Analysis of Furniture Products' Contribution to Turkey's Economy with a Hybrid Multi-criteria Decision Making Method

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The furniture sector has a strategic importance in Turkey. That sector contributes greatly to the national economy, provides high levels of employment, is rapidly growing, and does not have a foreign trade deficit. In this paper, a hybrid multi-criteria decision-making method was used to determine the contribution of some furniture products to Turkey's economy. First, the entropy method was used to determine the weight values of the criteria, and then the ELimination Et Choix Traduisant la REalité (ELimination Et Choice Translating REality) (ELECTRE) method was used to compare and rank the alternatives. As a result of this analysis, the furniture products that contributed the most to the national economy were "seating furniture and parts thereof, other wooden furniture", "wooden bedroom furniture", "other metal furniture", and "parts of furniture other than metal and wood". The least contributing products were "furniture used in medicine, surgical, dental, veterinary, and barber chairs *etc*.", "plastic furniture", and "furniture other than metal, wood, and plastic".

Keywords: Furniture products; Entropy; ELECTRE; Hybrid decision making model

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INTRODUCTION

Items of furniture are objects created in different materials or forms that have a role in human life by helping ensure the well-being of the individual or society. They additionally serve social and cultural needs and directly affect people's quality of life. Demand for furniture has continually increased due to factors such as population growth, increasing living standards, and an increase in the sector's export value, which directly affects the furniture sector (Şahin 2016; TOBB 2018).

The furniture industry can be regarded as a process that transforms materials such as wood, metal, marble, and plastic into intermediate products. Economically, the furniture sector provides significant employment opportunities to the country and contributes to the country's economy with its high added value (Ceylan 2009; Çolak 2009).

Turkey is one of the quickly growing countries in the furniture sector compared to other countries. In Turkey, this sector's history dates to the 19th century. Furniture was first produced by furniture masters in small workshops. Significant increases have been observed in the number of medium and large enterprises since the 1990s. However, Turkey's furniture industry is mainly composed of small- and medium-sized firms. The Turkish furniture sector achieved the fastest growth in 2005 with 8% growth (Çolak 2009; Köksal 2017).

Examining the production and foreign trade performance of furniture in the world reveals that the furniture industry reached a volume of approximately $240 billion

worldwide in 2018 (West Mediterranean Exporters Association 2020). While the center of furniture production in the world was previously in Europe, recently the weight of furniture production has shifted to the east, being mainly based in China. China is the leader in furniture production, followed by the US, Italy, and Germany. Turkey's furniture production was approximately 25 billion Turkish liras, according to 2018 data (Taşçı and Çanakçı 2016; Çoşkun 2019; TSI 2020a). Total furniture exports in the world were approximately $194 billion in 2018. China is the leading country in world furniture exports with a 33% share. China is followed by Germany, Poland, Italy and the USA. These five countries make up approximately 58% of the world furniture exports. Turkey with $2.687 billion ranks 14th in the world in terms of furniture exports. Total furniture imports in the world were approximately $193 billion in 2018. The largest furniture importer country in the world is the USA. The USA imported $59.132 billion worth of furniture in 2018. Other large importing countries are Germany, United Kingdom, France, Canada, Japan, Netherlands, and Spain. Turkey had $592.8 million in import volume in 2018 (Republic of Turkey Ministry of Trade 2020).

The furniture sector is one of the leading sectors in the Turkish economy. This is because the furniture industry provides high employment opportunities, has a high added value, and is one of the industries with the least foreign dependency. As a result, this sector has the potential to reduce Turkey's dependence on foreign entities. For this, how much furniture products contribute to the country's economy and the export potential of the products must be known. However, this is a difficult problem that must be solved by decision makers. For this reason, determining the economic contribution of furniture products to country has been chosen as the research subject of this study.

With multi-criteria decision-making (MCDM) techniques, decision makers can make more effective and easier decisions. The MCDM techniques are selective techniques used to evaluate, rank, and select the most suitable alternative among various alternatives (Azadfallah 2017). There are various MCDM techniques used in the literature. Some techniques include analytical hierarchy process (AHP), entropy, ELimination Et Choix Traduisant la REalité (ELimination Et Choice Translating REality) (ELECTRE), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), VIseKriterijumsa Optimizacija I Kompromisno Resenje (VIKOR), The Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE), *etc*. In some studies, the MCDM techniques have been used alone or by combining two techniques (Halicka 2020; Singh *et al.* 2020). In this research, a two-step hybrid MDCM technique was used, which was created by combining the entropy and ELECTRE methods. In the first step of this hybrid method, the weights of the criteria were determined via the entropy method. The ELECTRE method was used to rank furniture products against each other in terms of their economic contribution.

Many methods are used for weighting the criteria; however, in practice, one of the most used is the AHP method. The AHP method is influenced by subjective preferences. Objective weighting methods, such as entropy, can be used to prevent subjective preference assessment (Chen 2019; Yuan *et al.* 2019). In this method, the weight of each criterion is calculated based on observation values. The low entropy value of the criterion indicates that the criterion is important and that the weight value is large (Chen *et al.* 2015a; Chen 2020).

The ELECTRE method is a technique that represents the dominance of relations between different alternatives by outranking relations (Pang *et al.* 2011). This method may be more suitable for problems with many alternatives and few criteria because it has a

clearer view of alternatives by eliminating the less favorable ones (Pohekar and Ramachandran 2004). It has some advantages: it is easy to understand, there is a clear logic relationship, the calculation can be made with a program such as Microsoft Excel, all the data in the decision matrix can be used, and it can process heterogeneous scale criteria by not changing the actual value of the alternatives on each criterion without need for normalization or prediction techniques. The main disadvantage of the ELECTRE method is that it may not be suitable when calculating the total score for each alternative because it supposes that all criteria are at a similar generalization level (Safitri and İbrahim 2019; Zhang and Xue 2019).

Examining the literature shows that the two-step hybrid (entropy-ELECTRE) method has been used in a variety of research areas. Singh *et al.* (2020) used the entropy-ELECTRE method to select the best brake friction composite composition from a range of natural fiber reinforced composites in their research. Lee and Chang (2018) evaluated renewable energy sources for electricity generation in Taiwan; they used the entropy method to evaluate the criteria and the weighted sum method (WSM), VIKOR, TOPSIS, and ELECTRE methods to rank the alternatives. Wang and Liu (2016) evaluated the energy saving and emission reduction in a thermal power plant using the entropy-ELECTRE hybrid method. Khosheghbal *et al.* (2014) investigated factors to improve the performance of BIK port, one of the important ports of Iran, using ELECTRE and entropy methods.

In this paper, an attempt is made to determine the furniture products that contribute most to Turkey's economy using a hybrid MCDM method. For this purpose, firstly, the criteria and alternatives were determined. Then, the weight values of the criteria were determined using the entropy method. The superiority of each alternative over each other and the ranking of the alternatives were made using the ELECTRE method.

This ranking was done to specify the products that will be able to contribute the most to the country, economically. As a result of this, helping decision-makers in the creation of strategies and plans to reduce the trade deficit in country. Furthermore, this work can contribute to literature from a different aspect such as the decision-making applications in the furniture industry and economic contribution to the country.

EXPERIMENTAL

Materials

The data used were sourced from the Turkey Statistical Institute, and the research covers years 2009 to 2018. The Harmonized Commodity Description and Coding System (HS) was used for the export and import data, whereas the European Community Industrial Product List was used for the production data. In addition, the main product groups were obtained by bringing together the sub-groups of each product (Table 1). The codes 31.00, 31.01, 31.02, 31.03, and 32.50.30 are the production data and the codes 94.01, 94.02, and 94.03 are the export and import data.

Methods

Entropy method

Proposed by Shannon and Weaver (1949), entropy can be used to calculate the weights of the criteria. This method is defined as the measure of uncertainty in information formulated using probability theory (Shemshadi *et al.* 2011). The entropy method consists of four steps, which are listed below (Li *et al.* 2011; Lee *et al.* 2012; Chen *et al.* 2015b).

Table 1. Production and Foreign Trade Codes of Furniture Products Used in the Study

Seating Furniture and Parts Thereof	Furniture: Medical, Surgical, Dental, or Veterinary, Barber's Chairs and Parts Thereof	Furniture: Metal, for Office Use	Furniture: Wooden, for Office Use	Furniture: Wooden, for Kitchen Use	Furniture: Wooden, for Bedroom Use	Furniture: Plastic	Furniture: Other Than Metal, Wood and Plastic Use	Furniture: Wooden, Other Than for Office, Kitchen or Bedroom Use	Furniture: Parts Thereof, Other Than Metal and Wood Use	Furniture: Metal, Other Than for Office Use
3100115500	3250305000	3101114000	3101120000	3102100000	3109123000	3109143000	3109145000	3109130000	3100209000	3109110000
3100115900										
3100117000										
3100119000							940382			
3100121000		3101117000								
3100123000										
3100125001	3250303000		940330	940340	940350	940370	940383	940360	940390	940320
3100125002										
3100129000		940310								
3100130000							940389			
3100140000										
9401										

Step 1: Creating the decision matrix

The decision matrix consists of the alternatives and the evaluation criteria.

Step 2: Normalization of the decision matrix

The data was subjected to normalization using Eqs. 1, 2, and 3,

$$a_{ij}=x_{ij}/max_{ij} \quad (1)$$

$$a_{ij}=min_{ij}/x_{ij} \quad (2)$$

$$p_{ij}=\frac{a_{ij}}{\sum_{i=1}^{m} a_{ij}} \quad (3)$$

where x_{ij} is the performance value of the i alternative in j criteria, a_{ij} is the benefit value, and p_{ij} is the normalized value.

Step 3: Calculating the entropy value

After normalization, the entropy value of each criterion was calculated. The *k* value was the inverse of the natural logarithm of the total number of alternatives (k =1 / ln(m)). The e_j value takes a value between 0 and 1. The entropy value was calculated according to Eq. 4,

$$e_j=-k\sum_{i=1}^{m} p_{ij}\,Inp_{ij} \quad (4)$$

where e_j is the entropy value and *k* is the entropy coefficient.

Step 4: Calculation of weight value

The entropy value of each criterion was used when calculating the weight values. The sum of the weight values calculated for each criterion should be 1. The weight value is indicated by "w_j" and the formula of w_j is given in Eq. 5,

$$w_j=\frac{1-e_j}{\sum_{j=1}^{n}(1-e_j)} \quad (5)$$

where w_j is weight value.

ELECTRE method

The ELECTRE method was introduced by Bernard Roy in 1968 and has been widely researched since then (Roy 1991). This method starts with the creation of the decision matrix and consists of seven steps. The stage of forming the decision matrix was described in the steps of the entropy method, and the other steps were listed as follows (Pang *et al.* 2011).

Step 2: Normalization of the decision matrix

The decision matrix was normalized using Eq. 6,

$$r_{ij}=\frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (6)$$

where r_{ij} is normalized value.

Step 3: Weighting of normalized decision matrix

The weighting normalized decision matrix was created by multiplying the normalized values with the weight values obtained by the entropy method, as shown in Eq. 7,

$$V_{ij} = r_{ij} \times w_j \quad (7)$$

where V_{ij} is weighted normalized value.

Step 4: Determination of concordance and discordance interval sets

The weighted normalized decision matrix was used to determine the concordance and discordance interval sets. The concordance and discordance sets were created for each *via* Eqs. 8 and 9, respectively:

$$C_{ab} = \{j | x_{pj} \geq x_{aj}\} \quad (8)$$

$$D_{ab} = \{j | x_{pj} < x_{aj}\} \quad (9)$$

Step 5: Calculation of the concordance and discordance indices

Through using the concordance and discordance sets, the concordance and discordance matrix was created. Eq. 10 was used for the concordance matrix, and Eq. 11 was used for the discordance matrix:

$$C_{ab} = \sum_{j \in C_{ab}} w_j \quad (10)$$

$$D_{ab} = \frac{\max\limits_{j \in D_{ab}} |v_{aj} - v_{bj}|}{\max\limits_{j \in J, m, n \in I} |v_{mj} - v_{nj}|} \quad (11)$$

Step 6: Superiority comparison

The averages for the concordance ($\bar{c}$) and discordance ($\bar{d}$) values were determined *via* Eqs. 12 and 13:

$$\bar{c} = \frac{\sum_{a=1}^{m} \sum_{b}^{m} c(a,b)}{m(m-1)} \quad (12)$$

$$\bar{d} = \frac{\sum_{a=1}^{m} \sum_{b}^{m} d(a,b)}{m(m-1)} \quad (13)$$

If $\bar{c} \leq C_{ab}$ in the concordance matrix, it was stated as "YES". If $\bar{d} \geq D_{ab}$ in the discordance matrix, it was stated as "YES".

Step 7: Calculation of net concordance and discordance matrix

The net concordance and discordance values were used to rank alternatives. These values were calculated *via* Eqs. 14 and 15:

$$C = \sum_{b=1}^{n} c_{(a,b)} - \sum_{b=1}^{n} c_{(b,a)} \quad (14)$$

$$D = \sum_{b=1}^{n} d_{(a,b)} - \sum_{b=1}^{n} d_{(b,a)} \quad (15)$$

RESULTS AND DISCUSSION

The decision matrix consists of the alternatives and the evaluation criteria. There were 11 alternatives and 3 criteria in this research. The alternatives were as follows: seating furniture and parts thereof (SF), furniture used in medicine, surgical, dental, veterinary, and barber chairs, *etc*. (FM), metal furniture used in offices (MFO), wooden furniture used in offices (WFO), kitchen furniture (KF), wooden bedroom furniture (WBF), plastic furniture (PF), furniture other than metal, wood, and plastic (FOWP), other wooden furniture (OWF), parts of furniture other than metal and wood (PFO), and other metal furniture (OMF). The criteria researched for this paper were the production value, export value, and import value. Attention has been paid to make the data available in the selection of criteria and alternatives. Furthermore, the ELECTRE method is more appropriate to use in decision-making problems where several criteria are compared and there are many alternatives (Pohekar and Ramachandran 2004). The decision matrix (Table 2) was created by taking an arithmetic average of the ten-year data of alternatives and criteria (Turkish Statistical Institute 2020a; 2020b).

Table 2. Decision Matrix (TSI 2020a; 2020b)

Alternatives	Production Value (1000 Turkish Lira)	Export Value (1000 Turkish Lira)	Import Value (1000 Turkish Lira)
SF	4269073	1900774	932891
FM	210355	89171	68241
MFO	1065129	128707	12424
WFO	895628	151836	15563
KF	704709	87388	50841
WBF	1712697	1091881	63944
PF	158828	106242	21415
FOWP	47781	53648	49041
OWF	1102073	860375	209416
PFO	97533	308752	82544
OMF	383930	300933	130819

After the decision matrix was created, the data were normalized with Eqs. 1, 2, and 3, and the normalized data are shown in Table 3. After normalization, the entropy value of each criterion and the weight value of each criterion by using Eqs. 4 and 5 were determined, respectively. Results regarding entropy and weight values are shown in Table 4. According to the Table 4, the weight values of the criteria determined by the entropy method were the export value (0.38), production value (0.357), and import value (0.263), as ranked from high to low. This study represented that the export value had more importance when ranking the contribution of furniture products to Turkey's economy. The export value was followed by the production and import values, respectively. Exports are important for the growth and development of Turkey's economy (Bedük and Ince 2005). In Turkey, various steps have been taken to increase these exports, such as creating regional export associations, informing the sectors by generating export-oriented reports through Chambers of Commerce and Industry, and providing incentives to businesses engaged in export, *etc*. (Çoşkun 2019). Different products must be exported, and the products must be

exported to different countries to ensure stability and increase in exports (Acaravcı and Kargı 2015). An effort to overcome the reduction in domestic demand resulting from the economic crisis was attempted *via* export-orientation of Turkish companies. Therefore, today exporting has become a necessity, not only to get work done, but also as a means to grow companies and countries (Republic of Turkey Ministry of Trade 2020). Although there has not been much research on which products contribute more to the national economy, Bayram (2020) researched forest products using the entropy-TOPSIS method. In the study related to the contribution of forest products to Turkey's economy, the export value criterion was found to have the lowest weight value in between value related criteria. According to the results of this study, the reason for the opposite result Bayram's study may be that the weight value of the export differs on a product basis.

Table 3. Normalized Data

Alternatives	Production Value	Export Value	Import Value
SF	0.40094	0.37419	0.00373
FM	0.01976	0.01755	0.05099
MFO	0.10003	0.02534	0.28006
WFO	0.08411	0.02989	0.22357
KF	0.06618	0.0172	0.06844
WBF	0.16085	0.21495	0.05441
PF	0.01492	0.02091	0.16248
FOWP	0.00449	0.01056	0.07095
OWF	0.1035	0.16937	0.01662
PFO	0.00916	0.06078	0.04215
OMF	0.03606	0.05924	0.02660

Table 4. Entropy and Weight Values

Criteria	Entropy (e_j)	Weight (w_j)
Production value	0.768	0.357
Export value	0.753	0.380
Import value	0.829	0.263

After determining the importance levels of the criteria with the entropy method, the ranking of the alternatives was determined using the ELECTRE method. In the ELECTRE method, the decision matrix (Table 2) used in determining the weights of the criteria was used. Firstly, the normalization of the data in the decision matrix was done. The decision matrix was normalized using Eq. 6 and the results were given in Table 5. Then, the V_{ij} matrices (weighting normalized decision matrix) were obtained. To get this matrix, the normalized data were multiplied by the weight values of the criteria. The V_{ij} matrices are shown in Table 6. In this paper, 110 concordance and discordance sets were created for each *via* Eq. 8 and Eq. 9, respectively. Through using the concordance and discordance sets, the concordance and discordance matrix was created (Table 7 and 8). Equation 10 was used for the concordance matrix, and Eq. 11 was used for the discordance matrix. The averages for the concordance ($\bar{c}$) and discordance ($\bar{d}$) values were found as 0.5 and 0.58, respectively. With $\bar{c}$ and $\bar{d}$ values, 43 out of 110 superiority comparisons had superiority

relations. Comparison of the alternatives with the superiority relationship was shown in Table 9. Finally, the net concordance (C) and discordance (D) values were calculated using Eqs. 14 and 15, respectively, and the alternatives based on C and D values were ranked.

Table 5. The Normalized Decision Matrix

Alternatives	Production Value	Export Value	Import Value
SF	1.71E-07	3.28E-07	9.79E-07
FM	8.40E-09	1.54E-08	7.16E-08
MFO	4.25E-08	2.22E-08	1.30E-08
WFO	3.58E-08	2.62E-08	1.63E-08
KF	2.81E-08	1.51E-08	5.34E-08
WBF	6.84E-08	1.88E-07	6.71E-08
PF	6.34E-09	1.83E-08	2.25E-08
FOWP	1.91E-09	9.25E-09	5.15E-08
OWF	4.40E-08	1.48E-07	2.20E-07
PFO	3.90E-09	5.32E-08	8.66E-08
OMF	1.53E-08	5.19E-08	1.37E-07

Table 6. Weighting of Normalized Decision Matrix

	Production value	Export value	Import value
SF	6.09E-08	1.25E-07	2.58E-07
FM	3.00E-09	5.84E-09	1.88E-08
MFO	1.52E-08	8.43E-09	3.43E-09
WFO	1.28E-08	9.95E-09	4.30E-09
KF	1.00E-08	5.72E-09	1.40E-08
WBF	2.44E-08	7.15E-08	1.77E-08
PF	2.26E-09	6.96E-09	5.91E-09
FOWP	6.81E-10	3.51E-09	1.35E-08
OWF	1.57E-08	5.64E-08	5.78E-08
PFO	1.39E-09	2.02E-08	2.28E-08
OMF	5.47E-09	1.97E-08	3.61E-08

According to Table 10, the ranking was as follows: seating furniture and parts thereof, other wooden furniture, wooden bedroom furniture, other metal furniture, parts of furniture other than metal and wood, kitchen furniture, metal furniture used in offices, wooden furniture used in offices, furniture used in medicine, surgical, dental, veterinary, and barber chairs, *etc*., plastic furniture, and furniture other than metal, wood, and plastic. Güleç and Adıgüzel (2016) and Şahin (2016) determined that Turkey has the high comparative advantage for the "seating furniture and parts thereof" product group, whilst it has not a comparative advantage for "furniture used in medicine, surgical, dental, veterinary, and barber chairs, *etc*." product group. Additionally, other studies have shown that the Turkish furniture industry has increased its competitive position over time (Altay and Gürpınar 2008; Bashimov 2017).

Table 7. The Concordance Index Matrix

Alternatives	SF	FM	MFO	WFO	KF	WBF	PF	FOWP	OWF	POF	OMF
SF	-	1	1	1	1	1	1	1	1	1	1
FM	0	-	0.263	0.263	0.643	0.263	0.62	1	0	0.357	0
MFO	0	0.737	-	0.357	0.737	0	0.737	1	0	0.357	0.357
WFO	0	0.737	0.643	-	0.737	0	0.737	0.737	0	0.357	0.357
KF	0	0.357	0.263	0.263	-	0	1	1	0	0.357	0.357
WBF	0	0.737	1	1	1	-	1	1	0.737	0.737	0.737
PF	0	0.38	0.263	0.263	0	0	-	0.737	0	0.357	0
FOWP	0	0	0	0.263	0	0	0.263	-	0	0	0
OWF	0	1	1	1	1	0.263	1	1	-	1	1
PFO	0	0.643	0.643	0.643	0.643	0.263	0.643	1	0	-	0.38
OMF	0	1	0.643	0.643	0.643	0.263	1	1	0	0.62	-

Table 8. The Discordance Index Matrix

Alternatives	SF	FM	MFO	WFO	KF	WBF	PF	FOWP	OWF	POF	OMF
SF	-	0	0	0	0	0	0	0	0	0	0
FM	1	-	0.791	0.672	1	1	0.087	0	1	1	1
MFO	1	1	-	0.627	1	1	0.192	0	1	1	1
WFO	1	1	1	-	1	1	0.154	0.764	1	1	1
KF	1	0.681	0.485	0.434	-	1	0	0	1	1	1
WBF	1	0.018	0	0	0	-	0	0	1	0.100	0.356
PF	1	1	1	1	1	1	-	1	1	1	1
FOWP	1	1	1	1	1	1	0.452	-	1	1	1
OWF	1	0	0	0	0	0.378	0	0	-	0	0
PFO	1	0.112	0.713	0.616	0.597	1	0.052	0	1	-	1
OMF	1	0	0.297	0.229	0.207	1	0	0	1	0.038	-

Table 9. Comparisons

C(p, q)	$\bar{C} \leq C_{pq}$	D(p, q)	$\bar{D} \geq D_{pq}$	$A_p \rightarrow A_q$
C(SF, FM)	YES	D(SF, FM)	YES	SF → FM
C(SF, MFO)	YES	D(SF, MFO)	YES	SF→MFO
C(SF, WFO)	YES	D(SF, WFO)	YES	SF→ WFO
C(SF, KF)	YES	D(SF, KF)	YES	SF→KF
C(SF, WBF)	YES	D(SF, WBF)	YES	SF →WBF
C(SF, PF)	YES	D(SF, PF)	YES	SF →PF
C(SF, FOWP)	YES	D(SF, FOWP)	YES	SF →FOWP
C(SF, OWF)	YES	D(SF, OWF)	YES	SF →OWF
C(SF, PFO)	YES	D(SF, PFO)	YES	SF → PFO
C(SF, OMF)	YES	D(SF, OMF)	YES	SF →OMF
C(OWF, FM)	YES	D(OWF, FM)	YES	OWF → FM
C(OWF, MFO)	YES	D(OWF, MFO)	YES	OWF →MFO
C(OWF, WFO)	YES	D(OWF, WFO)	YES	OWF → WFO
C(OWF, KF)	YES	D(OWF, KF)	YES	OWF→KF
C(OWF, PF)	YES	D(OWF, PF)	YES	OWF → PF
C(OWF, FOWP)	YES	D(OWF, FOWP)	YES	OWF → FOWP
C(OWF, PFO)	YES	D(OWF, PFO)	YES	OWF→PFO
C(OWF, OMF)	YES	D(OWF, OMF)	YES	OWF→OMF
C(FM, PF)	YES	D(FM, PF)	YES	FM → PF
C(FM, FOWP)	YES	D(FM, FOWP)	YES	FM →FOWP
C(MFO, PF)	YES	D(MFO, PF)	YES	MFO→PF
C(MFO, FOWP)	YES	D(MFO, FOWP)	YES	MFO → FOWP
C(WFO, PF)	YES	D(WFO, PF)	YES	WFO → PF
C(KF, PF)	YES	D(KF, PF)	YES	KF→PF
C(KF, FOWP)	YES	D(KF, FOWP)	YES	KF→ FOWP
C(WBF, FM)	YES	D(WBF, FM)	YES	WBF→FM
C(WBF, MFO)	YES	D(WBF, MFO)	YES	WBF →MFO
C(WBF, WFO)	YES	D(WBF, WFO)	YES	WBF→WFO
C(WBF, KF)	YES	D(WBF, KF)	YES	WBF→ KF
C(WBF, PF)	YES	D(WBF, PF)	YES	WBF→ PF
C(WBF, FOWP)	YES	D(WBF, FOWP)	YES	WBF→FOWP
C(WBF, PFO)	YES	D(WBF, PFO)	YES	WBF →PFO
C(WBF, OMF)	YES	D(WBF, OMF)	YES	WBF →OMF
C(PFO, FM)	YES	D(PFO, FM)	YES	PFO → FM
C(PFO, PF)	YES	D(PFO, PF)	YES	PFO→PF
C(PFO, FOWP)	YES	D(PFO, FOWP)	YES	PFO →FOWP
C(OMF, FM)	YES	D(OMF, FM)	YES	OMF→FM
C(OMF, MFO)	YES	D(OMF, MFO)	YES	OMF → MFO
C(OMF, WFO)	YES	D(OMF, WFO)	YES	OMF→WFO
C(OMF, KF)	YES	D(OMF, KF)	YES	OMF→KF
C(OMF, PF)	YES	D(OMF, PF)	YES	OMF→ PF
C(OMF, FOWP)	YES	D(OMF, FOWP)	YES	OMF→FOWP
C(OMF, PFO)	YES	D(OMF, PFO)	YES	OMF→PFO

Table 10. Ranking Alternatives with C and D Values

Alternatives	C	Rank	D	Rank
SF	10	1	-10	1
FM	-3.182	9	3.73824	8
MFO	-1.436	6	2.5334	7
WFO	-1.39	7	4.341	9
KF	-2.806	8	0.7952	6
WBF	5.896	3	-5.90314	3
PF	-6	10	9.064	11
FOWP	-8.948	11	7.6874	10
OWF	6.526	2	-7.6224	2
PFO	-0.284	5	-0.0495	5
OMF	1.624	4	-3.5842	4

When the decision matrix was examined, the export-import balance of all furniture product groups was positive, *i.e.*, the Turkish furniture sector was one of the sectors that had low levels of foreign dependency. In addition, furniture product groups are generally produced for the domestic market in Turkey.

The production, export, and import values of the seating furniture product group were higher than the other furniture products examined in this study. The wooden bedroom furniture product group was second in production and export value, while the other wooden furniture product group was second in import value. In terms of its contribution to the country's economy, the other wooden furniture product group was ranked higher than the wooden bedroom furniture product group. The reason for such a result may be due to the high import value of the other wooden furniture product groups. Although the production value of the metal furniture product group used in offices was high, it lagged due to the low export and import values. The production value of the kitchen furniture product group was high, but other metal furniture and other furniture parts other than wood and metal were ranked higher than the kitchen furniture product group because the export values of these two product groups were high.

CONCLUSIONS

The Turkish furniture sector has importance due to its number of workplaces and level of employment. Although the furniture sector is a sector with a foreign trade surplus, high competitiveness, and is manufacturing-based, it remains low in the share of Turkey's total exports. In this paper, the contribution of the furniture industry to the national economy, which is one of the most important sectors in Turkey, was aimed to analyze in terms of sub-product group. To achieve this purpose, a hybrid (entropy-ELECTRE) technique was used. The following results were obtained:

1. Using the entropy method, the export value was the criterion with the highest importance, while the import value was the criterion with the lowest importance.
2. Among the furniture products, the five products that make the most contribution to the national economy were determined as follows: seating furniture, other wooden furniture, wooden bedroom furniture, other metal furniture, and parts of furniture other than metal and wood.

3. The production value of the seating furniture and other wooden furniture product groups was high. However, it was a remarkable result that the import values were quite high.
4. It is noteworthy that the export values of the products, such as seating furniture, metal and wooden furniture used in offices, kitchen furniture, and wooden bedroom furniture, were low compared to the production values. When evaluated, Turkey's furniture sector does not have the desired success in terms of exports. To increase exports, higher quality products can be produced, and more attention can be paid to research, development, and branding.
5. Through determining which furniture products contribute more to the country's economy, countries and businesses can determine strategies accordingly. In this study, only three criteria were addressed (*i.e.*, production value, export value, and import value). This situation is a limitation of the study. More criteria can be added to this study. In addition, different multi-criteria decision-making methods can be applied and compared.
6. Studies on decision making applications in the furniture industry are very limited. Research on the furniture sector is generally related to production, trade, competitiveness, and development, and it does not cover the contribution of furniture products to the country's economy. This study aims to fill a gap in the literature. In this respect, this study is one of the pioneering works in the field of furniture as far as we know for today.

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