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Full Length Research Paper

Impact of international trade on employment in manufacturing industry of Turkey

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Turkey abandoned import substitution industrialization strategies in foreign trade policies and started to implement export promoting strategies after a reform program started in 1980. Promoted exports brought along increasing imports. In this study, the impact of international trade on employment level in industry was investigated using an annual panel of data from 95 manufacturing industries in Turkey for the period of 1992 - 2001. A dynamic panel data model was used for that purpose. Results showed that trade variables had no significant impact on employment in the manufacturing industry at the current level, while lagged real exports and import penetration had the opposite effect on current employment during the period analyzed.

Key words: International trade, employment, dynamic panel data.

INTRODUCTION

Turkey left import substitution industrialization strategies in foreign trade policies and started to implement export promoting strategies after a reform program begun in 1980 (Başar and Temurlenk, 2007). Promoted exports brought along increasing imports, since 80 - 90% of imports consisted of imports of raw materials and investment goods over the period of 1980-2008 (TURKSTAT, 2009). Table 1 shows graphs of exports and imports by the manufacturing industry in Turkey for the period of 1980 - 2009. As shown in Figure 1, exports and imports by the manufacturing industry increased gradually after 1980 and reached a peak in 2008. By means of effective foreign trade strategies, the growth rate of foreign trade for manufacturing industry accelerated after 2002. Effects of crises in the economy can be seen clearly by examining the import data for the manufacturing industry in Figure 1. The economic crises in 1994, 1999, 2001 and 2008 caused a substantial fall in imports. The effects of the crises in the economy cannot be seen in the exports data in Figure 1, but global financial crisis in 2008 is apparent. Although exports were not affected by first three domestic economic crises like imports, global financial crises in 2008 caused the greatest downturn in both exports and imports.

Table 1 shows employment, production, wage rates, exports share and import penetration in manufacturing industry by two digit International Standard Industrial Classification Revision 3 (ISIC Rev. 3) code between 1992 and 2001. As it is shown in the table, 114.9 thousand new employees found job opportunities in the manufacturing industry. The employment in the manufacturing industry increased about 11.76%. It can be seen that the extent of employment change in the manufacturing industry differed substantially across two digit ISIC Rev. 3 industry divisions. While 13 industries recorded expansion, 8 industries recorded contraction in employment. The greatest change in employment was in office, accounting and computing machinery industry (30). Employment increased more than five times in these industries during the period of 1992-2001. The industries that recorded the next largest increase in employment were manufacture of furniture (36), other transport (35), wearing apparel (18), electrical machinery and apparatus (31) and rubber and plastic products (25). While employment change in the manufacture of office, accounting and computing machinery industry (30) and

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Table 1. Employment, production, wage rates, exports share and import penetration in manufacturing industries of Turkey, 1992 – 2001.

ISIC code	Employment ('000s)			Production (billion $)			Wages rates($)			Exports penetration			Import penetration		
	1992	2001	%Δ 1992 - 2001	1992	2001	%Δ 1992 - 2001	1992	2001	%Δ 1992 - 2001	1992	2001	%Δ 1992 - 2001	1992	2001	%Δ 1992-2001
15	152.3	149.4	-1.85	12.9	12.03	-6.72	7837	5652.7	-27.87	0.11	0.15	31.65	0.07	0.08	22.03
16	30.3	16.1	-46.87	2.45	3.13	27.72	9874.4	8852.6	-10.35	0.01	0.03	172.34	0.08	0.01	-84.09
17	181.2	219.6	21.20	8.94	9.9	10.69	5805.7	3811.6	-34.35	0.11	0.18	57.30	0.06	0.15	144.95
18	93.2	152.9	64.07	4.25	5.42	27.38	3180.3	2739.9	-13.85	0.69	0.74	7.18	0.01	0.04	565.00
19	14.7	16.4	11.62	0.53	0.6	12.23	4211.7	3676.9	-12.70	0.23	0.24	2.81	0.27	0.39	47.30
20	15.1	10.7	-29.53	0.75	0.49	-34.37	6235.8	3298.2	-47.11	0.04	0.16	290.82	0.08	0.21	180.09
21	20.7	21.1	1.58	1.5	1.5	-0.19	9591.7	7488.1	-21.93	0.04	0.15	280.57	0.23	0.52	128.81
22	14.6	11.3	-22.70	1.17	1.12	-4.35	8627.7	6016	-30.27	0.03	0.04	40.76	0.07	0.19	174.10
24	51.3	58.6	14.09	6.24	8.01	28.36	14389.9	18694.5	29.91	0.13	0.15	19.04	0.56	0.83	47.58
25	27.2	40.7	49.60	2.25	2.62	16.53	9266.9	6190.9	-33.19	0.12	0.32	179.14	0.16	0.3	88.11
26	70	67.8	-3.04	4.47	3.95	-11.64	8861.4	5686.2	-35.83	0.12	0.24	109.04	0.06	0.08	41.47
27	70.7	56.7	-19.78	6.85	6.45	-5.87	14228.2	10910.5	-23.32	0.22	0.43	94.05	0.23	0.56	146.15
28	39.3	50.1	27.43	2.17	2.2	1.23	6060.9	4543.4	-25.04	0.11	0.3	163.53	0.21	0.39	88.75
29	62.1	67.5	8.72	4.44	3.27	-26.28	7908.3	6149.2	-22.24	0.07	0.36	407.24	0.78	1.5	91.16
30	0.2	1.2	531.25	0.02	0.18	763.87	6063.3	4988.8	-17.72	0.74	0.23	-68.27	23.52	4.21	-82.09
31	21	31.6	50.19	1.67	1.95	16.92	9049.5	6109.4	-32.49	0.19	0.46	145.23	0.49	0.62	26.31
32	19.1	15.9	-16.65	2.25	2.18	-3.06	12821.4	11448.2	-10.71	0.1	0.43	342.41	0.36	0.93	158.34
33	3.3	2.2	-32.79	0.15	0.08	-45.62	8264.5	3952.3	-52.18	0.2	0.79	298.35	4.12	12.23	196.67
34	40.9	47.5	16.13	5.48	4.05	-26.11	10876.1	7984.5	-26.59	0.05	0.62	1085.13	0.25	0.54	112.60
35	6.6	12.5	89.20	0.26	0.45	74.22	11086.9	9988.6	-9.91	0.53	0.05	-90.11	3.69	2.84	-23.14
36	14.2	29.8	109.25	0.56	1.3	130.82	4333.8	3248.2	-25.05	0.12	0.52	335.97	0.28	0.29	1.95
Total	977.1	1092	11.76	79.65	81.16	1.90	8269.5	6154.1	-25.58	0.13	0.26	96.78	0.22	0.39	75.74

United Nations Industrial Development Organization (UNIDO), Industrial Statistics Database 2009.
15=Food products and beverages; 16=Tobacco products; 17= Textiles; 18=Wearing apparel; 19=Luggage, saddlery and footwear ; 20=Products of wood and cork; 21=Paper and paper products; 22=Printing and publishing; 24=Chemicals and chemical products; 25=Rubber and plastic products; 26=Other non-metallic minerals; 27=Manufacture of basic metals; 28=Manufacture of fabricated metal products (except machinery and equipment); 29=Manufacture of machinery and equipment; 30=Office, accounting and computing machinery; 31=Electrical machinery and apparatus; 32=Communication and apparatus; 33=Medical, precision and optical instruments, watches; 34=Motor vehicles and trailers; 35=Other transport; 36= Furniture.

furniture (36) were 531% and 109%, change in production in these were 764% and 131% respectively. The fact that changes in production in these industries are more than changes in employment indicates increasing returns to scale in these industries over the period of 1992-2001. As for manufacture of other transport (35), wearing apparel (18) and electrical machinery and apparatus (31), since change in production was not more than change in employment, decreasing returns to scale were in effect in these industries.

On the other hand, decreases in employment in the manufacturing of tobacco products (16), medical, precision and optical instruments, watches (33), products of wood and cork (20), printing and publishing (22), basic metals (27) and communication and apparatus (32) industries ranged between 16 - 47%. In contrast to employment loss in these industries, output per employee increased in manufacture of optical instruments, watches (33) and products of wood and cork (20). Increased

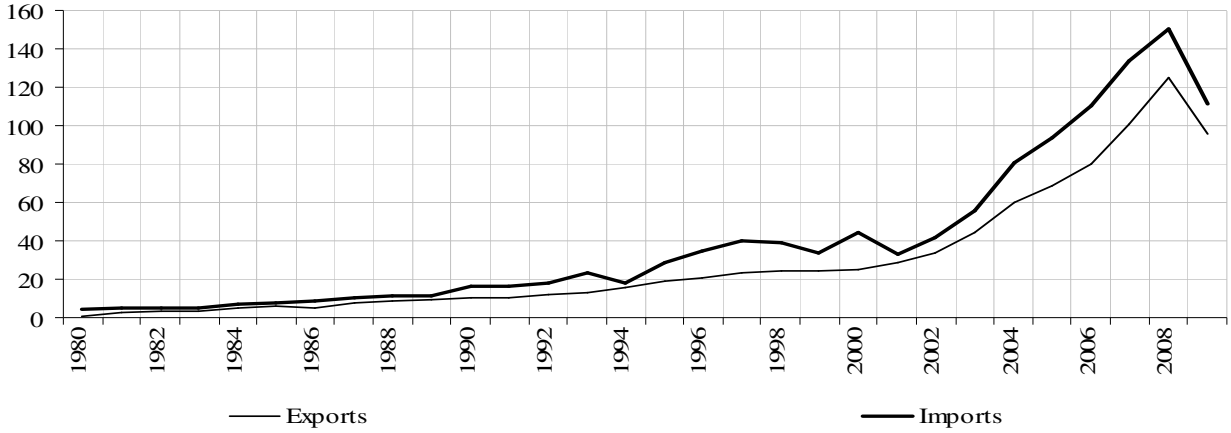

Figure 1. Exports and imports of manufacturing industry in Turkey (billion $). Source: www.turkstat.gov.tr (Visited at 25 August, 2010).

increased labour productivity in industries recording decrease in employment indicates technological and managerial progress in production.

Due to the loss maker manufacturing firms run by the government for the sake of statism and three serious economic crises in 1994, 1999 and 2001, production of manufacturing industry increased very little in this period. The combination of increased employment and stable production in manufacturing industry caused a decrease of 8.83% in production per employee. The greatest decrease in production per employee was about 36.36% in motor vehicles and trailers industry (34). Decrease in production per employee in manufacture of fabricated metal products (except machinery and equipment) (28), rubber and plastic products (25), wearing apparel (18), electrical machinery and apparatus (31) and manufacture of machinery and equipment (29) industries were over 20%. The greatest increase in production per employee was in the tobacco products (16) industry. Production per employee increased about 140.43% in this industry. This shows how privatization in this industry during 1990s was successful. The most recent industry to show the highest increase in productivity per employee was office, accounting and computing machinery industry (30) with an increase about 50%. Production per employee decreased in 13 industries and increased in 8 industries over this period.

As a result of decrease in labour productivity, the income effects of three serious economic crises and privatization which caused decline in number of high paid workers employed by politic practices, wage rates in all manufacturing industries decreased over the period of 1992 - 2001, excepting the manufacture of food products and beverages (15). Wage rates (wages per person per year) decreased between 9 - 53% among manufacturing industries in this period. Decrease of wage rates in manufacturing industry was 25.58%.

Import penetration ratios (or import shares) are intuitive indicators categorizing industries confronting serious foreign competition. Industries with high amount of output in international trade markets are generally trade-sensitive (import/export-sensitive) on account of import and export penetration (Kletzer, 2000). Penetration of exports and imports increased 96.78 and 75.74% respectively. That the import penetration increased more than export penetration in this period indicates manufacturing industries facing significant foreign competition. These increases in export and import penetration indicate that manufacturing industry in Turkey was successfully integrating into the international economy in this period. Export penetration in the manufacture of motor vehicles and trailers (34) increased more than ten times. Foreign direct investments of Toyota in 1994, Honda in 1997 and Hyundai in 1997 (Bedir, 2002) increased exports in this industry during this time period. Exports as a share of production in eleven industries ranged between 109 and 408% and imports as a share of consumption in nine industries ranged between 112 and 565%.

In this study, the employment impact of international trade in manufacturing industry of Turkey is investigated using Dynamic Panel Data method. Following the introduction, a theoretical framework and literature review of studies about the subject will be briefly summarized. In the third section, the model and dynamic panel data method used in this study are explained. In the fourth section, data and results of the analyses are presented. Results of the analysis are discussed in the fifth section.

LITERATURE REVIEW

International trade can reallocate production factors from import-competing sectors to exporting sectors in accordance with the fundamentals of comparative advantage. Given the assumption of full employment level, laid off workers are employed in other sectors without time lost.

Thus trade has no effect on the employment level and unemployment rates, and trade can affect only quality of jobs and income distribution in traditional trade models, since skills of employees in exporting and import-competing sectors are different (Jansen and Lee, 2007). In developing countries, production shifts towards low-skill-labour intensive goods, demand for unskilled workers and their wages increase. On the contrary, gap between unskilled and skilled relative wages widen in developed countries (Bussolo et al., 2002) in favor of skilled workers.

Freeman and Revenga (2004) classifies arguments on employment impact of international trade in three approaches. The first approach, having a Heckscher-Ohlin perspective, suggests that developed countries import mostly unskilled labour-intensive products from less developed countries and export mostly skilled labour-intensive products. Thus, the relative prices of unskilled-intensive products will reduce and wages of unskilled employees in the importing country and will have a downward pressure equalizing factor prices among trading countries under specific conditions. In this framework, if wages in an open economy are not flexible enough to respond to world competition, employees will lose their jobs. According to this model, the impact of international trade on employment emerges indirectly through a decrease in relative prices of goods using scarce factor in production, though many factors apart from trade can lead a negative correlation between prices and employment in industry using scarce factor in production. Labour market approach, the second approach, emphasizes that imports of labour-intensive products in developed countries from less developed countries leads to displacement among employees in those industries, reducing the labour demand of those employees and increased unemployment and decreased wages. The impact of international trade on employment is determined by share of employment in trading industries out of total employment. Decrease in demand for unskilled employee spreads economy-wide, depending on the size of the traded products industry, and leads wage-cuts and job losses for unskilled employees. The third argument one is the Ricardian approach which has a labour productivity/labour cost perspective. Different labour productivities among countries depending on different technology or labour skills are exogenous. Trade occurs when countries produce goods with labour costs that are less than or equal to unit labour costs of their trade partners. The unit labour cost of a country depends on both productivity and relative wages which are endogenous in this approach. An increase in labour productivity of a country deteriorates comparative advantage of its trade partner country. Deteriorated comparative advantage leads to a decrease in the range of goods produced in the trade partner country, resulting in relative wage cuts to balance trade deficits.

A large number of empirical studies have been produced to analyze the relationship between employment and trade in the economic literature. Because of the availability of data for empirical research, most the studies analyzed employment and trade in the manufacturing industry (Jansen and Lee, 2007). In most countries, surveys applied to the manufacturing sector are more detailed and frequent as compared to other sectors.

Since there is no perfect competition market with the assumption of full employment level in real life, some economists developed theoretical approaches to explain the interaction between trade and employment. One of the earliest approaches to analyze the relationship between trade and employment was developed by Brecher (1974). Extending the Heckscher-Ohlin model in an open economy, Brecher (1974) demonstrated that the employment effect of trade depends on mainly whether exported goods are capital-intensive or labour-intensive. If the home country exports capital-intensive goods and home specialization is not complete, the employment and welfare of economy may be decrease in the case of a minimum wage constraint (Brecher, 1974).

In order to assess impact of imports on steel industry in the US, Grossman (1986) developed a methodology and found that the loss in the employment of the steel industry could not be attributed to international competition. Using same methodology Grossman (1987) investigated wage and employment effects of international competition in nine US manufacturing industries. Grossman (1987) found that import competition had a significant effect on employment in one of the nine industries and on wages in only two industries.

Revenga (1992) investigated employment and wage effects of increased import competition on the US manufacturing industry using data for a panel of manufacturing industries for the period of 1977 - 1987. The estimates suggested that changes in import prices affected both employment and wages significantly.

Baldwin (1994) summarized and assessed recent studies of the employment and wages effects of current trends in trade and direct investment in OECD countries. According to Baldwin (1994), factors such as changes in labour supplies, technology and demand are generally more important than changes in trade for explaining employment changes.

Milner and Wright (1998) investigated labour market responses to trade liberalization in Mauritus, an industrializing country. Using the dynamic panel technique for importable and exportable sectors, they estimated employment and wage equations for the period including both the pre- and post-liberalization regimes. They concluded that liberalization in trade increased employment and wages in the long run, but placed downward pressure wages in the very short run. As for importable sector, employment and wages increased after liberalization and an expansion of economy and of labour of supply resulted.

In a dynamic labour demand framework Greenaway et al. (1999) modeled the effects of trade on employment in the UK using panel data of 167 manufacturing industries.

They concluded that increase in exports and imports reduced the level of derived labour demand. Results disaggregated by origin of imports showed that trade with the EU and US had stronger effects when compared to trade with East Asia. Developing a framework incorporating employment effects of export expansion, import competition and labour saving productivity improvements, Abraham and Brock (2000) assessed the sectoral employment effects of trade in Europe. They found a strong relationship between trade and employment in Europe. Hence they concluded that trade-related employment effects indicate the importance of export growth as a key engine of job creation.

Bahmani-Oskooee and Chakrabarti (2003) analyzed the long run relationship among employment and wages in the twelve US manufacturing sectors and import competition using Johansen and Juselius cointegration technique. Although results of cointegration analysis were identical to the results of Revenga (1992) study, positive correlation between import price and employment and negative correlation between import price and wages in the long run were not for the all sectors. Among the twelve sectors, eight of them had a significant positive correlation between import price and employment and six of them had a significant negative correlation between import price and wages.

Leichenko and Silva (2004) investigated impacts of international trade on rural manufacturing employment and earnings in the US. The findings of their study suggested that in both rural and urban counties lower export prices increased employment and earnings in the manufacturing industry, while lower import prices reduced rural employment but increase urban employment.

Morawczyński and Wach (2003) used stepwise multiple regression analysis to investigate the impact of Polish foreign trade on employment. Using pooled data from 28 sectors for the period of 1993 - 1999, they concluded that employment changes were negatively affected by import growth in all sectors and there was positive and statistically significant connection between employment and export penetration.

Nurmi (2004) analyzed the relationship between employment and international trade in the Finnish manufacturing sector for the period of 1980 - 2001 using plant and industry-level data. Results of this study showed that while the employment impact of imports was negative, employment impact of exports was positive.

Tomiura (2004) investigated the relationship between employment and import competition using data of 334 manufacturing industries at the four-digit level. Results of the study indicated that import competition had significant but small effect on Japanese employment during that period.

The relationship between exports and employment in China was analyzed by Fu and Balasubramanyam (2005) using Smith-Myint model of 'vent-for-surplus'. Using a dynamic labour demand framework for a panel of township and village enterprises in China, they found that while growth of exports increased employment, it did not promoted productivity.

Janiak (2006) merged the model of intra-industry reallocation proposed by Melitz (2003) with the large firm model proposed by Pissarides (2000) and found that due to the interaction between goods and laobour market imperfections, an increase in trade exposure generated more job destruction than creation. Janiak (2006) also tested predictions of this model by using Generalised Method of Moments (GMM) panel data methods to sectoral job flows of the US and found that results of empirical analysis confirmed the theoretical results. A substantial literature review about the impact of international trade and employment can be found in Hoekman and Winters (2005) and Lee (2005).

METHODOLOGY

Following Milner and Wright (1998) and Greenaway et al. (1999), the impact of international trade on employment in the manufacturing industry of Turkey is analyzed using the dynamic panel data model. This model was used for the first time by Milner and Wright (1998), conducted within the framework of a simple static profit-maximizing firm behavior, to analyze the impact of international trade on employment. The model originates in Cobb-Douglas production function which can be written as follows for a representative firm:

$$Q_{it} = A^{\gamma} K_{it}^{\alpha} L_{it}^{\beta} \qquad (1)$$

where Q is real output (production), K is capital stock, L is units of labour utilized, α and β are the factor share coefficients for K and L respectively, i is the industry, t is the period and γ is the parameter representing efficiency of the production process. Profit maximizing condition can be provided by a firm when the firm allocates labour and capital at the level that wage (w) is equal to the marginal revenue product of labour and user cost (c) is equal to the marginal revenue product of capital.

The capital variable in this function can be extracted from the expression of production by solving this system simultaneously (Milner and Wright, 1998). Thus the following equation is obtained:

$$Q_{it} = A^{\gamma} \left(\frac{\alpha L_{it}}{\beta} \frac{w_i}{c}\right)^{\alpha} L_{it}^{\beta} \qquad (2)$$

The labour demand equation of the industry can be obtained by taking logarithms and rearranging the equation (2) as follows:

$$\ln L_{it} = \phi_0 + \phi_1 \ln\left(\frac{w_i}{c}\right) + \phi_2 \ln Q_{it} \qquad (3)$$

where: $\phi_0 = -\dfrac{(\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta)}{(\alpha + \beta)}$, $\phi_1 = \dfrac{-\alpha}{(\alpha + \beta)}$, $\phi_2 = \dfrac{1}{(\alpha + \beta)}$.

Since the impacts of international trade on labour are to be investigated, it is assumed that *A* is a function of exports and imports. Thus A in the production function is hypothesized to be varied over time as follows (Greenaway et al., 1999):

$$A_{it} = e^{\delta_0 T_i} M_{it}^{\delta_1} X_{it}^{\delta_2}, \qquad \delta_0, \delta_1, \delta_2 \rangle 0 \tag{4}$$

where *T* is time trend, *M* is import penetration measured by ratio of imports to consumption (production + imports-exports) in sector *i* and *X* is export penetration measured by ratio of exports to production in sector *i*.

Thus, Equation (3) is written as:

$$\ln L_{it} = \phi_0^* - \mu_0 T - \mu_1 \ln M_{it} - \mu_2 \ln X_{it} + \phi_1 \ln(\frac{w_i}{c}) + \phi_2 \ln Q_{it} \tag{5}$$

$$\phi_0^* = \frac{-(\alpha \ln \alpha - \alpha \ln \beta)}{(\alpha + \beta)},$$

$$\mu_0 = \mu\delta_0, \quad \mu_1 = \mu\delta_1, \quad \mu_2 = \mu\delta_2, \quad \mu = \frac{\gamma}{(\alpha+\beta)}$$

Since the level of employment may be diverted from its stationary state by costs concerning employment adjustment in the wake of adjustment to equilibrium, lags may be added to model to take heterogeneity effects into consideration in case the employment is measured by aggregating across workers with different adjustment costs (Greenaway et al., 1999: 492).

Data and implementation

Data series on employment, wages, output, imports and exports of manufacturing industries in Turkey that are used in this study were obtained from The United Nations Industrial Development Organization (UNIDO) database.

The dataset corresponding to a four-digit International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 3 level of aggregation is constituted of a panel of 95 manufacturing industries for the period of 1992-2001. In order to provide a balanced panel, some industries lacking complete data over the period analyzed were omitted.

In accordance with cross-sectional and time series dimensions of panel data used in this study, the base equation for the panel of industries estimated in this study can be written as follows:

$$\ln L_{i,t} = \mu_0 + \beta_t D_t + \theta_1 \ln L_{i,t-j} + \theta_2 \ln Q_{i,t-j} + \theta_3 \ln W_{i,t-j} + u_{i,t}; \tag{6}$$

where $u_{i,t} = \mu_i + v_{i,t}$, μ is the industry specific effect, u is addition of the industry specific effect (μ) and remainder is disturbance (v), D is time dummies, *i* is the industry, *j* is the number of lag and *t* is the time. In the base equation, derived labour demand is a function of real output and real average wage. This model can be extended by adding import penetration (*M*) and export penetration (*X*) into the equation (6), so that impact of trade variables on employment can be analyzed. The extended equation can be written as follows:

$$\ln L_{i,t} = \mu_0 + \beta_t D_t + \theta_1 \ln L_{i,t-j} + \theta_2 \ln Q_{i,t-j} + \theta_3 \ln W_{i,t-j} + \theta_{4j} \ln X_{i,t-j} + \theta_{5j} \ln M_{i,t-j} + u_{i,t} \tag{7}$$

The dynamics of employment adjustment in the labour market such as bargaining considerations can be captured by introducing a lagged employment variable into the employment function. After a change in independent variables, the evolution of employment can be determined by adding lags of other independent variables such a distributed lag structure (Greenaway et al., 1999). In panel data technique, OLS estimator is biased and inconsistent due to industry and time specific effects. The Least Square Dummy Variable approach (fixed effect estimator) or Generalized Least Square approach (random effect estimator) may wipe out the industry and time specific effect. But the fixed and random effect estimators are also biased and inconsistent due to endogenity problem (Baltagi, 2005). Since total employment is a function of an industry specific effect, lagged values of total employment is also function of an industry specific effect. So the independent variable is correlated with the error term. For this reason, equation (7) is adjusted so as to transform out the industry-specific effects as follows:

$$\Delta \ln L_{i,t} = \mu_0 + \beta_t D_t + \theta_{1j} \Delta \ln L_{i,t-j} + \theta_{2j} \Delta \ln Q_{i,t-j} + \theta_{3j} \Delta \ln W_{i,t-j} + \theta_{4j} \Delta \ln X_{i,t-j} + \theta_{5j} \Delta \ln M_{i,t-j} + \Delta u_{i,t} \tag{8}$$

In order to overcome endogenity problem, some methods are offered in the literature such as Corrected LSDV (Least Square Dummy Variable) approach by Kiviet (1995), instrumental variable approach by Anderson and Hsiao (1981), GMM estimator with difference by Arellano and Bond (1991), GMM with system by Arellano and Bover (1995) and Blundell and Bond (1998) (Mehrhoff, 2009). In this study, the two-step GMM technique of Blundell and Bond (1998) using t-2 and possible earlier lags as instruments for

Table 2. Employment Equations for Manufacturing Industry (1992-2001).

Model number	1		2		3	
Dependent variable	$\Delta \ln L$		$\Delta \ln L$		$\Delta \ln L$	
Variable	Coefficient	Std. error[1]	Coefficient	Std. error[1]	Coefficient	Std. error[1]
$\Delta \ln L_{t-1}$	0.604[a]	0.08	0.674[a]	0.08	0.632[a]	0.08
$\Delta \ln L_{t-2}$	0.047	0.07	0.093	0.07	0.043	0.08
$\Delta \ln Q$	0.467[a]	0.06	0.493[a]	0.05	0.470[a]	0.06
$\Delta \ln Q_{t-1}$	-0.173[a]	0.06	-0.234[a]	0.06	-0.163[a]	0.06
$\Delta \ln Q_{t-2}$	-0.098[c]	0.05	-0.115[b]	0.06	-0.171[a]	0.06
$\Delta \ln W$	-0.202[b]	0.10	-0.179[b]	0.08	-0.173[b]	0.08
$\Delta \ln W_{t-1}$	0.106	0.07	0.119	0.08	0.094	0.07
$\Delta \ln W_{t-2}$	-0.009	0.06	0.031	0.06	-0.004	0.05
$\Delta \ln rX$			0.012	0.02		
$\Delta \ln rX_{t-1}$			0.054[a]	0.02		
$\Delta \ln X_{t-2}$			-0.028	0.02		
$\Delta \ln rM$			-0.001	0.01		
$\Delta \ln rM_{t-1}$			0.017	0.02		
$\Delta \ln rM_{t-2}$			-0.016	0.02		
$\Delta \ln X$					0.009	0.02
$\Delta \ln X_{t-1}$					0.035[c]	0.02
$\Delta \ln X_{t-2}$					-0.042	0.03
$\Delta \ln M$					0.017	0.02
$\Delta \ln M_{t-1}$					0.004	0.02
$\Delta \ln M_{t-2}$					-0.052[c]	0.03
F test[2]	F(15,94) = 53.04 (0.000)		F(21,94) = 600.86 (0.000)		F(21,94)=71.89 (0.000)	
Second Order Serial Correlation	-0.74(0.458)		-1.21(0.225)		-0.79(0.432)	
Hansen J test[3]	33.23(0.156)		32.14(0.188)		32.99(0.163)	

[1]Robust corrected small sample standard errors (Windmeijer, 2005). [2]Wald statistics are not reported due to small sample standard error. Alternatively *F* test is reported. [3]Sargan test are not reported due to robust standard error. Alternatively Hansen test is reported. a, b and c indicate significant levels at 1, 5 and 10%, respectively. In parenthesis are probability ratios. Time dummies are not reported

the endogenous variables was adopted.

RESULTS

Results of the dynamic panel data analysis of base labour demand specification equation and the extended equation including foreign trade variables as explanatory variables are given in Table 2. Both import penetration (*M*) and export penetration (*X*) ratios and the level of real imports (*rM*) and exports (*rX*) were used in extended equation estimation and are presented in Table 2. There must be no second order serial correlation when t-2 instruments are used, thus test statistics are calculated and presented in the table. Hansen (1982) test was used to check the validity of the instrument set which is based on the correlation between the instruments and the residuals from the model (Roodman, 2006). Instead of the Sargan (1958) test, the Hansen J statistic is calculated and reported with the same null hypothesis due to robust estimation. Standard error estimates will be "robust" to heteroskedasticity or serial correlation in the errors, thus Windmeijer (2005) corrected robust standard error estimates are used and reported (Roodman, 2006). Windmeijer (2005) corrected robust standard error estimates are consistent with panel-specific autocorrelation and heteroskedasticity. We also applied small-sample adjustment to standard errors and report the F test instead of the Wald chi-squared test. In the dynamic panel data, the number of instruments grows quadratically with T and GMM becomes inconsistent as the number of instruments becomes too large (Mehrhoff, 2009). In case of problem of too many instruments in the GMM estimation, we collapse the instrument set.

Results of three models are given in Table 2. The results of base specification reported in the first column of Table 2 are in accordance with expectations in terms of output and wages. Growth in output increases the level of

derived labour demand in both the short-run and in the long-run and is statistically significant at the 1% level. Growth in wage rates has a negative impact on the level of derived labour demand in the short-run, which is statistically significant at the 5% level. The coefficient of the lagged dependent variable is found positive and statistically significant at the 1% level which implies that growth in employment in the current year has a significant effect on employment growth in the next year. The baseline specification performs well in the conventional statistical sense, having a high degree of explanatory power, with no reported second order correlation, suggesting that a valid instrument set consisting of lags of output and wages has been employed and the residuals are not correlated.

The results of the augmented model, which is expanded by including real exports and real import into base specification, are given in the second column of Table 2. In this model wage and output coefficients have similar signs and significance to those of the base specification equation indicating robustness of the specification to such change. The coefficient of first lagged real exports is positive as expected and significant at 1% level indicating that growth in exports in the current year has a significant effect on employment growth in the next year. The coefficient of real imports is negative, but insignificant such as coefficients of lagged imports.

Results of the second augmented model obtained by introducing export penetration and import penetration into base specification are given in the third column of Table 2. The signs and significance level of lagged employment, output and wage variables are same as previous models. The coefficient of first lagged export penetration is positive as expected and significant at 10% level. As obtained in the second model, sign of lagged export penetration in the third model indicates that growth in export penetration in the current year has a significant effect on employment growth in the next year. The coefficient of second lagged import penetration is negative and significant at the 10% level.

Conclusion

In this study, the impact of international trade on employment in the manufacturing industry was investigated using a panel data of 95 manufacturing industries. Following Milner and Wright (1998) and Greenaway et al. (1999), the impact of international trade on employment of manufacturing industry in Turkey was analyzed using a dynamic labour demand equation by incorporating international trade variables such as imports and exports in a panel data framework.

The results of this study show that increased output had a positive impact on employment, while wages had negative impact on employment in all models analyzed in this study. When variables of international trade are introduced to the base equation, it was found that coefficients of exports and imports variables are not statistically significant. This indicates that real exports, real imports, export penetration and import penetration do not have any significant impact on employment in the current year. The coefficients of first lagged export penetration and real exports found to be positive as expected and statistically significant, indicating growth in export penetration and real exports in the current year had significant and positive impact on employment growth in the next year. As a developing country, the labour force in manufacturing industry principally consists of unskilled employees in Turkey and the positive impact of increased exports on employment is consistent with all approaches found in international trade literature as described by Freeman and Revenga (2004). As to imports, only second lagged import penetration had a significant and negative impact on current employment.

REFERENCES

Abraham F, Brock E (2003). Sectoral employment effects of trade and productivity in Europe. Appl. Econ., 35(2): 223-238.

Anderson TW, Hsiao C (1981). Estimation of dynamic models with error components. J. Am. Statistical Association. 76: 589-606.

Arellano M, Bond SR (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Rev. Econ. Stud., 58: 277-297.

Arellano M, Bover O (1995). Another look at the instrumental variables estimation of error components models. J. Econom., 68: 29-51.

Bahmani-Oskooee M, Chakrabarti A (2003). Import competition, employment and wages in U.S. manufacturing. J. Policy Model., 25(9): 869-880.

Baldwin RE (1994). The effect of trade and foreign direct investment on employment and relative wages. OECD Econ. Stud., No. 23.

Baltagi BH (2005). Econometric analysis of panel data. West Sussex, John Wiley & Sons.

Başar S, Temurlenk S (2007). Trial for Turkey, a Makromodel. New York: Image Publishing.

Bedir A (2002). Development perspective of the automotive industry in Turkey. Ankara, Turkey, State Planning Organization.

Blundell R, Bond S (1998). Initial conditions and moment restrictions in dynamic panel data models. J. Econom., 87: 11-143.

Brecher RA (1974). Minimum wage rates and the pure theory of international trade. Quart. J. Econ., 88(1): 98-116.

Bussolo M, Mizala A, Romaguera P (2002). Beyond Heckscher-Ohlin: trade and labour market interactions in a case study for Chile. J. Policy Modeling. 24(7-8): 639-666.

Freeman R, Revenga A (2004). How much has LDC trade affected western job markets?. in: Trade and Jobs in Europe, Eds. Mathias Dewatripont, Andre Sapir and Khalid Sekkat, Oxford, Oxford University Press.

Fu X, Balasubramanyam VN (2005). Exports, foreign direct investment and employment: the case of China. World Economy. 28(4): 607-625.

Greenaway D, Hine RC, Wright P (1999). An empirical assessment of the impact of trade on employment in the United Kingdom. Eur. J. Polit. Econ.,15 (3): 485-500.

Grossman GM (1986). Imports as a cause of injury: the case of US steel industry. J. Int. Econom., 20: 201–223.

Grossman GM (1987). The employment and wage effects of import competition. J. Int. Econ. Integration. 2: 1–23.

Hansen L (1982). Large sample properties of generalized method of moments estimators. Econometrica, 50(3): 1029-1054.

Hoekman B, Winters AL (2005). Trade and employment: stylized facts and research findings. Working Papers No. 7, United Nations, Department of Economics and Social Affairs. http://www.un.org/esa/desa/papers/2005/wp7_2005.pdf (Visited at

20th August 2010).
Janiak A (2006). Does Trade liberalization lead to unemployment? theory and some evidence. ECARES, Universite Libre de Bruxelles Working Paper. www.roa.unimaas.nl/seminars/pdf2007/janiak.pdf (Visited at 20th August 2010).
Jansen M, Lee E (2007). Trade and employment: challenges for policy research. Geneva: World Trade Organization. http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---webdev/documents/publication/wcms_081742.pdf (Visited at 20th August 2010).
Kiviet, JF, (1995), 'On Bias, Inconsistency, and Efficiency of Various Estimators in Dynamic Panel Data Models'. J. Econ., 68: 53-78.
Kletzer LG (2000). Trade and job loss in US Manufacturing, 1979-1994. In: The Impact of International Trade on Wages, Ed. Robert C. Feenstra, The University of Chicago Press, 349-396.
Lee E (2005). Trade liberalization and employment. Working Papers 5, United Nations, Department of Economics and Social Affairs. http://www.un.org/esa/desa/papers/2005/wp5_2005.pdf (Visited at 20th August 2010).
Leichenko R, Silva J (2004). International trade, employment and earnings: evidence from US rural counties. Reg. Stud., 38(4): 355-374.
Mehrhoff J (2009) A solution to the problem of too many instruments in dynamic panel data GMM. Deutsche Bundesbank, Discussion Paper, 31/2009.
Melitz MJ (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica, 71(6): 1695-1725.
Milner C, Wright P (1998). Modelling labour market adjustment to trade liberalization in an industrialising economy. Econ. J., 108(447): 509-528.
Morawczyński R, Wach K (2003). Does Polish foreign trade impact employment? An empirical investigation. In: Entrepreneurship, Employment and Beyond 2003, Ed. J. Targalski, 55-66, Cracow, Publishing House of Cracow University of Economics.
Nurmi S (2004). Openness to trade and employment dynamics in Finnish manufacturing. European Trade Study Group ETSG2004 Programme, Nottingham, 9-11 September. http://www.etsg.org/ETSG2004/Papers/Nurmi.pdf (Visited at 20th August 2010).
Pissarides CA (2000). Equilibrium unemployment theory. Cambridge, The MIT Press.
Revenga AL (1992). Exporting Jobs? the impact of import competition on employment and wages in U.S. manufacturing. Quart. J. Econ., 107(1): 255-84.
Roodman D (2006). How to do xtabond2: an introduction to "difference" and "system" gmm in stata", Center for Global Development Working Paper Number 103.
Sargan J (1958). The estimation of economic relationships using instrumental variables", Econometrica. 26(3): 393-415.
Tomiura E (2004). Import competition and employment in japan: plant startup, shutdown and product changes. Japanese Econ. Rev., 55(2): 141-152.
TURKSTAT (2009). Statistical Indicators 1923-2008. Ankara: Turkish Statistical Institute. http://www.tuik.gov.tr/yillik/Ist_gostergeler.pdf (Visited at 20th August 2010)
UNIDO (2009). UNIDO Industrial Statistics Database, United Nations Industrial Development Organisation, Vienna.
Windmeijer F (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. J. Econom., 126(1): 25-51.