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COMPETITIVENESS OF THE FOREST PRODUCTS INDUSTRY IN TURKEY: THE REVEALED COMPARATIVE ADVANTAGE INDEX

This study, aimed to determine the competitive position of the forest products industry in Turkey between 2001 and 2017 using the revealed comparative advantage approach. One of the three product sectors of the forest products industry (wood and articles of wood, wood charcoal;sector 21) was examined at the level of product subgroups. This sector was found to be far from the desired position in terms of competition. When the sector was analysed by sub-group, especially the product subgroups 4411, 4413 and 4415 had a competitive position. Moreover, it was found that the trend in Turkey's imports of wood and wooden articles was not high. However, imports under specified product groups were above the general level of imports in Turkey.

Keywords: wood and articles of wood, wood charcoal; comparative advantage; trade balance

Introduction

The existing resources and the imbalance in the structure of existing and ever-increasing needs at individual and social levels make it necessary to search for new resources and make best use of existing ones. The fact that the phenomenon of globalization eliminated borders in the economic sense, especially after the 1980s, strengthened the reliance of countries on each other, and the resulting improved access to resources, caused an increase in the number of production units. This increase has led to problems in resource use, which is limited, while bringing a serious dimension to competition. In this structure, production units, faced with many opportunities and threats, must seek success and continuity in competition and limit their production efforts to specific areas. The effort to attract the largest share in international markets brings about an increase in competition among companies and countries.

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The development of countries is closely related to the success of foreign trade. In evaluations where the export level is one of the success criteria, the strategic successes and production forces of companies are accepted as the starting point in the development of the sector in which they are active and in achieving international success. The changes in foreign trade figures over the years at the sectoral level indicate the fields where focus and resources should be allocated. An increase in the level of exports at the sectoral level cannot be considered as a comparative advantage at international level, and it should also be acknowledged that a decrease is not a failure. Accurately interpreting these increases and decreases, which may occur due to various factors, ensures that past years are evaluated in an integrated way.

Micro-level sectoral power and success of countries are the determinants of macro-level success and power. In order to achieve success at an international level, it is necessary to determine the sectoral competitive advantages. The projections made for the coming years indicate that a certain number of countries in the world, including Turkey, will gain a larger share of world value added and will increase their global competitiveness [Erkan 2012].

The forest products industry, which is part of manufacturing industry and include hundreds of different products and production types, is divided into two sub-groups: intermediate goods and consumer goods. According to the International Standard Industrial Classification of All Economic Activities (ISIC), the forest products sector is grouped in three main fields: wood, wood products and fungi; paper and paper products; furniture. Although there are occasional differences in the classifications made internationally, the accepted classifications are those of the Statistical Classification of Economic Activities in the European Community (NACE) and ISIC.

In order for social and economic changes in society to increase the demand for forest products and affect the sector's a share in the expanding market, it is necessary to track the developing technologies and determine consumer needs accurately. Therefore, it is important to accurately evaluate the competitive advantage in terms of product variety and make analyses that contribute to the country's economy.

In this study, it was sought to determine the comparative advantages of the forest products industry in Turkey on the basis of product subgroups using various competitiveness indices. Within the scope of the study, the period between 2001 and 2017 was examined in two parts. Moreover, the changes that occurred in the product subgroups over the years, and the product groups that should be given weight in production and export by the most appropriate resource distribution based on comparative advantage were determined. The study also detailed how periodic trends change at subgroup level.

Competition, competitiveness and theoretical approaches that explain competitiveness

The concept of competitiveness, on which there is no consensus regarding its exact definition, is a concept that includes phenomena such as continuity in production, increase in value added, sustainable income increase, and production in compliance with standards.

The theory of absolute advantage, which was introduced by Adam Smith [Smith 1776] and accepted as the first theory of international trade, states that the export of goods produced inexpensively and the importation of expensive goods will give countries an advantage. While this theory evaluates the individual production superiority of countries, Ricardo [1817] stated that countries and production units are not internationally independent and operate in competition, and argued that production should be carried out considering corrections to the prices of other countries. According to this theory, which is known as the theory of comparative advantage and is one of the oldest international trade theories, it is not necessary for countries to have an absolute advantage over another to carry out international trade. According to Ricardo, countries should act on the basis of relative price differences in the international arena. In other words, countries do not have to produce goods cheaper than each other.

Countries should specialize and export in the areas in which they have comparative advantage, and import the products which would be costly to produce. In such cases, the exporting and importing countries will all profit [Miral 2006]. On this basis, the actions of all the countries and production units will contribute positively to the welfare and development of the countries and the world [Sharma 2004]. In order to eliminate the shortcomings of the theory of comparative advantage, the factor density theory developed by Heckscer [1919] and Ohlin [1933] bases superiority among countries on the countries' means of production. The excessive use of intensively owned factors will provide an advantage over other countries in production. While these classical approaches try to explain international competitive advantage on a national basis, in the modern approaches pioneered by Michael Porter, competitiveness is explained as industry-based. Porter stated that the available resources will decrease and consequently the comparative advantage may change, and that the new competitiveness factors will be cost, quality, product differentiation, technological differences and market structures [Porter 1998].

In the literature, there are many studies on these indices used to make comparisons between countries and sectoral evaluations. Bojnec [2001] examined the countries that have an important share in world agricultural trade in terms of comparative advantage, and determined that South American countries have such an advantage. The objective of the study by Dieter and Englert [2007] was to analyse the competitiveness of the German forest industry

sector against international timber markets. In order to determine the competitiveness of the Turkish furniture industry in the international arena, Altay and Gürpınar [2008] analysed data collected between 2001 and 2006 with the help of the Balassa and Volltrath indices. They determined the changes in the sector and made various recommendations. De Carvalho et al. [2009] analysed the competitiveness of Brazil in the international wood pulp market with RCA and the Relative Position in the Market (RPM) indices. Aini et al. [2010] examined the comparative advantage of Malaysian timber products in the European market. Erkekoğlu et al. [2014] examined the competitiveness of the furniture sector in Kayseri using the Balassa and Volltrath indices, and explained that this sector has comparative advantage both in Turkey and internationally. Sujova and Hlavackova [2015] evaluated the level and development of competitiveness of the wood processing industry in the Czech Republic in a sub-sectoral structure. In a study by Palus et al. [2015], the trade performance and competitiveness of the Slovak wood processing sectors and their comparison with the Visegrad group countries were analysed. In another study, the competitiveness of wood and semi-finished wood products in Slovakia and selected other Central European countries was compared [Parobek et al. 2016]. Maksymets and Lönnstedt [2016] evaluated changes in the international competitiveness of the forest products industries in three countries; Sweden, the US, and Ukraine. Maxir and Masullo [2017] analysed Brazil's international trade in forest products between 2000 and 2014, emphasizing its role using the RCA and Revealed Comparative Disadvantage (RCD) indices. In a study by Milicevic et al. [2017], the competitiveness of the wood processing industry in the Republic of Serbia between 1995 and 2015 was determined using six partial indicators of competitiveness. De Souza et al. [2018] determined the competitiveness of exports of sawn wood and tropical plywood and compared the performance of both products.

Materials and methods

Material

In the present study, the paper and paper products and furniture sectors were excluded and all of the subgroups of the "wood and articles of wood, wood charcoal" sector were analysed with regard to the determined indices. The reason for focusing on this sector is that many businesses produce such goods in Turkey and they are used as inputs in many other sectors. The analysis covered the period between 2001 and 2017, which was divided into two sub-periods: 2001-2009 and 2010-2017. Therefore, it was attempted to determine the differences in terms of periodic changes in competitive characteristics. The data were taken from the TradeMap website, and the product groups defined by that site were considered.

Wood and articles of wood, wood charcoal

The contribution of wood and articles of wood, including wood charcoal, to production and employment in Turkey, with thousands of enterprises operating on different scales was defined in relation to 21 product subgroups (Table 1).

Table 1. Wood and articles of wood, wood charcoal

Product codes	Definition
4401	Fuel wood, in logs, billets, twigs, faggots or similar forms; wood in chips or particles; sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms
4402	Wood charcoal, incl. shell or nut charcoal, whether or not agglomerated (excluding wood charcoal used as a medicament, charcoal mixed with incense, activated charcoal and charcoal in the form of crayons)
4403	Wood in the rough, whether or not stripped of bark or sapwood, or roughly squared (excluding rough-cut wood for walking sticks, umbrellas, tool shafts and the like; wood in the form of railway sleepers; wood cut into boards or beams, etc.)
4404	Hoopwood; split poles; piles, pickets and stakes of wood, pointed but not sawn lengthwise; wooden sticks, roughly trimmed but not turned, bent or otherwise worked, for the manufacture of walking sticks, umbrellas, tool handles or the like; chipwood, wooden slats and strips and the like (excluding hoopwood cut to length and chamfered; brush surrounds and shoe trees)
4405	Wood wool; wood flour (wood powder able to pass through a fine, 0.63 mm mesh, sieve with a residue of ≤ 8% by weight)
4406	Railway or tramway sleepers (cross-ties) of wood
4407	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness of > 6 mm
4408	Sheets for veneering, incl. those obtained by slicing laminated wood, for plywood or for other similar laminated wood and other wood, sawn lengthwise, sliced or peeled, whether or not planed, sanded, spliced or end-jointed, of a thickness of ≤ 6 mm
4409	Wood, incl. strips and friezes for parquet flooring, not assembled, continuously shaped (tongued, grooved, rebated, chamfered, V-jointed beaded, moulded, rounded or the like) along any of its edges, ends or faces, whether or not planed, sanded or end-jointed
4410	Particle board, oriented strand board (OSB) and similar board (e.g. waferboard of wood or other ligneous materials, whether or not agglomerated with resins or other organic binding substances) (excluding fibreboard, veneered particle board, cellular wood panels and board of ligneous materials agglomerated with cement, plaster or other mineral bonding agents)
4411	Fibreboard of wood or other ligneous materials, whether or not agglomerated with resins or other organic bonding agents (excluding particle board, whether or not bonded with one or more sheets of fibreboard; laminated wood with a layer of plywood; composite panels with outer layers of fibreboard; paperboard; furniture components identifiable as such)

4412	Plywood, veneered panel and similar laminated wood (excluding sheets of compressed wood, cellular wood panels, parquet panels or sheets, inlaid wood and sheets identifiable as furniture components)
4413	Metallised wood and other densified wood in blocks, plates, strips or profile shapes
4414	Wooden frames for paintings, photographs, mirrors or similar objects
4415	Packing cases, boxes, crates, drums and similar packings, of wood; cable-drums of wood; pallets, box pallets and other load boards, of wood; pallet collars of wood (excluding containers specially designed and equipped for one or more modes of transport)
4416	Casks, barrels, vats, tubs and other coopers products, parts thereof, of wood, incl. staves
4417	Tools, tool bodies, tool handles, broom or brush bodies and handles, of wood; boot or shoe lasts and shoetrees, of wood (excluding forms used in the manufacture of hats, forms of heading 8480, other machines and machine components, of wood)
4418	Builders joinery and carpentry, of wood, incl. cellular wood panels, assembled flooring panels, shingles and shakes, of wood (excluding plywood panelling, blocks, strips and friezes for parquet flooring, not assembled, and pre-fabricated buildings)
4419	Tableware and kitchenware, of wood (excluding interior fittings, ornaments, cooperage products, tableware and kitchenware components of wood, brushes, brooms and hand sieves)
4420	Wood marquetry and inlaid wood; caskets and cases for jewellery or cutlery, and similar articles, of wood; statuettes and other ornaments, of wood; wooden articles of furniture (excluding furniture, lighting fixtures and parts thereof)
4421	Other articles of wood, n.e.s.

Method

There are many different methods developed to measure international competitiveness. These methods, primarily use foreign trade data to measure the competitiveness of companies, industries and countries. In this study, *RCA*, which was proposed by Liesner [1958] and developed by Balassa [1965], and three different indices, formulated by Volltrath [1991], were used. The Balassa and Voltrath indices are commonly used to measure competitiveness. The first index formulated by Voltrath is the Relative Trade Advantage (*RTA*), which consists of the difference between Relative Export Advantage (*RXA*) and Relative Import Advantage (*RMA*). The second index was ln *RXA*, which is the simple logarithm of the Relative Export Advantage Index. The third index was the Revealed Competitiveness (*RC*) index, which consists of the difference between the logarithmic forms of *RXA* and *RMA*.

Balassa index (or Revealed Comparative Advantage, *RCA*)

Balassa's [1965] index, which stands out in terms of measuring specialization in international trade, allowed the share of a targeted group of goods in the total

exports of a country to be expressed relative to the corresponding share of the world's total exports. As a result of the analysis, a value of *RCA* less than 1 indicates that the country is not competitive in terms of the revealed comparative advantages at the level of the relevant product, and a value of *RCA* greater than 1 indicates that the country has a revealed comparative advantage in the product group [Balassa 1965; Kum 1999; Altay and Gürpınar 2008]. The Balassa index compares the specialization of a country in a product group with that of the world. Here, it is determined whether it has comparative advantage at the product group or sectoral level, rather than the elements that determine the comparative advantage [Beningo 2005; Mykhnenko 2005]. The index developed by Balassa is shown in Equation 1.

$$RCA_{ij} = \frac{\left(\frac{X_{ij}}{X_{it}}\right)}{\left(\frac{X_{wj}}{X_{wt}}\right)} \tag{1}$$

where: X_{ij} is country i's exports of goods j
X_{it} is country i's total exports
X_{wj} is the world's exports of goods j
X_{wt} is the world's total exports

Vollrath's Revealed Comparative Advantage indices

The Balassa index, which is criticized for taking only export data into account, was revised by Vollrath [1991]. The new calculation, which was made by subtracting the total export data in order to prevent the export data in the product group from being counted twice, consists of three different measurements to determine the export competitiveness.

Relative Trade Advantage (*RTA*)

The Relative Trade Advantage index, which has a more complex structure than the *RCA* index, is equal to the difference between the *RXA* index and the *RMA* index [Vollrath 1991; Utkulu and İmer 2008]. The index, which determines the net trade effect by using export and import values, is shown in the equation below.

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \tag{2}$$

If the result obtained from the calculation is greater than 0, it indicates that the country has a competitive advantage at the product or sector level, and if it is smaller than 0, this indicates that it has a competitive disadvantage.

Relative Export Advantage (*RXA*)

Vollrath's *RXA* index prevents the country and product (sector) from being counted twice, unlike in the Balassa index. This index can be defined as the ratio of domestic specialization of a country's exports of a particular product or sector to the world specialization of the same product or sector exports [Sarıçoban and Kösekahyaoğlu 2017]. The index is formulated in the equation below:

$$RXA = \frac{\left(\frac{X_{ij}}{X_{it} - X_{ij}}\right)}{\left(\frac{X_{wj} - X_{ij}}{X_{wt} - X_{it}}\right)} \tag{3}$$

If $RXA > 1$, this means that the share of this goods group in the country's exports is greater than its share in the exports of the world or other compared country groups. In this case, it is concluded that there is an export competitive advantage of the country in this goods group. $RXA < 1$ indicates that the country has a competitive disadvantage. A value of 1 indicates a balance in export competitiveness.

Relative Import Advantage (*RMA*)

The *RMA* index shows the situation of a country in the world in terms of an imported commodity. The equation for the index is given below [Fronberg and Hartmann 1997]:

$$RMA = \frac{\left(\frac{M_{ij}}{M_{it} - M_{ij}}\right)}{\left(\frac{M_{wj} - M_{ij}}{M_{wt} - M_{it}}\right)} \tag{4}$$

where: M_{ij} is country i's imports of goods j
M_{it} is country i's total imports
M_{wj} is the world's imports of goods j
M_{wt} is the world's total imports

It can be concluded that there is a competitive disadvantage at the level of this product group if the *RMA* value is greater than 1 and there is a competitive advantage if it is smaller than 1.

Simple logarithm of the Relative Export Advantage (ln *RXA*)

This index is widely used because it allows comparison of competitiveness based on the export performance of competitor countries. In the classification of ln *RXA* values, the following results are obtained:

If ln *RXA* ranges between 0.5 and ∞, the comparative advantage is high;
If ln *RXA* ranges between -0.5 and 0.5, the comparative advantage is marginal;
If ln *RXA* rhanges between -∞ and -0.5, the comparative advantage is low. The index logarithm formula is shown below [Erkekoğlu et al. 2014].

$$\ln RXA = \ln[X_{ij}/(X_{it}-X_{ij})/(X_{wj}-X_{ij})/(X_{wt}-X_{it})] \quad (5)$$

Revealed Competitiveness (*RC*)

This index consists of the logarithmic forms of the *RXA* and *RMA* indices. A positive value obtained for this index shows that there is a competitive advantage, and a negative value shows that there is a competitive disadvantage. This is a preferred measurement over ln *RXA* and *RTA* in terms of reflecting the supply and demand balance [Sarıçoban and Kösekahyaoğlu 2017].

$$RC = \ln RXA - \ln RMA \quad (6)$$

Results and discussion

Wood and articles of wood, wood charcoal

The period between 2001 and 2017 for the defined product sector was divided into two sub-periods with the aim of comparing the periodic values of the competition index. Data on foreign trade in the products within the defined periods are summarized in Table 2 [TradeMap 2018].

It may be that a significant foreign trade deficit occurred within the period examined at the level of products subgroups within the wood, wooden articles and wood charcoal sector. In a significant number of subgroups (4401, 4402, 4404, 4405, 4408, 4409, 4410, 4411, 4413, 4414, 4415, 4416, 4417, 4418, 4419, 4420 and 4420), there was an increase in exports in the periods examined. When the import level was examined within the periods, it was observed that there were increases in the subgroups 4401, 4402, 4404, 4407, 4408, 4409, 4410, 4411, 4412, 4413, 4414, 4415, 4416, 4416, 4417, 4418, 4419, 4420 and 4421. Although a foreign trade surplus was observed in the subgroups 4404, 4408, 4410, 4413, 4415 and 4418 in the period 2001-2009, the values obtained were low. Considering the averages for the period 2010 -2017, a foreign trade surplus was observed in the subgroups 4410, 4411, 4413, 4415 and 4418. In the comparative evaluation of the two periods, the product subgroups that were positive in the period 2001-2009, but turned negative in the period 2010-2017, were 4404 and 4408, while subgroup 4411 turned from negative to positive in the period 2010 -2017. In addition, it is noteworthy that the trade deficit in the products of subgroups 4401, 4402, 4407 and 4412 increased significantly.

Table 2. Foreign trade figures for "wood and articles of wood, wood charcoal" at product subgroup level (000 dollars)

Product codes	2001-2009 Imports	2001-2009 Exports	2001-2009 Balance of trade	2010-2017 Imports	2010-2017 Exports	2010-2017 Balance of trade
4401	80378	96.555	**-80281.445**	231394	772	**-230622**
4402	2875	7.777	**-2867.223**	26787	653.375	**-26133.625**
4403	159334	3176	**-156158**	108184	2850	**-105334**
4404	112	128.111	**16.111**	998	157.875	**-840.125**
4405	1473	9.777	**-1463.223**	1361	35.75	**-1325.25**
4406	1588	294.555	**-1293.445**	689	253.625	**-435.375**
4407	73317	17649	**-55668**	230126	12633	**-217493**
4408	15094	20257	**5163**	41654	26247	**-15407**
4409	10994	9253	**-1741**	16368	15540	**-828**
4410	41296	48971	**7675**	84320	91032	**6712**
4411	171998	95102	**-76896**	216362	289708	**73346**
4412	60530	16305	**-44225**	288003	14895	**-273108**
4413	3361	7310	**3949**	8884	26615	**17731**
4414	1692	810	**-882**	3391	1587	**-1804**
4415	3062	19239	**16177**	8102	33160	**25058**
4416	714	87	**-627**	1503	181	**-1322**
4417	634	486	**-148**	2117	993	**-1124**
4418	30406	46676	**16270**	71197	158730	**87533**
4419	2394	990	**-1404**	11577	2685	**-8892**
4420	4370	770	**-3600**	8325	1897	**-6428**
4421	10571	8033	**-2538**	26177	18688	**-7489**

Table 3 summarizes the index values for the subgroups of "wood and articles wood, wood charcoal" obtained using Balassa's *RCA* and Volltrath's *RCA*.

The *RCA* index for "wood and articles of wood, wood charcoal" had an average value of 0.48 between 2001 and 2009. It exhibited no competitiveness during this period. With an average of 1.08 between 2010 and 2017, it indicated a revealed comparative advantage. The identification of the product subgroups that caused this change will contribute to a realistic discussion of the competitive advantage of the sector. As a result of the evaluations, it was seen that four product subgroups (4410, 4411, 4413 and 4415) had a revealed comparative

Table 3. Competitiveness of "wood and articles of wood, wood charcoal" at product subgroup level

Codes	2001–2009						2010–2017					
	RCA	*RXA*	*RMA*	*RTA*	ln *RXA*	*RC*	*RCA*	*RXA*	*RMA*	*RTA*	ln *RXA*	*RC*
4401	0.004	0.004	1.86	**-1.85**	-5.49	-6.11	0.01	0.01	2.12	**-2.11**	-4.37	-5.12
4402	0.003	0.002	0.52	**-0.52**	-5.87	-5.23	0.09	0.08	1.87	**-1.78**	-2.4	-3.03
4403	0.042	0.042	1.16	**-1.11**	-3.15	-3.3	0.02	0.02	0.45	**-0.42**	-3.71	-2.92
4404	0.113	0.112	0.05	**0.05**	-2.18	0.7	0.08	0.08	0.34	**-0.25**	-2.42	-1.35
4405	0.023	0.023	2.72	**-2.69**	-3.74	-4.74	0.04	0.04	1.35	**-1.31**	-3.09	-3.4
4406	0.194	0.193	0.63	**-0.44**	-1.64	-1.19	0.09	0.09	0.16	**-0.06**	-2.31	-0.52
4407	0.087	0.086	0.22	**-0.13**	-2.44	-0.96	0.04	0.04	0.49	**-0.44**	-3.11	-2.4
4408	0.945	0.945	0.43	**0.5**	-0.05	0.77	1.13	1.14	1.04	**0.1**	0.13	0.09
4409	0.303	0.302	0.22	**0.07**	-1.19	0.3	0.39	0.39	0.26	**0.12**	-0.93	0.39
4410	1.064	1.065	0.62	**0.44**	0.06	0.53	1.48	1.49	0.88	**0.61**	0.4	0.52
4411	1.832	1.845	2.4	**-0.56**	0.61	-0.26	3.62	3.71	1.8	**1.91**	1.31	0.72
4412	0.226	0.225	0.53	**-0.3**	-1.49	-0.86	0.12	0.12	1.66	**-1.54**	-2.1	-2.61
4413	2.49	2.518	1.32	**1.19**	0.92	0.64	11.5	12.6	2.47	**10.2**	2.54	1.63
4414	0.118	0.117	0.16	**-0.04**	-2.13	-0.33	0.2	0.2	0.29	**-0.08**	-1.57	-0.35
4415	1.222	1.224	0.13	**1.08**	0.2	2.18	1.29	1.3	0.21	**1.08**	0.26	1.79
4416	0.022	0.022	0.13	**-0.11**	-3.81	-1.78	0.02	0.02	0.36	**-0.33**	-3.54	-2.54
4417	0.271	0.269	0.26	**0.007**	-1.31	0.02	0.37	0.37	0.22	**0.14**	-0.98	0.51
4418	0.594	0.593	0.28	**0.3**	-0.52	0.72	1.3	1.31	0.42	**0.88**	0.27	1.13
4419	0.232	0.23	0.29	**-0.06**	-1.46	-0.25	0.35	0.34	0.78	**-0.43**	-1.05	-0.81
4420	0.088	0.087	0.26	**-0.17**	-2.43	-1.09	0.14	0.14	0.36	**-0.21**	-1.92	-0.9
4421	0.287	0.285	0.21	**0.06**	-1.25	0.27	0.41	0.41	0.33	**0.07**	-0.88	0.19
Mean	0.48	0.48	0.68	**-0.2**	-1.82	-0.95	1.08	1.13	0.85	**0.29**	-1.4	-0.9

advantage between 2001 and 2009. It is accepted that the higher the *RCA* coefficient, the higher the competitiveness and competitive advantage. As a result of the calculation carried out by taking the average of the values for the period 2010-2017, the product subgroups that had a comparative advantage, increased numerically. It was seen that six out the 21 subgroups (4408, 4410, 4411, 4413, 4415 and 4418) had a revealed comparative advantage, and that this sector reached a better position in terms of export data in the period 2001-2009. It is noteworthy that the subgroups 4408 and 4415, which did not have a comparative advantage in the period 2001-2009, had a comparative advantage in the period 2010-2017. In addition, it was determined that only five subgroups (4403, 4404, 4406, 4407 and 4412) showed a downward trend in the product subgroup comparisons, while all the other subgroups showed an upward trend.

The values observed demonstrated that the disadvantageous situation was reduced; however, the competitiveness remained far from the desired level.

RXA, which is a relative export advantage index, was calculated within the periods examined and showed significant similarities with *RCA*.

In the calculations made in the context of the relative import advantage index, results of 1 and above are indicative of a competitive disadvantage in imports. Within the periods examined, it was seen that the sector averages remained within the limits of competitive advantage, but increased in the period 2010-2017. The product subgroups, which caused this change, were 4401, 4402, 4413 and 4415. As a result of the calculations made considering the average values for the period 2001-2009, it was determined that five subgroups (4401, 4403, 4405, 4411 and 4413) had values of 1 and above. The subgroups 4401, 4403, 4405, 4411 and 4413 had a disadvantage in terms of imports, while the other sub-groups had an advantageous situation. This showed that there was an advantageous situation in the production of wood and articles of wood in the period 2001-2009. Considering the period 2010-2017, seven product subgroups (4401, 4402, 4405, 4408, 4411, 4412 and 4413) had a disadvantage in imports. The highest disadvantage was that of subgroup 4405 in the period 2001-2009, and that of subgroup 4413 in the period 2010-2017. It was found that the trend in Turkey' s imports of wood and articles of wood was not high. However, imports under specific product groups were above the general level of imports in Turkey.

As a result of the calculations made regarding ln *RXAN*, which allows the comparison of competitiveness with respect to export performances, the low level of advantage in the wood and articles of wood sector in the period 2001-2009 changed positively in 2010-2017. Although the wood and wood products sector had low levels of advantage, it is noteworthy that the competitive advantage of the product subgroups 4411 and 4413 in the period 2001-2009 was high. In the subgroups 4410 and 4415, it was seen that the competitive advantage took marginal values. Other product groups gave values below the desired levels in terms of competition. In the analyses for the period 2010-2017, it was seen that the subgroups 4411 and 4413 increased their competitive advantages. Four subgroups (4408, 4410, 4415 and 4418) had values within the marginal limits in the period 2010-2017, and this indicated the existence of a positive change in the competitiveness of the sector.

The negative value of the *RC* index, which consists of the logarithmic forms of the *RXA* and *RMA* indices and shows the relative competitive advantage of the sector, indicates the existence of a competitive disadvantage. It was observed that there was a competitive disadvantage in the sector within the periods examined, and that the trend leaned towards negative between 2010 and 2017. Considering the averages for the period 2001-2009, it was seen that there was a competitive advantage in eight product subgroups (4404, 4408, 4409, 4410, 4413, 4415, 4417 and 4418). The high value for subgroup 4415 among these

subgroups was remarkable. Considering the period 2010-2017, the number of product subgroups with competitive advantage increased to nine (4408, 4409, 4410, 4411, 4413, 4415, 4417, 4418 and 4421). Subgroup 4404, which had a competitive advantage in the previous period (2001-2009), lost its advantage, while subgroups 4411 and 4421, which had a competitive disadvantage in the previous period, now showed an advantage. Within this period (2010-2017), subgroup 4415 still had the highest value, even though it experienced a decline compared to the previous period (2001-2009). As regards the *RC* index value, product subgroups that negatively affected the competitive average of the sector were 4401, 4402, 4403 and 4405 in 2001 - 2009 and 4401, 4402, 4403, 4405, 4407, 4412 and 4416 in 2010-2017. Kayacan [2004] stated that forest-based sectors do not have sufficient advantages and power in international markets. Yıldırım et al. [2008] claimed that Turkey 's wood panels industry can compete with EU countries. Şahin [2016] found that the SITC 24 (cork and wood) and SITC 25 (pulp and waste paper) sectors have low competitiveness in Turkey. Moreover, it has been found that the competitiveness of SITC 63 (cork and wood manufacture, excluding furniture), SITC 64 (paper, paperboard and articles of paper pulp, of paper or of paperboard) and SITC 82 (furniture) have increased in recent years. In a study by Keskingöz [2018], it was determined that the "wood and articles of wood, wood charcoal" sector in Turkey has a comparative disadvantage and is a net importer. In another study, Turkey was found to have a competitive advantage with respect to products in the subgroups 4410 (particle board, oriented strand board and similar board), 4411 (fibreboard of wood or other ligneous materials), 4413 (metallised wood and other densified wood in blocks, plates, strips or profile shapes) and 4415 (packing cases, boxes, crates, drums and similar packings, of wood) [Kara et al. 2019]. Müftüoğlu and Kayacan [2019] found that Turkey has low competitiveness in products of SITC 63 (wood and cork manufactures excluding furniture), whereas it has no competitiveness in products of SITC 24 (wood, lumber and cork). Briefly, the results are seen to be similar to those of the studies conducted here.

Conclusions

In the present study, in which the competitive position of the Turkish forest products industry in the international arena was analysed, one of the industry's three main production sectors (wood and articles of wood) was investigated. The determined periods were evaluated in two sections covering the periods 2001-2009 and 2010-2017, in order to determine periodic trends. A total of 21 product subgroups within the sector were investigated within the defined periods. Based on the results obtained, the following suggestions can be made:

- It was seen that the "wood and articles of wood, wood charcoal" sector cannot be evaluated as having reached an adequate level, and it is far from

the desired position in terms of competition. Although there are positive or negative changes over time in the ability of different subgroups to compete, there seems to be a positive trend. In particular, the preservation of the competitive position of products in the subgroups 4411, 4413, and 4415 and assurance of a sustainable quality, are important for other sub-groups of the sector to reach the desired level.

- The calculations showed that these subgroups are the pioneers in competition. However, it should be kept in mind that if the problems in the supply of raw materials are not solved, these subgroups may lose their advantage in terms of competitive position. It is known that problems concerning raw materials and by-products, which limit competition in exports, constitute obstacles to various investments in sub-sectoral groups and limit technological development. Measures should be taken to eliminate import dependency in the procurement of raw materials in all areas, and the quality of domestic production should be increased to world standards.
- The brand value of products in Turkey should be increased, and Turkish production expressions should be used frequently. Industrialists who plan to be permanently present in foreign markets and to enter new markets should not be left without support. All obstacles to participation in trade fairs and market events must be removed. New, and especially high value-added products should be mobilized, and the advantages gained should be increased.
- Finally, rational measures should be taken to enable the disadvantaged products to be able to compete.

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