects of CU on productivity performance of Turkish manufacturing sector.

As an international trade variable we use the import variable. In the literature, various studies use the import variable as the determinant of productivity and growth (Marwah and Tavakoli, 2004; Bayoumi, Coe and Helpman, 1999; Sjöholm, 1999; Levine and Renelt, 1992; Lee, 1994; Coe and Helpman, 1995 Ferreria and Rossi, 2003). The main reason for preferring imports as the trade variable is the rapid rise of ratio of import to GDP in Turkey in recent years. In the last few years the import ratio has repeatedly reached record levels. In addition, economic growth rates have reached high levels during the last five years. These empirical facts have given rise to discussions about the relationship between imports and growth in the Turkish economy. The prevailing explanation is the import dependency of the Turkish manufacturing sector. Put differently, it is argued that the rising import volume is the result of the increasing growth rates of the Turkish economy. The effect of imports on growth has been granted little attention. For this reason, we aim at clarifying the effects of imports on economic growth, namely productivity. In this study, the import variable represents total imports for 12 sectors of the Turkish manufacturing industry from the EU countries. Since we want to obtain the scale and competition effects of imports in addition to their R&D spillover effects, we use the total imports for the manufacturing industry, rather than just the imports of intermediate products or the imports of capital equipment.

We prefer to use the level of productivity, instead of the growth of productivity level as a measure of growth. In the literature, it is argued that the growth rates of countries do not display considerable changes over the short and medium term (Winters, 2004). In this case, when the relationship between trade and growth is examined, the possibility of obtaining a positive relation becomes weak. Moreover, according to Solowian growth models, if the level of productivity changes once for all, it causes changes in growth rate transitionally. Therefore, examining the level effect means examining transitional dynamics, namely growth.

Our data is a panel of 12 manufacturing industry sectors for 8 years. The period of the study is 1994-2001. Although the CU was put into effect in 1996, most of the tariff reductions were implemented just before 1996. For this reason, the study period starts two years before the introduction of the CU. The ending period of 2001 is chosen because of a lack of data that is consistent with the previous years. In spite of this imperfection, the time period in question is well suited to asses the impact of the CU.

The cross-section units of the study are 12 manufacturing industry sectors of the Turkish economy. Those sectors are: Food, beverages and tobacco, textile, wearing apparel and leather, wood and wood products, paper and paper products, printing and publishing, chemical products, petroleum products, rubber products, non-metal mineral products, excluding petroleum and coal, basic metal products, fabricated metal products, machinery and transport equipment.

In the estimation process, the fixed effect specification of the panel data is used. Fixed effect specification is preferred so as to account for time-invariant unobservable heterogeneity among industries that is potentially correlated with the dependent variable. In so doing, one also dispenses with the omitted-variable problems in the regressions, by means of capturing idiosyncratic factors that might have affected the dependent variable.

The main variables which we use in this study are sectoral real value added (VA), sectoral real import volume with the EU countries (M), sectoral total factor productivity (TFP), sectoral labour productivity (LP), domestic research and development (sectoral real research and development expenditures (RDL), and sectoral real research and development capital stocks (RDS)), sectoral real capital stocks (K), and sectoral total employment (L).

Sectoral value added, sectoral labour and sectoral domestic research and development were obtained from the State Institute of Statistics (SIS) and deflated with the sectoral WPI (wholesale price index). Sectoral import data was also obtained from the SIS and deflated with the import price index. One of the difficulties with our data set was to get a hold on the data for the sectoral capital stock of the manufacturing industry. We have constructed the sectoral capital stock data for 1994-2001 on the basis of the method used in Maraşlıoğlu and Tıktık (1991) and Griliches (1980). To estimate the sectoral capital stock, the following equation was used: $K_{i,t}= (1-\delta)K_{i,t-1} +I_{i,t}$, where t=1994-2001, i=1-12 sectors, $K_{i,t}$: capital stock for i^{th} sector and t^{th} year, $I_{i,t}$: investment for i^{th} sector and t^{th} year, δ: yearly depreciation rate.

Using this equation and the capital stock calculations in Maraşlıoğlu and Tıktık (1991), capital stocks for 1994-2001 were calculated. As with Maraşlıoğlu and Tıktık (1991), the depreciation rate was assumed to be 0.0563. Annual investment data was obtained from the SIS.

As a first step, we attempted to investigate the effects of imports from the EU countries on multifactor productivity during the CU period. For this purpose, we estimated the Cobb-Douglas production function with the explanatory variables K and L. The estimated residuals from this equation are used as a proxy for TPF. We then estimated the TFP equation with the explanatory variables imports from the EU and research and development. Both volume and consumption share of import are statistically insignificant in the TFP equation. Similarly, research and development capital stock and real expenditure are also not significant variables. In the same context, the lagged values of these explanatory variables do not have a statistically significant effect on TFP. The insignificance of explanatory variables may be a result of errors in the estimation of TFP, that is, compounded errors of two sets of above mentioned regression (Ferreira and Rossi, 2003). The other limitation of TFP regressions is that business-cycle fluctuations that affect the behaviour of output and factors may also affect the productivity measurement, although those fluctuations have no long-run impact on the productivity trend. For example, during recessionary periods output shrinks even though capital stock and capacity do not shrink and so TFP may seem to be falling and TFP measures fall. Whereas during recovery periods capacity utilization increases, output may increase even without any increase in capital input. Consequently, measured TFP also increases. During the period 1994-2001 there were severe ups and downs in Turkish economy. In 1994 and in 2001 the output of the Turkish economy fell markedly. In 1994 and in 2001, growth rates were –6.1 and –9.5 respectively. Therefore, TFP measurements may not be reliable for the period under study.

Because of these deficiencies in the TFP measurements, we use alternative models and estimations in order to examine the productivity effect of sectoral import from EU countries after the implementation of the CU.

To obtain the industrial sector's multifactor productivity effect of imports from the EU countries, the first alternative model we estimate is the Cobb-Douglas production function. The advantage of using the Cobb-Douglas production function over TFP is that it avoids the above mentioned compound errors generated by two different regressions. We estimate the double logarithmic form of Cobb-Douglas production function with a fixed effect model of panel data. Our dependent variable is manufacturing sectors' real value added. Explanatory variables are capital stock (K), employment (L), research and development variable, and import variable. In our model we assume that productivity is a function of imports and domestic research and development. That is, we start with a simple production function $VA_{it} = A_{it} f(L_{it}, K_{it})$ where VA_{it} is value added in sector *i* at time *t*, and *A*, *L* and *K* are the level of total factor productivity, number of employees and capital stock. We assume that total factor productivity can be expressed as a function of import from the EU countries (*M*) and domestic research and development (*RD*): A=f(M, RD). Therefore, our output equation becomes:

$$\log VA = \beta_0 + \beta_1 \log L + \beta_2 \log K + \beta_3 \log M + \beta_4 \log RD \qquad (1)$$

In the estimation of equation (1), not only the current import (*M*) and domestic research and development (*RD*), but also the lagged values of these variables are included as explanatory variables in order to take into account the time lag in the diffusion of knowledge via import and research and development. In order to take into account the relative importance of *RD* expenditure in relation to the sector size, rather than the *RD* expenditure itself the sectoral share of research and development in output is introduced into the equation (*RD/Q*). Accordingly, Equation (2) is estimated using fixed effect GLS.

$$\ln VA_{i,t} = \beta_{i0} + \beta_{i1}\ln L_{i,t} + \beta_{i2}\ln K_{i,t} + \beta_{i3}\ln M_{i,t} + \beta_{i4}\ln M_{i,t-1} + \beta_{i5}\ln\left(\frac{RD}{Q}\right)_{i,t} + \beta_{i6}\ln\left(\frac{RD}{Q}\right)_{i,t-1} + \varepsilon_{it} \quad (2)$$

Table 1 summarizes the fixed effect estimation outcomes of the production function.

Table 1

Estimation Results of Production Function*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(K)	0.625790	0.088286	7.088220	0.0000
LOG(L)	0.052836	0.125212	0.421969	0.6746
LOG(M)	0.315771	0.112187	2.814683	0.0067
LOG(M(-1)	-0.043263	0.085562	-0.505631	0.6151
LOG(RD/Q)	-0.174175	0.033743	-5.161774	0.0000
LOG(RD(-1)/Q(-1))	0.138990	0.048584	2.860828	0.0059
AR(1)	0.703859	0.083335	8.446147	0.0000

R-squared	0.803434	Mean dependent var	4.797925
Adjusted R-squared	0.782743	S.D. dependent var	0.408896
S.E. of regression	0.190590	Akaike info criterion	-0.374467
Sum squared resid	2.070498	Schwarz criterion	-0.138339
Log likelihood	18.98294	F-statistic	38.82991
Durbin-Watson stat	2.067070	Prob(F-statistic)	0.000000

Source: authors' own

* Standard errors and t-statistics of coefficients are computed using White's heteroscedasticity consistent variance-covariance estimator.

Various measures of imports from the EU and research and development are used in the estimation of production function. According to the estimation results of the production function, current import volume (M) is a statistically significant variable with positive sign (Table 1). Although this paper does not attempt to consider the causality problem between trade and growth explicitly, one might well argue that current year import volume is an endogenous variable. More specifically, current year import volume could depend on current year output: when current year output rises current year import volume might also rise. To elucidate the direction of causality between output and import volume, a Granger causality test (Madalla, 1992:393-4) is run for two variables. The result is that, in a Granger sense, causality runs from import to output and therefore to productivity. The regression is:

$$\log VA = \underset{(3.76)}{0.4825}\log M(-1) - \underset{(3.50)}{0.4932}M(-2) + \underset{(1.70)}{0.4044}\log VA(-1) + \underset{(2.70)}{0.6098}\log VA(-2)$$

with t-statistics in parentheses. According to t-statistics, the lagged value of *M* is significant. For detailed information on Granger causality tests, see Madalla (1992:393-4).Since only the current import volume is statistically significant and the lagged value of import is not a statistically significant variable, it can be claimed that positive effect of import on output might be due to the increase in the number of intermediate inputs rather than the increase in the diffusion of knowledge via imports(Table 1). The lagged value of the share of research and development expenditures in output (*RD*/*Q*) is also statistically significant variable with positive signs (Table 1). On the other hand, the current value of the R&D expenditure share is statistically significant and the sign of that variable is negative. The increasing size of current year R&D expenditure implies consumption of more resources in this sector without a significant immediate improvement in efficiency and productivity which may become obtainable after the current period. Therefore, it may be possible to obtain a negative effect on output in the case of current year investment expenditures for R&D. As a result one can argue that total manufacturing sector import from the EU and the previous year's share of domestic research and development expenditure have an increasing effect on the level of productivity of the Turkish manufacturing sector. Because the coefficient of import variable (0.315771) is higher than the coefficient of research and development variable (0.138990) we can say that the effect of imports on productivity is larger than the effect of domestic research and development. As expected, capital stock over employment has a positive significant effect on sectoral manufacturing output. However, employment variable (*L*) is not significant. This insignificance of labour input might be explained by the fact that the employment data does not indicate the quality of labour and hours worked. The AR(1) term is also included in the equation because of the detected autocorrelation problem during the estimation process.

The other alternative productivity measure model which we used for investigating the impact of manufacturing sector imports from the EU on the productivity of Turkish manufacturing industry is single factor productivity, namely a labour productivity equation (Equation 3).

$$\left(\frac{VA}{L}\right)_{i,t} = \alpha_{i0} + \alpha_{i1}RD_{i,t} + \alpha_{i2}M_{i,t} + \alpha_{i3}M_{i,t-1} + \alpha_{i4}Q_{i,t} + \omega_{it} \tag{3}$$

Our productivity measure is based on "total labour force employed in production". We calculated labour productivity by dividing total sectoral value added with sectoral labour force employed in production. The explanatory variables in this equation are import variable (*M*), domestic research and development variable (*RD*) and output (*Q*). The output variable is included in the equation in order to capture the scale effect. Under the assumption of increasing returns to scale, output increases result in productivity gains. The various measures of import and research and development variable are used for obtaining more reliable results. Equation (3) is estimated using fixed effect GLS.

Table 2

Estimation Results of Labor Productivity Equation *

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.750563	0.307170	-2.443475	0.0183
RD	2.72E-05	1.65E-05	1.649394	0.1056
M(-1)	0.000864	0.000482	1.794205	0.0791
M	0.000631	0.000928	0.679868	0.4999
Q	0.009593	0.002303	4.165558	0.0001
AR(1)	0.550303	0.138870	3.962721	0.0002

R-squared	0.747111	Mean dependent var	1.227590
Adjusted R-squared	0.662815	S.D. dependent var	0.749515
S.E. of regression	0.435226	Akaike info criterion	1.393986
Sum squared resid.	9.092226	Schwarz criterion	1.962672
Log likelihood	-28.30456	F-statistic	8.862918
Durbin-Watson stat.	2.508540	Prob(F-statistic)	0.000000

Source: authors' own

* Standard errors and t-statistics of coefficients are computed using White's heteroscedasticity consistent variance-covariance estimator.

According to the results of the labour productivity equation estimation, the lagged value of real import volume (*M*(-1)) and research and development stock (*RD*) are significant variables with positive signs (Table 2). Unlike first equation, this result emphasizes the fact that the productivity effect of import comes via the lagged value of import. This result may be interpreted as the natural consequence of the time lag in the diffusion of knowledge through imports.

So, we can argue that the volume of manufacturing industry imports from the EU countries has a labour productivity increasing effect on the Turkish manufacturing industry. Similarly, the results reported confirm the positive relationship between labour productivity and domestic research and development stock. The coefficient of import variable (0.000864) is again greater than the coefficient of R & D (2.72E-05). Therefore, one can argue that the positive impact of imports on labor productivity is higher than that of research and development in the Turkish manufacturing industry. As expected, value added has a positive impact on labor productivity and, therefore, confirms the existence of increasing returns to scale in Turkish manufacturing industry. The AR (1) term is also included in the equation because of the detected autocorrelation problem during the estimation process.

CONCLUSION

In the literature recent studies claim that trade liberalization and economic integration may cause productivity and growth gains as well as level effects. It is contended that trade increases economic growth and productivity via two main channels, namely technology and investment. The mechanisms by which trade induced technology-led growth is achieved are the international spillover of knowledge, increased competitive pressure, an increase in the number of intermediate inputs, an increase in the diffusion of knowledge via imports and an increased opportunity to reap economies of scale.

Turkey established a Customs Union with the European Union in 1996. Studies exploring the economic affects of the Customs Union on Turkish economy generally do not aim to reveal the growth and productivity effects of the Customs Union. Therefore, the aim of this study is to test for the technology-led growth induced by the CU, both directly and indirectly, for Turkish economy. For the direct test of technology-led growth total factor productivity and labour productivity equations for Turkish manufacturing industry sectors were estimated. An indirect test of technology-led growth was performed by estimating a sectoral production function that included a trade variable. The data set used for estimation is a panel of 12 manufacturing industry sub-sectors for the period 1994-2001.

The following conclusions can be derived from the results of our panel data estimations. First of all, both the volume and the consumption share of import variables do not exhibit a significant affect on the total factor productivity equation. Methodological deficiencies in the TFP measurement might be the main reason for the insignificance of import variables in that equation. This problem led us to estimate the labour productivity equation as an alternative. According to the estimation results of labour productivity equation, import volume has a positive significant affect on output per labour. In other words, the positive affect of sectoral manufacturing industry import from the EU on the labour productivity of the Turkish manufacturing industry can be considered as direct evidence for technology-led growth in the Turkish case.

In the total output equation estimation the import variable, the volume of imports from EU countries also implies a positive effect. These results show that we obtained productivity improving effect of import both indirectly, by estimating production function with trade variable, and directly, by estimating labor productivity equations. Put differently, it is observed that sectoral manufacturing imports from EU countries causes both a labor and a total factor productivity increase in Turkish manufacturing industry. Domestic research and development variables also have significant and positive effects on both labour productivity and output in the Turkish manufacturing industry. In both the labor productivity and output equations, import variables have higher coefficients than the coefficients of domestic research and development variables. Therefore, one can claim that import volume has a greater effect on productivity in Turkish manufacturing than domestic research and development.

Overall, we can suggest that, although increasing import volume is causing a current account deficit, the productivity enlarging effects of rising import volumes should not be disregarded. In particular, productivity improving effects has been generated by manufacturing imports from EU countries. This can be regarded as one of the positive effects of the Customs Union on the Turkish economy.

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Received: November 2008, revised: February 2009