



Journal of Applied Sciences

ISSN 1812-5654

science
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A Regression Analysis of the Economic Factors Effecting the Import of Forest Industry Products in Turkey

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Abstract: In this study, effective economic factors on the import of forest industry products were investigated. Data used in the time series analysis covered a period of 18 years from 1985 to 2002. Double-log linear function was used to analyze the import model. The imported forest industry products in Turkey were considered to be a function of domestic production value, domestic prices, national income per capita, lagged import value (t-1), exchange-rate (TL/\$) and export values. The parameters were evaluated using a regression analysis. The results indicated that imported forest industry products in Turkey have largely been effected by national income per capita, domestic prices, export values and exchange-rate variables.

Key words: Forest industry products, import, regression analysis, Double-log linear function, Turkey

INTRODUCTION

Forest industry is one of the most important of 64 industries, among the main production sectors in Turkey. Forest as a natural resource supplies products to many sectors with renewable characteristics. Therefore, the demand for forest products is increasing. Forest industry, being a sector of flexible structure is in harmony with different use of inputs-outputs and also being on the top of whole sectors requiring intensive labour. Since the technology in the forest industry requires low-skill labour, improvement of forest industry is crucial in the development of a country.

Forest industry supplies raw material to many sectors in the production of wood origin products. Therefore, the forest industry is considered to be Main Primary Industry within the science of industrial economics.

Forest products are divided into two groups as main and end products and forest industry is studied under primary and secondary industries.

The amount of annual import-export and the values of a country are the most important indicators of economic development and the state of integration with the markets of the world. Available sources used by business enterprises in different industry groups and import-export activities have important influences on economic development.

The business enterprises in the manufactured goods industry are the cornerstones of economic development. The productive activities of these enterprises result in

competition in the domestic and foreign markets and increase the level of consumption of sources. Thus, the sources of a country have to be extensively analyzed and studied to make them contribute to economic development of the country^[1].

The forest industry products of Turkey: The production and the consumption of forest products have recently been increased parallel to the technological progress. In this study, the term Forest Industry Products is used to describe the products of paper and its by-products, furniture, wood and fungi.

The forest industry products within manufacturing industry is an important sector consisting 1.44 of Gross National Products (GNP), 28 of manufacturing industry product value, 1.02 of export value and 0.7% of national employment in Turkey^[2] with its added value to Turkish economy in 2002. On the other hand, forest industry products consist of 22% of manufacturing industry in respect of the number of work places and 9% of total employment. The capacity utilization rate of these companies is only 70-80%^[3]. However, the higher rates of work place and employment are not adequate to attain the desired development values. The problems faced in business enterprise management is the important management problems^[4].

Managements of forest industry products shape its working positions according to the inward conditions with a high ratio and face problems of information management^[5]. However, there are some other problems

Table 1: The values of forest industry products in Turkey (1984-2002)

Year	Production 000 \$	Index	Capacity utilization rate %	Index	Import 000 \$	Index	Export 000 \$	Index
1984	852 009	100	68,65	100	63 455	100	90 182	100
1985	1 023 726	120	68,80	100	64 384	101	163 938	182
1986	1 067 642	125	69,40	101	75 813	119	110 802	123
1987	1 562 811	183	81,95	119	117 249	185	136 752	152
1988	1 480 315	174	79,20	115	182 213	287	111 723	124
1989	1 680 394	197	75,65	110	264 915	417	99 299	110
1990	2 142 210	251	78,75	115	379 000	597	127 000	141
1991	2 047 854	240	76,65	112	471 000	742	125 000	139
1992	2 381 963	280	77,45	113	486 000	766	141 000	156
1993	2 980 315	350	76,75	112	901 000	1420	143 000	159
1994	2 244 224	263	70,75	103	574 000	905	252 000	279
1995	3 547 619	416	76,65	112	951 000	1499	295 000	327
1996	2 709 593	318	76,30	111	1 076 000	1696	319 000	354
1997	2 515 948	295	81,20	118	1 135 000	1789	368 000	408
1998	2 783 821	327	80,20	117	1 236 000	1948	366 000	406
1999	2 675 143	314	76,25	111	1 253 000	1975	389 000	431
2000	2 750 435	323	80,70	118	1 591 000	2507	257 000	285
2001	2 693 720	316	73,45	107	1 048 000	1652	382 000	424
2002	2 614 917	307	82,75	121	1 366 000	2153	457 000	507

related to the management^[6,7] which make them unable to came on the foreign markets and so make contributions to the development of the country.

Production values and import and export values of forest industry products of Turkey are presented in Table 1.

While the production has been increasing continuously through the years, the import ratios remain higher than those of the production. The production was raised three times between 1984 and 2002^[8].

The factors result in higher import ratios need to be studied by an econometric method to determine the structure of the import of Turkey's forest industry products.

MATERIALS AND METHODS

The time series data from 1985 to 2005 (18 years) were used in this study. A transformation into free market economy took place in 1983 in Turkey. Therefore, we decided to take the introduction of free market economy as a starting point on the forest industry products following this transformation.

The State Planning Organization under the Prime Ministry collected the data used in the study from various statistical resources such as the Statistical Yearbook of Turkey published by the State Institute of Statistics (SIS) and the Privatization Commission Reports. In addition, literatures relevant to the field of study have been investigated. The data were analyzed with a Minitab 12.0 statistical package program.

Initially, the parameters of forest industry products have been determined and explained by the method of index numbers. The import model of forest industry products has been analyzed econometrically. The variables of import model used in the study are also explained.

The prices of products and competitive products, amount of domestic production, capacity utilization rates, foreign exchange rate, taste and preference of people, export values and individual incomes are placed among the important variables to determine the import of industrial goods in econometric models used^[9-13].

The remarks of the variables used are presented in Table 2.

Double-log linear function was used to analyze the import model. These type of functions have been widely used for import demand analysis throughout the world^[14-17]. If the double-log linear function is used, partial regression coefficients give the direct elasticity and thus, the results can easily be evaluated.

In statistically testing model, the level of importance was used 1% and reliability 95%.

The closed form of the model could be shown as follow:

$$IMP_t: f(Q_t, P_t, INC_t, Ex_t, EXR_t, IMP_{t-1})$$

and the open form is;

$$\ln(IMP_t) = \alpha_0 + \alpha_1 \ln Q_t + \alpha_2 \ln P_t + \alpha_3 \ln INC_t + \alpha_4 \ln EXR_t + \alpha_5 \ln EXR_t + \alpha_6 \ln IMP_{t-1}$$

These variables are describe as following:

- (IMP_t) Forest Industry Products Import Value (000 \$)
- (Q_t) Forest industry product production value (000 \$)
- (INC_t) National Income Per Capita (\$)
- (P_t) Wholesale Price Index of Domestic Price of Forest Industry Products (%) Deflator is 1994 = 100 according to Wholesale Price Index)
- (Ex_t) Export value of forest industry products (000 \$)
- (EXR_t) Exchange-rate (TL/\$)

Table 2: The remarks of the variables used in the model

Dependent variable		
(IMP _t)	Forest Industry Products Import Value (000 \$)	
Independent Variables		Remarks
(Q _t)	Forest industry product production value (000 \$)	When the domestic supply is not enough current demand could be met by import
(INC _t)	National Income Per Capita (\$)	Consumption level could be increased while the level of national income per capita is increasing. This increasing demand could be met by import.
(P _t)	Wholesale Price Index of Domestic Price of Forest Industry Products (%). (Deflator is 1994=100 according to Wholesale Price Index)	When the domestic price is higher than foreign price, import could be taken place.
(EX _t)	Export value of forest industry products (000 \$)	While the countries are exporting the production with a higher price, they also could import some production to meet the domestic demand.
(EXR _t)	Exchange-rate (TL/\$)*	The value of national currency in respect to foreign currency could influence the demand of import.
(IMP _{t-1})	Lagged Variable. (000 \$) (The import value of the year before)	Lagged import value, income and price changes could influence the import positively along the last period ^[19] .

* TL; Turkish Liras (Unity of Turkish Money)

(IMP_{t-1}) Lagged Variable. (000 \$) (The import value of the year before)

RESULTS AND DISCUSSION

The results of Turkey's forest industry products import by using double-log linear model are given in Table 3.

Multiple determination coefficient of the model (R-square) is 0.996 and this shows that the variables in the model explain 99.6% of the import variables. Adjusted multiple determination coefficient is 0.994 (Table 3).

F-test was used to determine significance of the function. The results of F-test on 1% importance level was F-estimate>F-Table (449.61>9.89). So the model was meaningful at 1% importance level. The results indicated that it was adequate to explain the effects of independent variables on dependent variable.

A t-test was used to examine the importance of every independent variable in the import demand model. The income per capita (INC_t) 1%, domestic price index variable (P_t) 1%, export value variable (EX_t) 5%, Exchange-rate (EXR_t) 3% and lagged import value variable (IMP_{t-1}) 11% import level were different from zero which means statistically significant. Since the production value (Q_t) was 80%, no comment was made on this variable.

Any autocorrelation problem on the model's time series was controlled by Durbin-Watson (DW) test. Time series analysis and the use of lagged variable on the model together require autocorrelation to be controlled^[18]. Durbin-Watson statistical value of the model is 2.55 (DW value:2.55, k = 6, n = 18, critical values; dl: 0.52-du:1.80). This value indicates the unstable area of critical values table at 1% importance level. Therefore, discussion on the correlation and the study of Von-Neumann statistical values were not meaningful.

Von-Neumann test value is 2.782. V critical values are $v = 0.903$ ve $v' = 3.134$ on Von-Neumann value table at 1% importance level consequently. Von - Neumann test value is between the v critical values and there wasn't any autocorrelation ($v < V$ test value $< v'$).

Test and parameter results effecting import demand of Turkey's forest industry products were meaningful at the determined importance levels. The results gives us an opportunity to discuss the model.

The partial regression coefficient of production value of forest industry is 0.069. Since this variable is meaningful 80% after t-test, it wasn't taken into consideration.

When the national income per capita increases consumption also increases during the same time. The partial regression coefficient of national income per capita (INC_t) is 0.764. This variable is statistically meaningful at 0.01 levels. 1% increase in national income per capita causes 0.8% increase in forest industry product import when the other variables remain fixed. This high level of elasticity could be explained such that when the income of a person is increased demand for forest industry products also increases.

When domestic price of a product is higher than that of the foreign country and the demand for product exceeds the supply, it is normal to import that particular product from other countries. The partial regression coefficient of wholesale price index of domestic prices of forest industry products (P_t) is 1.062. This variable is meaningful at 0.01 level. When the domestic price index increases 1%, import increases 1.062%. This shows that, the forest industry products import has elasticity in domestic prices of forest products. Therefore, import has a high level of sensitivity to product prices which is an expected fact. As a result, foreign prices of forest industry products had more advantages

Table 3: The parameters and statistics influencing the import factors

	Const.	Q_t	INC_t	P_t	EX_t	EXR_t	IMP_{t-1}	R^2	Adj- R^2	F	DW
Coef.	4.505	0.069	0.764	1.062	-0.20	-0.791	0.133	99.6	99.4	449.61	2.5
t-ratio	1.76	0.26	3.70	3.06	-2.16	-2.51	1.71				
p (%)	(0.10)	(0.80)	(0.01)	(0.01)	(0.05)	(0.03)	(0.11)				
SD	2.554	0.267	0.206	0.347	0.094	0.315	0.078				

over that of the domestic prices during the studied period. The higher costs originated from business administration problems of forest industry products in Turkey directly affect the domestic prices. Consequently, the goods in demand above the supply is imported because of more favourable prices.

While the countries are importing products to meet the domestic demand, they could also export the same products to benefit from the foreign price advantages. The partial regression coefficient of export value of forest industry products (EX_t) is -0.20. This variable is meaningful at 0.05 level. The negative mark of this variable explains that 1% increase in export value of forest industry products causes 0.2% decrease on import. In other words, forest industry products export has a very low elasticity to import. This low level of export could be related to the price and quality of the product. Proper production to meet the needs of foreign market and a competitive pricing system with the foreign prices could positively affect the forest industry products export.

External value of a currency could directly affect imports. Countries could fulfill more imports in the time of currency appreciation and more exports in time of currency depreciation. The partial regression coefficient of exchange-rate (EXR_t) is -0.791. This variable is meaningful at 0.03 level. The negative mark of this variable explains that 1% increase in exchange rate (TL/\$) or when the currency depreciation is 1%, the import of forest industry products will decrease 0.8%.

The partial regression coefficient of lagged import value (IMP_{t-1}) is 0.133. This variable is meaningful at 0.11 level. 1% increase in import value of previous year increases 0.13% of the current year. The elasticity of the variable is low and the import value of the previous year has only a little effect on the current year.

CONCLUSIONS

Natural effects and people have continually destroyed forests, which provide raw material for manufacturing some substantial elements of daily life such as paper, wood products like furniture. It is obvious that if continues effort for reforestation is made, forests will make contribution to the economy of the country which would otherwise very serious environmental problems arise.

Forest industry holds a top place among the manufacture industries. However, the need for raw material to be used in forest industry is largely provided by import. The import value of forest industry products is approximately 1-1.4 billion US \$. It seems that the country will continue to pay even larger amounts unless necessary measures have been taken and this industry given due importance.

In this study, the forest industry products were studied econometrically to determine the efficient factors of forest products import between 1985-2002 years.

The analyses revealed that any increase in the income per capita and in the prices of domestic forest products results in increase in the forest industry products import. On the other hand, export of the forest industry products and national currency devaluation by US dollar causes decrease in forest industry products import.

Turkish governments have to take necessary measures to supply the forest products through domestic forest resources. First of all, modern management methods have to be employed at the forest industry production. In addition to this, further studies need to be conducted to study on cost efficiency. The forest resources of the country have to be actively used and be renewed continuously. Thus, the contribution of the forest industry products to the economy of the country could be increased and maintained. In the course of time, forestry resources will be good enough to meet domestic demand and to get away from the pressure of import.

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