Eurasian Journal of Social Sciences, 4(1), 2016, 50-58
DOI: 10.15604/ejss.2016.04.01.005

EURASIAN JOURNAL OF SOCIAL SCIENCES

http://www.eurasianpublications.com/

THE EFFECTS OF IMPORT COMPETITION ON EMPLOYMENT AND WAGES IN THE MANUFACTURING INDUSTRY OF TURKEY

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Abstract

This paper investigates the effect of import competition on employment and wages in the 18 sectors of the Turkish manufacturing industry using panel data methodology over the 2003-2011 period. The industry import unit value indexes are used in order to measure import competition for the industries. The estimation results of two stages squares method suggest that changes in import values have a significant effect on employment in the sectors of manufacturing industry. However, this study can not find a significant relationship between import competition and industry wages.

Keywords: Import Competition, Employment, Wages, Labour Market, Panel Data Techniques

1. Introduction

Turkey experienced a major structural change in the 1980s by shifting from an import substituting industrialization strategy to an export-oriented growth model via implementing an orthodox structural adjustment program. Turkey has also gone through a substantial process of liberalization at the national as well as international level in the 2000s and it is seen as a successsful example of integration to the world economy.

Manufacturing industry is very crucial for the production and employment indicators of Turkey as well as for foreign trade. In this paper, wage, employment, exchange rate, and import unit value index data are studied in the 18 sectors of Turkish manufacturing industry during the 2003-2011 period. These sectors account for % 78 of total imports and % 27 of employment in 2011.

This study uses the framework developed in Revenga (1992). Revenga investigates the effect of increased import competition on employment and wages, in the U.S. manufacturing industry over the 1977-1987 period. In the empirical analysis, she uses previously unavailable industry import price data and an instrumental variables estimation strategy. According to the estimation results of this paper, changes in import prices have a significant effect on both employment and wages.

Previous studies tend to find only weak correlations between increased import competition and employment decline, and similarly weak relationships between changes in import competition and manufacturing wages.

Grossman (1987) examines nine manufacturing industries for the 1969- 1979 period and finds a significant effect of import competition on employment in only one of the nine industries, and a significant impact of imports on wages in only two. Grossman (1986) analyzes the steel industry and he concludes that most of the loss in steel industry employment during the 1976-1983 period cannot be attributed to international competition.

Mann (1984) also finds a small impact of import prices on employment, but finds that import share has a larger effect. However, Freeman and Katz (1991) find a significant correlation between volume of imports and employment, and a small but statistically significant relation between imports and wages. Branson and Love (1986) also find substantial effects of the real exchange rate on employment. On the other hand, Revenga (1995) finds that reductions in quota coverage and tariff levels lead to moderate reductions in firm-level employment in the manufacturing industry of Mexico. Changes in quota coverage do not affect wages while reductions in tariff levels cause increases in average wages.

The current study analyzes the effect of import competition, which is measured by import unit value indexes here, on sectoral employment and wages in the Turkish manufacturing industry. For this purpose, 18 sectors of the Turkish manufacturing industry are studied for the period covering 2003 to 2011 and employing panel data techniques. In the first section, data is explained and some descriptive statistics on 18 industries are presented.In the second part, the econometric methodology used in this study is explained and the estimation results are analyzed. The final section presents a summary of the empirical analysis and concluding remarks.

2. Empirical Analysis – Data Description

In this paper, the effect of import competition on employment and wages in the manufacturing industry is measured by import unit value indexes at the sectoral level due to the lack of industry import price data of Turkey. Although these data is not a perfect substitute of the price data, it can still help us to understand the general trends in the Turkish manufacturing industry.

In the model, two measures are used for industry employment: the number of employees in each industry and average person-hours per week. The latter is constructed as the product of the number of employees and the number of hours worked by employees per week in each industry.

The wage variable is the hourly wages and salaries paid for employees in each industry.There is a second wage variable used in the econometric model which is the hourly wages and salaries paid for employees in services. This variable is used as the alternative wage. All wage variables are deflated by the aggregate Consumer Price Indeks (CPI) of Turkey. The other explanatory variables in the employment and wage equations are: the aggregate unemployment rate and the index of energy prices. These variables are used to capture cyclical fluctuations in demand and as measure of other factor prices, respectively.

Following Revenga, two instrumental variables which are used to estimate import unit value indexes for industries are constructed: "…the industry exchange rate variable is defined as a geometric average of the nominal exchange rates of countries accounting for more than 2 percent of industry imports" (Revenga, 1992, p.262). The weights used here are the share of each foreign country's goods in total imports of Turkey for that special industry category in 2010. The second instrumental variable is the indexes of foreign production costs; they are constructed analogously being equal the import share weights times each country's producer price index. These two instrumental variables are deflated by the aggregate Producer Price Index (PPI) of Turkey.

The data for employment, wage, import and production are obtained from the Turkish Statistical Institute (TUIK) Databases for Annual Industry and Service Statistics and Foreign Trade Statistics and from the Turkish Statistical Institute Statistical Indicators - 1923-2011 (Turkish Statistical Institute, 2001, 2012 and 2014). The data for energy price index and producer price index by country are from the OECD Stan Database (OECD, 2014). The effective exchange rates by country are obtained from Bank of International Settlements financial statistics (BIS, 2014) and United Nations Conference on Trade and Development (UNCTAD) Statistics (2014).

Table 1. Descriptive statistics for Turkish manufacuring industry (2003-2011)

MANUFACTURING INDUSTRIES (NACE Rev.2)	EMP. (2003-2011) Ave. Num.	Δ EMP. (2003-2011)	Δ IMP. (2003-2011)	IMP. SHARE (2010)	Δ IMP. SHARE (2003-2011)	Δ IMP. UNIT VALUE ENDEKS (2003-2011)	Δ NOMINAL EXCH. RATE (2003-2011)	Δ REAL EXCH. RATE (2003-2011)	ΔWAGE (2003-2011)
Food and Beverages (10+11)	288 576	0.19	0.23	0.07	0.01	0.29	0.11	-0.18	0.03
Tobacco Products (12)	16 773	-0.53	0.03	0.14	0.05	0.26	0.15	-0.14	-0.01
Textiles (13)	322 942	0.02	0.15	0.20	0.03	0.22	0.14	-0.15	0.04
Wearing Apparel (14)	379 790	0.08	0.70	0.13	0.09	0.24	0.14	-0.15	0.07
Leather (15)	40 734	0.15	0.28	0.33	0.09	0.26	0.14	-0.14	0.10
Wood and Products of Wood and Cork (16)	37 593	0.24	0.53	0.20	0.07	0.24	0.13	-0.16	0.12
Paper and Paper Products (17)	38 709	0.19	0.29	0.38	0.02	0.21	0.13	-0.16	-0.12
Coke and Refined Petroleum Products (19)	6 465	0.07	0.30	0.41	0.00	0.56	0.13	-0.16	-0.04
Chemicals and Pharmaceutical Products (20+21)	83 558	0.10	0.31	0.61	0.14	0.21	0.12	-0.17	-0.03
Rubber and Plastic Products (22)	120 173	0.29	0.30	0.19	-0.01	0.24	0.13	-0.16	0.07
Other Non-Metallic Mineral Products (23)	153 214	0.27	0.37	0.09	0.02	0.23	0.13	-0.16	0.01
Basic Metals (24)	91 862	0.19	0.12	0.26	-0.13	0.49	0.15	-0.14	0.02
Fabricated Metal Products (25)	171 072	0.34	0.32	0.20	-0.02	0.21	0.13	-0.16	0.07
Computer, Electronic and Optical Products (26)	27 355	0.05	0.30	0.78	0.20	0.13	0.12	-0.17	0.06
Electrical Equipment (27)	91 073	0.26	0.69	0.47	0.21	0.02	0.13	-0.15	0.01
Machinery and Equipment n.e.c (28)	128 968	0.25	0.38	0.64	0.03	0.09	0.12	-0.17	0.10
Motor Vehicles (29)	125 379	0.23	0.39	0.45	0.09	0.16	0.12	-0.16	-0.01
Furniture and Other Manufacturing (31+32)	139 513	0.32	0.18	0.23	-0.05	0.38	0.11	-0.18	0.06

Notes: 1) Manufacture of printing and reproduction of recorded media (18) and Manufacture of other transport equipment (30) are excluded from this group as the import unit value index data is not constructed for them. 2) Changes are log changes between 2003 and 2011 (except changes in import shares). 3) Imports are deflated by the industry import unit value indexes.

All variables used in estimations are expressed in constant prices and in logaritms. The deflators used are aggregate producer price index (PPI), aggregate consumer price index (CPI) and import unit value indexes.

Table 1 presents 18 manufacturing industries included in this study and the information on the selected economic variables for these industries. According to the table, employment increases in all industries between 2003 and 2011 except one industry (tobacco). During the same period, import unit value indexes increase in all industries implying the expected relationship between import prices and employment (decreasing import competition and employment increase). Table 1 also shows the import shares of industries which are defined as imports / (domestic output + imports). Although this rate changes from sector to sector, most of the sectors of the Turkish manufacturing industry (13 out of 18) are included in the high import share category. There are only three and two sectors in the medium and low import share groups, respectively (Table 2). According to the changes between 2003 and 2011, there is an increase in import shares in most industries. Since the share of imports in total output can be a good measure of the intensity of import competition, its magnitude is likely to have implications for the relationship between import competition, employment, and wages. Table 3 gives the mean percentage changes in these variables for all industries and by three (high, medium and low) import-share groups.

Both Table 1 and 3 reveal substantial decreases in industry exchange rates for all industries and for all different import-share groups between 2003 and 2011. The depreciation of the exchange rates seems to lead to increases in import value indexes for all industries and for different import-share groups. However, the standard deviation of import value index exceeds the standard deviation of industry exchange rate. Although the increase in employment in all industries and different import-share groups (except medium import-share group) corresponds to the depreciation in industry exchange rates and to the increase in import prices (value), the increase in real wages does not appear to reflect the full magnitude of the exchange rate and import price (value) changes. On the other hand, both employment and real wage have much higher standard deviations than sectoral exchange rate.

Table 2. Import shares by industries (2010)

HIGH IMPORT SHARE	MEDIUM IMPORT SHARE	LOW IMPORT SHARE
Textiles (13)	Tobacco Products (12)	Food and Beverages (10+11)
Leather (15)	Wearing Apparel (14)	Other Non-Metallic Mineral Products (23)
Wood and Products of Wood and Cork (16)	Rubber and Plastic Products (22)	
Paper and Paper Products (17)		
Coke and Refined Petroleum Products (19)		
Chemicals and Pharmaceutical Products (20+21)		
Basic Metals (24)		
Fabricated Metal Products (25)		
Computer, Electronic and Optical Products (26)		
Electrical Equipment (27)		
Machinery and Equipment n.e.c (28)		
Motor Vehicles (29)		
Furniture and Other Manufacturing (31+32)		

Notes: Import shares are defined as imports / (domestic output + imports). High import share industries are defined as those with import shares greater than or equal to 0.20 in 2010. Medium import share industries are those with import shares greater than or equal to 0.10 but less than 0.20. Low import share industries are those with import shares less than 0.10.

Table 3. Descriptive statistics by import share groups (2003-2011)

VARIABLES	ALL INDUSTRIES	HIGH IMPORT SHARE	MEDIUM IMPORT SHARE	LOW IMPORT SHARE
	Mean log changes, 2003-2011 (S.D. log changes)			
Employment	0.0366 (0.1093)	0.0453 (0.0830)	-0.0138 (0.1921)	0.0559 (0.0715)
Real Wage	0.0039 (0.0403)	0.0037 (0.0333)	0.0054 (0.0697)	0.0025 (0.0193)
Import Unit Value Index	0.0308 (0.0470)	0.0304 (0.0489)	0.0310 (0.0386)	0.0331 (0.0486)
Industry Exchange Rate	-0.0198 (0.0362)	-0.0199 (0.0363)	-0.0189 (0.0368)	-0.0212 (0.0368)
Energy Price Index	0.0566 (0.0371)	0.0566 (0.0372)	0.0566 (0.0378)	0.0566 0.0382
Import Share	0.0113 (0.0489)	0.0067 (0.0442)	0.0329 (0.0658)	0.0088 (0.0429)

Notes: Employment is measured in person-hours per week in this table.

3. Econometric Methodology and Estimation Results

The empirical model used here is based on a competitive labour market model in which wages adjust to equate labor demand and labor supply (Revenga, 1992). Labor market clearing yields the following quasi-reduced-form equations for changes in employment (L) and wages (W):

$$dlnL_{it} = \alpha_1 dZ_{it} + \alpha_2 dlnP^m_{it} + \alpha_3 dH_{it} + u_{it} \quad (3)$$

$$dlnW_{it} = \beta_1 dZ_{it} + \beta_2 dlnP^m_{it} + \beta_3 dH_{it} + vit \quad (4)$$

where L_{it} is the demand for labor in industry i and year t, Z_{it} and H_{it} are the vectors of observed factors that shift labor demand and labor supply, respectively in industry i and year t, P^m_{it} is the domestic currency price of the import good and W_{it} is the industry wage. The terms u_{it} and v_{it} represent unmeasured labor demand and labor supply shocks.

In the econometric model, employment and wage equations are estimated using annual panel data for 18 industries classified by NACE Rev.2 for the 2003-2011 period. The estimation results are shown in Tables 4 and 5. The equations are estimated in the first differenced forms. The dependent variable in column (1) is the number of production workers, in column (2) is average weekly person-hours and the dependent variable in column (3) is the industry wage. The determinants of industry wages and employment are the import unit value index at industry level (instead of import prices), the aggregate unemployment rate, the alternative real wage (the real wage in services), and the energy price index.

Table 4 presents the Ordinary Least Squares (OLS) estimates. According to the estimation results, employment is negatively related to the import value indeks and unemployment rate and positively related to energy prices. However, OLS estimates for wage equation do not give any statistically significant result for any variable, except energy prices, in the equation.

Table 5 presents similar specifications which control for the endogeneity of import prices through an instrumental variables approach. Instruments for the unit value index of imports include the industry-specific exchange rate and industry-specific foreign production costs. Both

variables are constructed similarly by using the share of each foreign country's goods in total imports of the special industry category in 2010 as weights.

The Two Stages Least Squares (2SLS) estimates are quite different from those obtained using OLS. The estimated effect of import value on employment is positive, larger in magnitude and statistically significant. But the estimation results for wage equation do not reveal a significant and meaningful relationship between changes in import value indexes and wages. The point estimate of the elasticity of employment with respect to import value is 0.23 when the number of production workers is used as a measure of employment and it is 0.40 when person-hours are used instead. These estimates imply that a 10 percent reduction in the value of the import reduces employment by 2.3 to 4.0 percent, depending on the employment measure used. But estimation results do not show a statistically significant relationship between changes in industry wages and changes in import value in the Turkish manufacturing industry. According to Revenga, the possible reason behind the biased results from OLS estimations is "a simultaneous relationship between import prices and industry employment and also between import prices and industry wages" (Revenga, 1992, p.276).

The main finding of this study is that import competition which is measured by unit value index here has a significant effect on employment in the Turkish manufacturing industry. Although OLS estimation shows a negative effect, two stages squares method yield positive and significant import value elasticities. These estimated 2SLS import value elasticities for employment range from 0.23 to 0.40. The meaning of this result is a 10 percent increase in the value of the competing import good is associated, on average, with an increase of about 2.3 to 4.0 percent in employment. However, the estimation results of this study do not reveal a statistically significant relationship between import competition and industry wages.

Table 4. The regression results of the ordinary least squares estimates, first differences (2003-2011)

Variable	Workers (1) (Drisc/Kraay Std. Err.)	Hours (2) (Drisc/Kraay Std. Err.)	Wages (3) (Drisc/Kraay Std. Err.)
Constant	0.003456 (0.009603) t: 0.36	0.007614 (0.016830) t: 0.45	0.009295 (0.006098) t: 1.52
Import	-0.148204*** (0.039458) t: -3.76	-0.291730*** (0.075361) t: -3.87	-0.052948 (0.051343) t: -1.03
Unemployment	-0.260016*** (0.07329) t: -3.55	-0.531848*** (0.132334) t: - 4.02	-0.043427 (0.026790) t: -1.62
Alternative Wage	0.043124 (0.041106) t: 1.05	0.097607 (0.074393) t: 1.31	-0.025587 (0.021617) (t: -1.18)
Energy Prices	0.278591*** (0.069011) t: 4.04	0.526944*** (0.131616) t: 4.00	-0.057722** (0.023068) t: - 2.50
R^2	**0.22**	**0.22**	**0.0098**

Notes: ***Significance at the 1% level; **Significance at the 5% level; *Significance at the 10% level. 1) As a result of the various tests used in order to determine the correct estimation method -F, likelihood-ratio (LR), Lagrangian Multiplier (LM), Score and Hausmann tests-, fixed individual effects method is found to be appropriate. 2) The problems of heteroscedasticity and cross sectional correlation which have been detected by the relevant tests (Modified Wald test for heteroscedasticity and Breusch-Pagan Lagrange Multiplier test with the tests of Pesaran, Friedman and Frees for cross sectional correlation) in the model are corrected by Driscoll and Kraay Estimator (see Baltagi, 2005; Breitung, 2001; Greene, 2003; Hadri, 2000; Hill *et al.* 2011; Im *et al.* 2003; Levin *et al.* 2002; Tatoglu, 2012a, 2012b).

Table 5. The regression results of the instrumental variables estimates, first differences, 2003-2011

Variable	Workers (1) (Drisc/Kraay Std. Err.)	Hours (2) (Drisc/Kraay Std. Err.)	Wages (3) (Drisc/Kraay Std. Err.)
Constant	-0.000088 (0.006994) t: -0.01	0.001204 (0.012942) t: 0.09	0.007754 (0.004304) t: 1.80
Import Price	0.226613*** (0.079655) t: 2.84	0.398552*** (0.121480) t: 3.28	0.104016 (0.069084) t: 1.51
Unemployment	-0.191398** (0.078176) t: -2.45	-0.412973*** (0.139537) t: -2.96	-0.011055 (0.037062) t: -0.30
Alternative Wage	0.032995 (0.040393) t: 0.82	0.074849 (0.070561) t: 1.06	-0.027837 (0.026530) t: -1.05
Energy Prices	0.212068** (0.092989) t: 2.28	0.398530** (0.166284) t: 2.40	-0.082717** (0.031325) t: -2.64
R^2	**0.25**	**0.24**	**0.021**

Notes: ***Significance at the 1% level; **Significance at the 5% level; *Significance at the 10% level. 1) As a result of the various tests used in order to determine the correct estimation method -F, likelihood-ratio (LR), Lagrangian Multiplier (LM), Score and Hausmann tests-, fixed individual effects method is found to be appropriate. 2) The problems of heteroscedasticity and cross sectional correlation which have been detected by the relevant tests (Modified Wald test for heteroscedasticity and Breusch-Pagan Lagrange Multiplier test with the tests of Pesaran, Friedman and Frees for cross sectional correlation) in the model are corrected by Driscoll and Kraay Estimator (see Baltagi, 2005; Breitung, 2001; Greene, 2003; Hadri, 2000; Hill *et al.* 2011; Im *et al.* 2003; Levin *et al.* 2002; Tatoglu, 2012a, 2012b).

4. Concluding Comments

This paper investigates the impact of import competition on employment and wages in the Turkish manufacturing industry for the 2003-2011 period. The statistical study on data about employment, wages, import unit value indexes, exchange rates and producer price indexes for importing countries reveals that sectoral exchange rates decreased for all industries between 2003 and 2011. The depreciation of sectoral exchange rates is reflected in import unit value indexes and there is an increase in all industry import value indexes between 2003 and 2011. The effect of increasing import value indexes, which are used instead of import prices in this study, is seen obviously on industrial employment. The decrease in import competition leads to an increase in the employment levels of almost all industries.

The results of empirical study which uses instrumental variables strategy on panel data for 18 industries show that there is a positive and significant reletionship between import competition and industry employment in Turkey. The estimated two stages least squares import value elasticities for employment range from 0.23 to 0.40, which means that a 10 percent increase in the value of the competing import good is associated, on average, with a rise of about 2.3 to 4.0 percent in employment.

However, this study can not find a statistically significant relationship between import competition and industrial wages. In the future, if import price data for Turkey become availabe for researchers, the findings of these studies can be more clear.

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