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# Analysis of forest product trade relationships between Turkey and European Union member states

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The countries have needed to strengthen their trade relationships in the face of increasing competition conditions with globalization and a lot of unions emerged all over the world. The European Union, remaining in the foreground as an economical, commercial and political factor in these unions, possesses considerable influence, which a lot of countries want to be involved in. Turkey, being in the European integration process, looks for a place in European Union (EU) with its own resources and production power. Production and foreign trade data of the forest products industry, being among Turkey's important sectors, were compared with 25 different EU countries by using hierarchical cluster analysis, and Turkey's trade relationship was determined. The production amounts, import and export amounts and the values, between 2002 and 2006, belonging to the EU member countries and Turkey were used. It has been found that all countries could be divided into nine different groups according to countries' forest products industry structures. Competition advantage is experienced in the board sector but not in the paper and lumber sectors. The forest products industry sectors of Turkey have the capacity to compete with EU countries.

**Key words:** Hierarchical cluster analysis, foreign trade, trade relationships, forest products industry.

## INTRODUCTION

The world has become like a small village, as a result of the recent globalization period, and is in a rapidly changing process that is called the competitive age. In this context, competitiveness has taken on a new and multi-dimensional meaning. Factors that resist changing economic conditions and direct the world and local economies constitute underlying subjects of economic policy makers. For this reason, a lot of different economic confederations and communities have been formed; each entity wants to remain in the foreground in its economic directions and resource sharing all over the world. Among these corporations, the European Union (EU) has made

progress against the other international organizations in many respects and has started to exert its strength in the political arena on the side of economic subjects (Salmon, 2006).

The European Union is the world's second largest economy, being only slightly smaller than the US in purchasing power parity terms, and slightly larger in terms of official exchange rates. The EU is the world's largest merchandise exporter, accounting for nearly one-fifth of world trade, as well as its largest services exporter, accounting for over a quarter of world trade. It is the world's largest importer of commercial services and second only to the US as an importer of goods (Young and Peterson, 2006). The biggest enlargement in EU history, also known as the fifth enlargement, was made in 2004, in terms of countries and population. As a result of that, the total population within the EU reached to 445 million, with the participation of 75 million additional people. In this way, a labor force of 28 million partook in the EU market (URL 1, 2006). Turkey, wanting to be

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**Abbreviations:** EU, European union; SME, small and medium size enterprises.

strong economically and politically in its region, has been focusing on long-term activities within the EU. Turkey applied to the European Union in 1959, a year after the establishment of European Economic Community, to be one of the associate members of the community, following Greece. It has been 42 years since the signing of the Ankara Agreement (Partnership Agreement), which is the fundamental text of European Union and Turkey association. It is certain that the association between both parties has not always been free from serious disagreements and problems (Aykaç and Parlak, 2002).

Turkey's resource base and production capacity would be considered as basic support for eligibility and competitive advantage in the economic and commercial area. The subject of comparing and explaining countries' economic strengths and relative competitiveness both on the macroeconomic and sector levels has long received academic attention in the economics literature. The literature analyzing trade competitiveness across countries aims at finding links between the relative competitiveness, price development, structural changes, and growth of exports markets. In comparison, the concept of (revealed) comparative advantage is used in analyzing the relative strengths of nations in different sectors of economic activity. If the export of a certain commodity or a group of commodities from a country is larger than the comparable imports, then the country exhibits a comparative advantage over other countries in terms of this sector (Ulusuviuri and Terro, 2002). Superiority and competitiveness in foreign trade is the ability to be in the most advantageous position in a continuously changing market environment. The competitiveness is based on consumer-orientation, quality, technical advantage, diversity of service and product, and the availability of a qualified labor force. Among these factors, the competition which has increased due to the growth in importance of a qualified labor forces, rapid technological change and globalization raise the importance of the ability to use flexible skills and information through continuous education and methodological and life-time learning (URL 2, 2008).

The foreign trading advantage and competitiveness of the manufacturing industry forms the basis of the sustainable development of the EU. The manufacturing industry share of EU production structure decreased from 30% in the 1970s to 18% in 2001. However, the service sector shares increased from 52 to 71% in the same period. The developing Information and Communication Technology (ICT) is increasing the interdependency between the service and manufacturing sectors (URL 3, 2008). The forest products industry sector, being one of the important sectors in manufacturing, possesses an effective production and trade power in Turkey and European Union members. Forest resources are spread all over the globe. Some areas have very large forest resources, e.g. tropical and boreal areas. Demand for

forest products is connected to dense and fast growing populations (Hillring, 2006). The total value of trade in forest products during 2000 - 2002 varied from 131 to 145 billion USD, and half of this value was accounted for by the exports from the European countries. North and Central America is the second largest exporting region, representing around 30% the total value declining over time. Asia is also a significant exporter, with around 13% of the value, while the regions of Africa, Oceania and South America are minor exporters. The same picture also holds for imports. Countries in Europe represent approximately 45% of the value of imports, followed by Asian countries (28%) and North and Central America (22%) (Hillring, 2006). Forest products firms represent nearly 22.3% of the total manufacturing industry, and employee portion is nearly 11.5% of all the employees in Turkey. It includes 59.690 firms (SIS, 2005); of that total, 98.5% are classified as micro and small scale firms. Forest product firms are scattered all over the region, and therefore, these firms have an important role in employment level and social welfare in Turkey (Akyüz, 2006).

Small and medium size enterprises (SME) possess an important share in production and commercial area in manufacturing industry and also forest product industry in Turkey, as being in EU. In addition, small and medium size enterprises possess an important power in EU and Turkey economical structure, production, and trade. For this reason, SME's have a crucial role to play in bringing about a dynamic and competitive economy. They have a significant role in innovation and are a major source of new competition and new employment opportunities (Doi and Cowling, 1998). But defining the small firm is perceived as difficult, with no consensus in the literature as to what constitutes a small firm (Carton and Carson, 2003). When the 2002 data of European countries is analyzed, it can be seen that SME constitutes 99% of the number of enterprises. The share of SME and the micro enterprises on the existing added value is about 59.7% (URL 4, 2007). Based on analysis of the industrial structuring of Turkey, it can be seen that SME has had an important influence on business and employment fields, although their description criteria have been different. SME constituted 99.4% of the manufacturing industry, 55.3% of the employment and 30.5% of the added value in 2001 (SIS, 2002). These values constituted 99.6% of the total manufacturing industry enterprises, 57.3% of the employment, and 31.7% of the added value in 1985 (Akyüz, 2000). Turkey should benefit from its own resources by realizing their value in the period during which it turned its face to Europe. Therefore, the economical potential and industrial structure of the country should be analyzed thoroughly. Knowing its own strength and taking the necessary steps to this effect in order to take the fullest advantage of the strength are of vital importance for the countries in attaining the

**Table 1.** Description of variables and respective codes.

Code	Description	Code	Description
Particle Board	Production (m <sup>3</sup> )	Mechanical Wood Pulp	Production (m <sup>3</sup> )
Particle Board	Import (m <sup>3</sup> )	Mechanical Wood Pulp	Import (m <sup>3</sup> )
Particle Board	Export (m <sup>3</sup> )	Mechanical Wood Pulp	Export (m <sup>3</sup> )
Particle Board	Import (1000 \$)	Mechanical Wood Pulp	Import (1000 \$)
Particle Board	Import (1000 \$)	Mechanical Wood Pulp	Import (1000 \$)
Medium Density Fiberbd.	Production (m <sup>3</sup> )	Chemical Wood Pulp	Production (m <sup>3</sup> )
Medium Density Fiberbd.	Import (m <sup>3</sup> )	Chemical Wood Pulp	Import (m <sup>3</sup> )
Medium Density Fiberbd.	Export (m <sup>3</sup> )	Chemical Wood Pulp	Export (m <sup>3</sup> )
Medium Density Fiberbd.	Import (1000 \$)	Chemical Wood Pulp	Import (1000 \$)
Medium Density Fiberbd.	Import (1000 \$)	Chemical Wood Pulp	Import (1000 \$)
Plywood	Production (m <sup>3</sup> )	Recovered Paper	Production (m <sup>3</sup> )
Plywood	Import (m <sup>3</sup> )	Recovered Paper	Import (m <sup>3</sup> )
Plywood	Export (m <sup>3</sup> )	Recovered Paper	Export (m <sup>3</sup> )
Plywood	Import (1000 \$)	Recovered Paper	Import (1000 \$)
Plywood	Import (1000 \$)	Recovered Paper	Import (1000 \$)
Sawnwood	Production (m <sup>3</sup> )	Newsprint Paper	Production (m <sup>3</sup> )
Sawnwood	Import (m <sup>3</sup> )	Newsprint Paper	Import (m <sup>3</sup> )
Sawnwood	Export (m <sup>3</sup> )	Newsprint Paper	Export (m <sup>3</sup> )
Sawnwood	Import (1000 \$)	Newsprint Paper	Import (1000 \$)
Sawnwood	Import (1000 \$)	Newsprint Paper	Import (1000 \$)
Veneer Sheets	Production (m <sup>3</sup> )	Printing and Writing Paper	Production (m <sup>3</sup> )
Veneer Sheets	Import (m <sup>3</sup> )	Printing and Writing Paper	Import (m <sup>3</sup> )
Veneer Sheets	Export (m <sup>3</sup> )	Printing and Writing Paper	Export (m <sup>3</sup> )
Veneer Sheets	Import (1000 \$)	Printing and Writing Paper	Import (1000 \$)
Veneer Sheets	Import (1000 \$)	Printing and Writing Paper	Import (1000 \$)
Insulating Board	Production (m <sup>3</sup> )	Other Paper and Paperbd.	Production (m <sup>3</sup> )
Insulating Board	Import (m <sup>3</sup> )	Other Paper and Paperbd.	Import (m <sup>3</sup> )
Insulating Board	Export (m <sup>3</sup> )	Other Paper and Paperbd.	Export (m <sup>3</sup> )
Insulating Board	Import (1000 \$)	Other Paper and Paperbd.	Import (1000 \$)
Insulating Board	Import (1000 \$)	Other Paper and Paperbd.	Import (1000 \$)

development level. Within the existing potential, the necessary importance and support should be given to small and medium enterprises forming the most effective part of the economic life, and to the forest products industry having a significant position among these enterprises. The purpose of this paper is to analyze the overall position of the forest products industry of Turkey and the EU countries and then to put forth our position among the member countries with the aid of a hierarchical cluster analysis method.

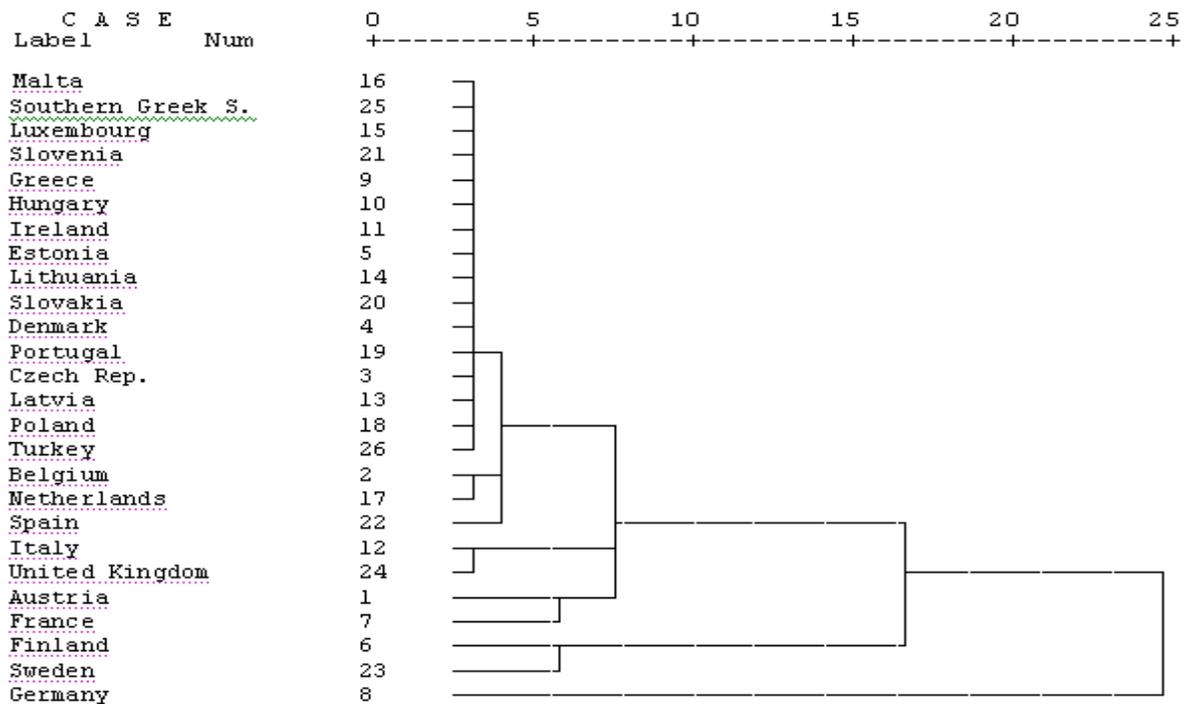
## EXPERIMENTAL

In this study, the forest products industry in Turkey and the EU countries have been examined and compared. In this respect, 12 different product groups relating to the forest products industry sector and 60 variables of them were assessed. Their code, description and type can be found in Table 1 (Yıldırım, 2006).

The production, import, and export amounts and the values for

the period between 2002 and 2006 were used in the analysis. Average data over five years were used. The data regarding the forest products industry sector in Turkey and the EU countries was cited from the website of FAOSTAT (Food and Agriculture Organization of the United Nations) (URL 5, 2008). To decide on the countries' forest product industry structures and to determine their competitive spirit, multivariate analyses were used, as many variables are effective on this subject. Similar studies, but different variables and goals, have been conducted in the US, the UK, and Portugal by Ozimek (1993), Openshaw (1995) and Soares et al. (2003). For Turkey, one can mention the pioneering work of SPO (1998), Cavrar (2002), and more recently of Akyüz et al. (2004). A hierarchical cluster analysis approach was used to determine the similarities in terms of the structure of forest products sector between Turkey and the other countries. A discriminant analysis approach was used to test the homogenization status of the groups and determine the group Turkey falls into.

Multivariate statistical techniques are the right tools for viewing and analyzing a matrix of complex data (Torres et al., 2006). Multidimensional statistical methods need to be used to introduce the competitiveness of Turkey in terms of the sectors in forest products industry and of the 25 EU member countries. Therefore,



**Figure 1.** Dendrogram as a result of hierarchical clustering analysis.

the statistical software program package SPSS 11 for Windows has been used for grouping and testing the validity of the groups. Within this program the hierarchical cluster analysis and discrimination analysis methods were used (SPSS, 2003).

The cluster analysis is a statistical method, and its main aim is to make the scattered data workable by summing them up according to the similarities and by classifying them. This method is completely based on numerical analysis, and the categories are not known in advance. There are numerous reasons for which the cluster analysis has been found to be valuable. Firstly, finding the accurate groups may be an aim. Secondly, cluster analysis may be useful for decreasing the amount of data that must be viewed to understand the results of a study. Methods of hierarchical clustering are the statistical methods aiming to gather the units together through different phases determine consecutive clusters and then designate the distance (or similarity) level of the units to be included in these clusters (Özdamar, 2002). In the aggregative preference, firstly, it is recognized that each individual is a separate group. Then the individuals that are closer to each other are connected, and the transaction is continued until the number of groups equals one (Manly, 1990).

Discrimination analysis is a multivariate statistical analysis displaying how the classification variables, which are defined in the beginning, manage grouping of the examined individuals. The method aims at setting the most effective variable(s) for making distinction between the groups, and it aims to reveal the issues displaying in which group a new individual may be placed, based on those variables (Gümüş, 1996).

## RESULTS AND DISCUSSION

There are many factors that affect a country's success and competitive advantages in the forest products industry.

Because of this fact, multivariable statistical methods must be used to make a valid comparison of countries' ability to compete with each other. It is important to find a suitable variable that fits the objective when using the multivariable statistical methods. For this reason to elucidate the countries' forest products industry structures and competitive powers, based on production, export and import of products are used. The hierarchical cluster analysis, a statistical method, was used in order to gather 26 countries on different stages and determine clusters consecutively and understand the similarity level of countries to be included in these clusters (distance or closeness).

As a result of the hierarchical clustering analysis that was conducted, the dendrogram concerning the countries' classification is shown in Figure 1. When the dendrogram is analyzed, it can be seen that 26 countries can be divided into 9, 7, 5, 3 and 2 groups, depending on 60 variables. The transaction that was used here is that the countries with similar variables take place in a homogenous group. The discrimination analysis was used in order to understand which of the group numbers that had been determined as a result of the hierarchical clustering analysis was significant and what the degree of their success was.

As a result of the hierarchical clustering analysis, groups of 9, 7, 5, 3 and 2 were established. Table 2 shows the result of the grouping of 9 and Table 3 displays that all of them are significant ( $p < 0.05$ ) after they are tested with

**Table 2.** Results of grouping of 9 in the discrimination analysis.

Function	Eigenvalue	% of variance	Cumulative %	Canonical correlation
1	8506.575 <sup>a</sup>	83.4	83.4	1.000
2	1145.477 <sup>a</sup>	11.2	94.7	1.000
3	330.169 <sup>a</sup>	3.2	97.9	0.998
4	116.784 <sup>a</sup>	1.1	99.0	0.996
5	42.128 <sup>a</sup>	0.4	99.5	0.988
6	24.009 <sup>a</sup>	0.2	99.7	0.980
7	21.471 <sup>a</sup>	0.2	99.9	0.977
8	10.177 <sup>a</sup>	0.1	100.0	0.954

a. First 8 canonical discriminant functions were used in the analysis.

**Table 3.** Group test as a result of the discrimination analysis.

Test of function(s)	Wilks' lambda	Chi-square	df	Sig.
1 through 8	0.000	489.677	128	0.000
2 through 8	0.000	376.568	105	0.000
3 through 8	0.000	288.512	84	0.000
4 through 8	0.000	215.979	65	0.000
5 through 8	0.000	156.369	48	0.000
6 through 8	0.000	109.317	33	0.000
7 through 8	0.004	69.076	20	0.000
8	0.089	30.173	9	0.000

the discrimination analysis. It would be the most convenient way for us to consider the clustering based on the largest number of groups. The greatest division is the grouping of 9, and Table 4 shows the groups of countries in detail. Germany, Sweden, Finland, France, Austria and Spain were each classified as belonging to their own distinctive group as a result of the hierarchical clustering analysis, as shown in Table 4. These countries display a heterogeneous situation when compared to other countries and each other in terms of 60 variables examined. United Kingdom and Italy showed similarities compared to variables which were examined. Likewise, the Netherlands and Belgium comprised a dual homogenous group. On the other hand, 16 countries including Turkey displayed a similar structure and were placed in the same group. Within this group, Poland, Latvia and the Czech Republic were the most similar to Turkey in terms of industrial characteristics of forest products.

As can be seen from this analysis, Germany, Sweden, Finland and France are much superior to the other countries in terms of the forest product industry, in both manufacturing and foreign trade volume. These countries are leaders not only in the EU, but also in the entire world. Therefore, it seems very hard to compete with these countries in this sector. Turkey has a respectable situation in the field of the forest products industry, achieving a relative position in the manufacturing industry

of approximately 25% in terms of enterprise. Turkey has a stronger structure than Denmark, Portugal, Ireland, Greece and Luxembourg, which have previously become EU members and the other latest 10 member countries. It can be concluded from the discrimination analysis results that the discrimination was achieved with a success of 100%. As a result of the same analysis, it can be said that the amount of isolation board production, amount of isolation board exports, and the isolation board export value variables' F values are not different from each other on the basis of equality testing with a significance level of 5% and that they are not an effective factor in the grouping. The remaining 57 variables are effective in the grouping.

It is possible to explain the groups that are formed according to the result of hierarchical cluster analysis as follows:

- Germany is included in the first group in terms of forest products industry because it ranks the first in amount of production and in the scale of imports and exports.
- Sweden and Finland rank first in the amount of production and export volume, which has an impact on their inclusion in the second or third group in this field. The import capacities of Sweden and Finland are low, whereas their foreign trade is in a very good situation.
- The greatest impact on France's place as the fourth is

**Table 4.** Groups established according to the result of hierarchical clustering analysis and the group-member countries.

Groups	1	2	3	4	5
Group members	Germany	Sweden	Finland	France	Austria
Groups	6	7	8	9	
Group members	United Kingdom Italy	Spain	Nether-lands Belgium	Turkey Poland Latvia Czech Republic Denmark Portugal Slovakia Lithuania	Estonia Ireland Hungary Greece Slovenia Luxembourg Southern Greek S. Malta

that it ranks the first in terms of manufacturing and the import volume and that it can be considered on the top level in terms of the export volume as well.

- Austria was separated from France to rank the fifth, which can derive from its slightly lower level of import volume.

- United Kingdom and Italy are in the sixth group because their amount of production and import volume are on a fairly good level and their import volume is higher than that of other countries.

- Spain establishes a different group than the Netherlands and Belgium, mainly because it occupies a better level than the others in terms of the amount of production.

- Germany, Sweden, Finland and France have a more significant difference than the other EU countries in terms of production and foreign trade volume, depending on 60 variables that have been discussed in the field of forest products. It can be said that this difference derives from the higher amounts of forest products for France and Sweden, France's economic power, and Germany's combining of these two situations. These countries are leaders not only in the EU, but also in the entire world in the forest products industry.

- Turkey is similar to Poland, Latvia and the Czech Republic, which are among 16 countries in the same group that it occupies. Turkey has the potential to leave the group of 16 countries, thanks to various incentives by attaching importance to technological investments in the field of forest products industry, as well as through research and development allowing it to compete with the countries in the other groups.

## Conclusions

We can suggest or list the task that would need to be completed by Turkey to move forward in the forest products industry field as follows:

- Holding a stable progress by decreasing the inflation rate.

- Reduction of high tax rate.

- Reduction of power requirements, and thereby reducing manufacturing costs, thus increasing competitiveness.

- Adopting technological innovations and renovating the technology on this field.

- Giving necessary importance to research and development.

- Planning new projects by promoting cooperation between industry and universities.

- Increasing the low productivity and capacity of enterprises.

- Increasing the quality of products.

- Giving necessary importance to marketing.

- Stimulating and subsidizing small and medium size enterprises (SME) that are the mainstay of the forest products industry.

- There are many enterprises, called micro-enterprises, employing 1 - 10 people, in the forest product industry, preventing unregistered employment working in these enterprises.

- Being able to make use of the forests, our natural resources, much more effectively and efficiently. In this context, the log quality should be increased in industrial wood processing, and it should be supported by planning new projects that are oriented towards achieving high added value.

- Being able to meet the foreign trade deficit. To do this, increasing the existing production capacity, the export amount, and increasing the expected industrial wood consumption by lowering of firewood consumption.

- Surveying the geographical proximity of Turkey to Europe, the Commonwealth of Independent States, and Middle East Country markets.

- Increasing the competitive advantage by increasing the trained labor force.

- Constituting various magnets to increase the share of private sector investment in economy, developing enterprises and pursuing a development-oriented policy.

- The products need to be manufactured up to EU standards, at all points, especially in terms of quality,

human health, and environmental issues,  
 - Employing trained people, who are the masters of their field, such as forest industrial engineers having the required level of knowledge and skill.

Most of the suggestions that have been mentioned throughout the text are the same factors that are necessary for not only the forest product industry, but also for the industrial sector as a whole.

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