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Export Barriers of Honey in Iran: The Application of the DEMATEL Method

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Abstract

The rapid world economic growth has driven the businesses towards involvement in international marketplaces due to lower business risks, lower commitment of resources, and higher flexibility of these markets. However, evidence indicates that barriers to exportation vary across different stages of internationalization. Therefore, this empirical study was carried out to explore exportation barriers of agricultural commodities, especially honey, in Iran. Based on an explorative literature review, several factors were considered as export barriers of agricultural commodities. These barriers were provided to a sample of 20 honey exporters in Ardabil province using a questionnaire. After collecting and analyzing the data, 21 factors were identified as the important barriers to honey export. A graph theory-based technique (DEMATEL) with feedback structure was used to explore the direct and indirect effects of barriers on the other barriers and the whole system. The results indicate that adjusting export promotion activities, lack of home government assistance/incentives, shortage of working capital to finance exports, high tariff and nontariff barriers, different foreign customer habits/attitudes are the most critical barriers in the order of importance.

Keywords:
export barriers, honey, agricultural products, DEMATEL

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INTRODUCTION

One of the most important consequences of globalization, especially in developing countries, is the expansion of international trade (Henson & Loader, 2000) because globalization has resulted in tighter integration in goods markets across countries (Sposi, 2015). The benefits associated with exporting are not restricted to the individual firms themselves. Economies also benefit from foreign operations of domestic firms because these activities promote socio-economic development, increase employment, and generate spillover effects, such as societal prosperity and assistance to local industries to boost productivity (Pinho &Martins, 2010; Uner et al., 2013).

Despite the desire of many firms, a great majority of them still refrain from exporting (Da Rocha et al., 2008). Furthermore, economists generally agree that trade barriers suppress overall economic efficiency to a large extent (Rahman & Dutta, 2012). Thus, understanding the barriers or obstacles to export activities should help in developing public policy to stimulate firms to internationalize (Uner et al., 2013).

One of the major problems in developing countries is the excessive reliance on their income on exporting one or a limited number (oil and oil products) of commodities. Iran's experiences in the last few years have shown that economic reliance on incomes from the crude oil export leads to instability of export's revenue. Thus, it is of significant importance to understand the barriers to exports, especially the export of agricultural commodities as the most important non-oil products in developing countries. In particular, recent efforts to reduce barriers to trade in agricultural and food products, including internal and external restrictions and other trade barriers, provide opportunities for enhanced export performance for both traditional and non-traditional products (Henson et al., 2000).

Concurrent with the liberalization of tariffs and quantitative restrictions, however, there have been increased concerns about the impact of other measures, many of which are not explicitly trade-related, on agricultural and food exports (Imbs & Wacziarg, 2003). Before exporting from or importing to other countries, countries must first be aware of restrictions imposed by the government on the trade. Subsequently, they need to make sure that they are not violating the restrictions by checking related regulations on taxes or duties, and finally, they may need a license to ensure a smooth export or import business and reduce the risk of penalties or violations. Sometimes the situation becomes even more complicated when the policies and restrictions of a country are changed. The slower growth of agricultural trade and the difficulties of developing countries in conquering a share of that growth are not surprising. Both developed and developing countries have erected massive barriers to agricultural trade over the course of this century (McCalla & Nash, 2007).

Early work on barriers to exporting activities was conducted in the 1980s (Cavusgil, 1977). Then, during the last four decades, an extensive amount of research has been focused on barriers to exporting efforts (Uner et al., 2013). This study aims to explore critical barriers to the export of agricultural commodities, specifically honey, in Ardabil province of Iran in order to contribute to the development of export of non-oil products. Given the fact that the agricultural sector can be considered one of the most competitive industries, the main focus of this research is to identify and classify barriers to exports of this category. The results of this study could help agricultural managers, owners of honey production centers, and other agricultural producers to formulate future policies.

Ardabil province enjoys a desirable climate and conditions for honey production, so it is possible to use the province's potentials in producing high-quality honey. Currently, the amount of honey production in Iran is 80 000 tons, but only 2% (1500 tons) is exported to target markets.

While researchers have done several studies on understanding export barriers, there is little consensus on this issue due to the differences in methodologies and contents (Da Rocha et al., 2008). Export barriers and challenges are defined as constraints in perception, structure, operation, and company's ability to initiate, develop and maintain export marketing operations (Morgan & Katsikeas, 1998).

Pinho and Martins (2010) emphasize two types of export barriers: first, problems that prevent companies from initiating export activities, and second, natural and empirical problems of companies that had already begun export operations.

Several researchers have proposed classification schemes for export barriers. Cavusgil and Nevin (1981) argue that real barriers to company exports are internal barriers. Cavusgil (1984) highlights organizational properties, and Gripsrud (1990) focuses on external barriers. Cavusgil and Yeoh (1994) and Tesfom and Lutz (2006) have studied barriers rising from internal and external environment of the companies. Leonidou (1995) and Morgan (1997) classify export barriers based on those in the internal or external environment and those in the internal or external markets and have categorized them into four groups: internal/internal, internal/external, external/internal and external/external barriers. Leonido (2004) classifies internal barriers into functional, informational, and marketing, while external barriers are classified into procedure, government, task, and environment.

One of the first experimental studies on export barriers has been Alexandrist (1971). He points out that the main problems in initiating exports are increasing competition in foreign markets, lack of export knowledge, misperception of export payment methods, and problems of identifying target foreign markets. Bilkey and Tesar (1977)'s study has been the first investigation into barriers via export stages. In another study, Rabino (1980) focused on real problems and identified perceived barriers.

Most studies have compared export barriers based on the differences between exporters and non-exporters (Burton & Schlegelmilch, 1987; Cheong & Chong, 1988; Leonidou, 1995; Morgan, 1997; Pinho & Martins, 2010). Kaleka and Katsikeas (1995) examined the differences between organized exporters and disorganized exporters. Katsikeas and Morgan (1994) focused on experience in the export market. Morgan and Katsikeas (1998) relate export problems to the company export rate. Some authors have defined export barriers for three groups: non-exporters, marginal exporters, and active exporters (Sharkey et al., 1989). Bilkey and Tesar (1977) and Suarez-Ortega (2003) have focused on developing exports and identifying their barriers.

Development in research has helped researchers document a rich collection of reasons behind companies initiating or expanding exports. Bilkey and Tesar (1977) argue that when companies initiate exports, they encounter the problem of identifying opportunities in foreign markets. Tesfom and Lutz (2006) point out that inadequate knowledge of the foreign market is the most serious problem of agencies in developing countries. Hook and Czinkota (1988) discuss limited knowledge of market intelligence for research in the foreign market. Morgan (1997) argues that a key reason for non-exports is the lack of time management (Rabino, 1980), inadequately trained staff for export (Da Rocha et al., 2008; Yaprak, 1985), and insufficient production ability (Alexandrides, 1971; Yaprak, 1985).

Many SMEs in developing countries have the problem of late and inadequate investment affecting production operations (Tesfom & Lutz, 2006). Bilkey (1978) and Kaynak and Kothari (1984), also, discuss the inability to self-finance as an export barrier. Some export barriers are associated with marketing function, for example the requirements of the quality standards of foreign markets (Bauerschmidth et al., 1985; Pinho & Martins, 2010; Rabino, 1980), product adaptation with foreign markets (Keng &Jiuan, 1989), problems of transportation and distribution (Barker & Kaynak, 1992; Rabino, 1980), creation of a marketing network (Tesfom & Lutz, 2006), product pricing in foreign markets (Da Rocha et al., 2008; Gripsrud, 1990; Morgan &Katsikeas, 1997; Rabino, 1980), logistic problems and after-sale services to foreign customers (Morgan &Katsikeas, 1997), and adjustment of export advertisements. Other scholars believe that a large number of export barriers are rooted in external environment. The nature of these barriers is different to understand: preferences of foreign consumers, unfamiliar business and practice protocols, imposition of tariff barriers, control of legal imports by foreign governments, fierce competition, and exchange rate risk (Tesfom & Lutz, 2006). For example, export procedures

and paperwork (Barker & Kaynak, 1992; Yaprak, 1985), communication problems and cultural differences (Bauerschmidth et al., 1985 ;Gripsrud, 1990; Pinho & Martins, 2010), political instability in foreign markets, competition in export markets (Kaynak et al., 1987), lack of government assistance to overcome export barriers (Bauerschmidth et al., 1985; Yaprak, 1985), different customer habits, and attitude in foreign markets (Shaw & Darroch, 2004) are all barriers to foreign export. While many scholars have provided reasons for export barriers in companies, the present study is comprehensive on the framework provided by Leonidou (2004) classification and identifies various types of export barriers proposed by companies.

Uner et al. (2013) examined export barriers based on company types and different international stages. Results show that perceived barriers are mainly different for companies in the internal marketing stage, pre-export stage, and different born global companies. Sposi (2015) addresses

Table 1
A Classification of Barriers to Export

	Informational		Limited information to locate/analyze market Problematic international market data Identification of foreign business opportunities
Internal	**Functional**		Inability to contact foreign customer Lack of managerial time to deal with exports Inadequate/untrained personal for exporting Lack of excess capacity for export Shortage of working capital to finance exports
	Marketing	**Product**	Developing new product for foreign markets Adopting export product design/style Meeting export product quality standards Meeting export packaging/labeling requirements Offering technical/after sales services
		Price	Offering satisfactory price to customers Difficulty in matching competitors' price Granting credit services to foreign customers
		Distribution	Complexity of foreign distribution channels Access to foreign distribution channels Obtaining reliable foreign representing Maintaining control over foreign middlemen
		Logistics	Difficulty in supplying inventory abroad Unavailability of warehousing facilities abroad Excessive transportation/insurance cost
		Promotion	Adjusting export promotion activities
External	**Procedural**		Unfamiliar export procedures/paperwork Problematic communication with foreign customers Slow collection of payment from abroad
	Governmental		Lack of home government assistance/incentives Unfavorable home rules and regulations
	Task		Different foreign customer habits/attitudes
	Environmental	**Economic**	Keen competition in foreign markets Poor/deteriorated economic conditions abroad Foreign currency exchange risks
		Political-Legal	Political instability in foreign markets Strict foreign rules and regulation High tariff and nontariff barriers
		Socio-Cultural	Unfamiliar foreign business practice Different socio-cultural traits Verbal/nonverbal language differences

Source: Uner et al., 2013

the role of commercial barriers in explaining why service costs are positively correlated with development level in different countries in relation with goods for sale. The findings show that removing business barriers eliminates more than half of the gap in the relative price of services between rich and poor countries with only minimal systematic effect on suitable price of business transactions. Arteaga-Ortiz and Fernández-Ortiz (2010) analyzed 2590 companies using structural equations modeling and classified export barriers in four groups of knowledge, resources, method, and external barriers. Kahiya and Dean (2016) studied 145 companies in New Zealand and analyzed the relationship between export development stages and export barriers for developing export barriers. The barriers derived from the literature are summarized in Table 1.

METHODOLOGY

This research is a quantitative study in the sense that it is a systematic empirical investigation into observable phenomena via statistical, mathematical, or computational techniques (Given, 2008). In order to conduct the research, the literature on "export barriers" was reviewed to explore existing frameworks. Uner et al. (2013)'s study was selected as the main framework for modeling. Based on their barriers, a questionnaire was designed and distributed among 20 honey exporters of Ardabil province (with more than 10 years of experience). They were asked to determine the importance of each barrier based on a 5-point scale from very low (1) to very high (5). According to the statistical analysis, among the 39 barriers, 21 barriers that were assigned with higher importance than the other barriers were considered as the important barriers to design DEMATEL direct relation matrix (Table 2).

In the next step, all 20 experts were asked to determine relation cells and score them proportional to the extent of influence that each raw factor has on each column factor in a 1-10 scale. Combining the individual matrixes into a group matrix resulted in Table 3. Then, the steps of Figure 1 were taken to conduct the research:

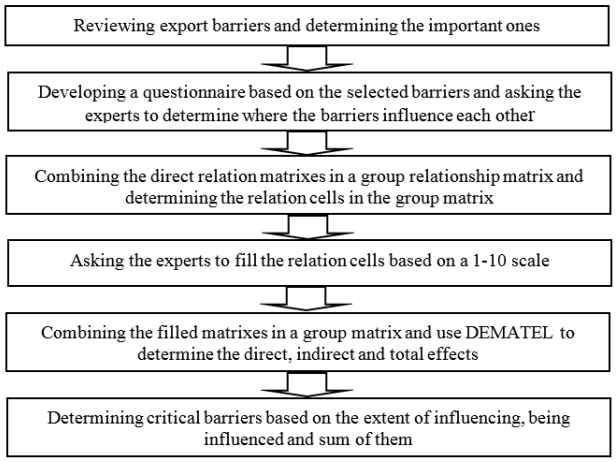

Figure 1. A step by step procedure for conducting the research

DEMATEL is a graph theory-based analysis technique that was first presented by American scientists in Science and Human Affairs Program (SHAP) between 1972 and 1976 to resolve complicated and intertwined problem groups (Wu, 2012). This structural modeling approach adopts the form of a directed graph, a causal-effect diagram, to present the interdependence relationships and the values of influential effects between factors. Through analysis of visual relationship of levels among system factors, all elements are divided into causal or influenced groups, and this can help researchers better understand the structural relationship between system elements and find ways to solve complicate system problems (Zhou et al., 2011). At first, the DEMATEL method focused primarily on the fragmented, and even contradictory, phenomena to find a reasonable solution. With further research, this method has been widely applied in more and more areas. Currently, the DEMATEL method has been applied to many fields, such as brand marketing (Wang &Tzeng, 2012), supplier selection (Chang et al., 2011), KM strategy selection (Wu, 2008), the improvement of the advantages of global managers (Wu & Lee, 2007), the enhancement of emergency management (Zhou et al., 2011) and so on. Moreover, the DEMATEL method is currently applied in many other areas (Huang et al., 2007; Lee & Tzeng, 2009; Lin & Wu, 2008; Liou & Chuang, 2010; Liou & Tzeng, 2007; Sankar & Prabhu, 2001; Tsai & Chou, 2009; Tzeng et al., 2006).

Table 2
More Important Barriers to Export (Extracted from Uner et al., 2013)

Barriers	Indicator
Unfamiliar export procedures/paperwork	(X_1)
Slow collection of payment from abroad	(X_2)
Lack of home government assistance/incentives	(X_3)
Unfavorable home rules and regulations	(X_4)
Different foreign customer habits/attitudes	(X_5)
Poor/deteriorated economic conditions abroad	(X_6)
High tariff and nontariff barriers	(X_7)
Different sociocultural traits	(X_8)
Limited information to locate/analyze market	(X_9)
Problematic communication with foreign customers	(X_{10})
Lack of managerial time to deal with exports	(X_{11})
Lack of excess capacity for export	(X_{12})
Shortage of working capital to finance exports	(X_{13})
Adopting export product design/style	(X_{14})
Meeting export product quality standards	(X_{15})
Meeting export packaging/labeling requirements	(X_{16})
Difficulty in matching competitors' price	(X_{17})
Obtaining reliable foreign representing	(X_{18})
Difficulty in supplying inventory abroad	(X_{19})
Excessive transportation/insurance cost	(X_{20})
Adjusting export promotion activities	(X_{21})

However, this effective structural modeling tool has not yet been used in the field of export barriers. This paper will employ the DEMATEL method to classify barriers influencing honey export and to identify the most important barriers. According to Gabus and Fontela (1972), the steps of the DEMATEL method are as follows:

Finding out the factors which influence the system in question. It is necessary to review a lot of literature to search for and collect relevant information in this phase.

Generating the initial direct-relation matrix from a committee of experts, and acquiring the assessments about the direct effect between each pair of elements. By converting the linguistic assessments into crisp values, we obtain the direct-relation matrix A = [aij], where *A* is an n×n non-negative matrix, and aij indicates the direct impact of factor i on factor j. When i = j, the diagonal elements are zero ($a_{ij} = 0$).

Normalizing the initial direct-relation matrix (D) through Eq. (1). All elements in matrix D are complying with $0 \leq d\_ij \leq 1$, and all principal diagonal elements are equal to 0.

(1)

Acquiring the total-relation matrix T using Eq. (2) in which I is an n×n identical matrix. The element tij indicates the indirect effects that factor i has on factor j, so the matrix T can reflect the total relationship between each pair of system factors.

$$T = D\,(I-D)^{-1} \quad (2)$$

Calculating the sum of rows and columns in matrix T through Eqs. (3) and (4). The sum of row i (ri) represents all direct and indirect influence of factor i on all other factors, so ri can be called the degree of influential impact. Similarly, the sum of column j (cj) can be called the degree of influenced impact, since cj summarizes both the direct and indirect impacts received by factor j from all other factors:

(3)

(4)

Naturally, when $i = j$, the indicator $r_i + c_i$ can

Table 3
Direct-Relation Matrix

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}
X_1	0	6.400	0	0	0	0	4.161	0	0	0	0	0	0	0	0	0	7.320	2.840	0	0	5.250
X_2	0	0	0	0	0	0	0	0	0	0	0	7.126	0	0	0	0	0	0	0	0	7.289
X_3	0	0	0	0	0	0	7.649	0	4.148	4.732	0	8.139	0	0	0	0	0	7.150	0	0	5.615
X_4	7.228	0	8.175	0	0	0	8.487	0	0	0	0	5.340	0	0	0	0	0	5.150	0	0	7.853
X_5	0	0	0	0	0	0	0	0	0	0	0	0	8.910	8.790	8.211	0	0	0	0	0	0
X_6	0	6.520	0	0	2.920	0	0	4.200	0	0	0	0	0	0	0	0	3.710	5.990	0	0	0
X_7	0	6.630	0	0	2.830	0	0	0	0	4.078	0	6.575	0	0	0	7.685	0	0	0	0	6.683
X_8	0	0	0	0	7.460	0	0	0	0	0	0	0	8.490	8.130	7.97	0	0	0	0	0	0
X_9	0	0	0	0	0	0	0	0	0	8.752	0	0	0	0	0	8.360	6.310	2.840	0	0	0
X_{10}	0	0	0	0	0	0	0	0	0	0	0	0	7.980	0	0	0	0	0	0	0	0
X_{11}	3.532	0	5.737	0	0	0	0	0	7.615	0	0	0	0	0	0	0	0	4.130	0	0	7.090
X_{12}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.411
X_{13}	0	0	0	0	0	0	0	0	0	0	0	5.818	0	0	0	0	0	0	0	0	7.093
X_{14}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X_{15}	0	0	0	0	8.640	0	0	0	0	8.360	0	0	0	7.660	0	0	6.823	5.570	0	0	0
X_{16}	0	0	0	0	7.980	0	0	0	0	7.227	0	0	0	7.500	0	0	0	0	0	0	0
X_{17}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.444
X_{18}	0	2.120	0	0	0	0	2.759	0	0	6.126	0	0	0	0	0	0	3.379	0	0	0	0
X_{19}	0	0	0	0	0	0	0	0	0	0	0	5.438	0	0	0	0	0	0	0	0	5.834
X_{20}	0	0	0	0	0	0	0	0	0	0	4.978	0	4.610	0	0	0	6.191	0	0	0	0
X_{21}	0	0	7.463	0	0	0	0	0	0	0	0	5.816	0	0	0	0	0	0	0	0	0

Table 4.
Total Influence Matrix

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}
X_1	0.179	0.000	0.037	0.000	0.010	0.000	0.117	0.000	0.004	0.044	0.000	0.047	0.056	0.013	0.002	0.010	0.046	0.180	0.083	0.000	0.209
X_2	0.000	0.002	0.040	0.000	0.006	0.000	0.009	0.000	0.004	0.014	0.000	0.060	0.178	0.009	0.001	0.025	0.337	0.020	0.037	0.000	0.224
X_3	0.000	0.032	0.047	0.000	0.021	0.000	0.192	0.000	0.103	0.170	0.000	0.098	0.237	0.044	0.004	0.036	0.099	0.042	0.224	0.000	0.267
X_4	0.171	0.071	0.262	0.000	0.026	0.000	0.269	0.000	0.026	0.077	0.000	0.113	0.231	0.027	0.005	0.037	0.098	0.060	0.218	0.000	0.388
X_5	0.000	0.002	0.001	0.000	0.086	0.000	0.002	0.000	0.000	0.086	0.000	0.001	0.001	0.324	0.226	0.211	0.040	0.030	0.000	0.000	0.005
X_6	0.000	0.161	0.011	0.000	0.104	0.000	0.008	0.099	0.001	0.032	0.000	0.032	0.031	0.063	0.041	0.043	0.021	0.097	0.149	0.000	0.617
X_7	0.000	0.160	0.046	0.000	0.079	0.000	0.010	0.000	0.005	0.118	0.000	0.068	0.193	0.049	0.016	0.042	0.221	0.024	0.041	0.000	0.262
X_8	0.000	0.002	0.001	0.000	0.274	0.000	0.002	0.000	0.000	0.096	0.000	0.001	0.001	0.365	0.249	0.242	0.044	0.033	0.000	0.000	0.006
X_9	0.000	0.009	0.007	0.000	0.001	0.000	0.011	0.000	0.001	0.231	0.000	0.015	0.005	0.044	0.000	0.001	0.213	0.150	0.069	0.000	0.039
X_{10}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.189	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X_{11}	0.084	0.022	0.181	0.000	0.005	0.000	0.044	0.000	0.198	0.074	0.000	0.061	0.046	0.016	0.001	0.007	0.059	0.049	0.155	0.000	0.255
X_{12}	0.000	0.001	0.020	0.000	0.000	0.000	0.004	0.000	0.002	0.003	0.000	0.016	0.004	0.001	0.000	0.001	0.002	0.001	0.004	0.000	0.111
X_{13}	0.000	0.008	0.043	0.000	0.029	0.000	0.015	0.000	0.004	0.049	0.000	0.196	0.012	0.042	0.006	0.143	0.182	0.113	0.177	0.000	0.244
X_{14}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X_{15}	0.000	0.009	0.004	0.000	0.223	0.000	0.010	0.000	0.000	0.236	0.000	0.004	0.004	0.289	0.046	0.044	0.183	0.139	0.001	0.000	0.024
X_{16}	0.000	0.000	0.000	0.000	0.205	0.000	0.000	0.000	0.000	0.187	0.000	0.000	0.000	0.271	0.043	0.040	0.008	0.006	0.000	0.000	0.001
X_{17}	0.000	0.001	0.020	0.000	0.000	0.000	0.004	0.000	0.002	0.003	0.000	0.017	0.005	0.001	0.000	0.001	0.002	0.001	0.004	0.000	0.112
X_{18}	0.000	0.061	0.007	0.000	0.006	0.000	0.067	0.000	0.001	0.154	0.000	0.009	0.022	0.031	0.001	0.004	0.096	0.003	0.005	0.000	0.037
X_{19}	0.000	0.001	0.029	0.000	0.001	0.000	0.005	0.000	0.003	0.005	0.000	0.153	0.006	0.001	0.000	0.001	0.003	0.001	0.006	0.000	0.161
X_{20}	0.010	0.004	0.029	0.000	0.004	0.000	0.007	0.000	0.024	0.015	0.118	0.031	0.117	0.007	0.001	0.017	0.174	0.018	0.038	0.000	0.073
X_{21}	0.000	0.006	0.188	0.000	0.004	0.000	0.035	0.000	0.018	0.031	0.000	0.157	0.043	0.118	0.001	0.007	0.018	0.008	0.040	0.000	0.062

X_1: Unfamiliar export procedures/paperwork, X_2: Slow collection of payment from abroad, X_3: Lack of home government assistance / incentives, X_4: Unfavorable home rules and regulations, X_5: Different foreign customer habits/attitudes, X_6 : Poor/deteriorated economic conditions abroad, X_7: High tariff and nontariff barriers, X_8: Different sociocultural traits, X_9: Limited information to locate/analyze market, X_{10}: Problematic communication with foreign customers, X_{11}**:** Lack of managerial time to deal with exports, X_{12}**:** Lack of excess capacity for export, X_{13}**:** Shortage of working capital to finance exports, X_{14}**:** Adopting export product design/style, X_{15}**:** Meeting export product quality standards, X_{16}**:** Meeting export packaging/labeling requirements, X_{17}**:** Difficulty in matching competitors' price, X_{18}**:** Obtaining reliable foreign representing, X_{19}**:** Difficulty in supplying inventory abroad, X_{20}**:** Excessive transportation/insurance cost, X_{21}**:** Adjusting export promotion activities.

Table 5
The Influential and Influenced Impacts of Sub-criteria

Related attributes	Indicator	R_i	C_i	$R_i + C_i$	$R_i - C_i$
Unfamiliar export procedures/paperwork	X_1	1.037	0.444	1.481	0.593
Slow collection of payment from abroad	X_2	0.966	0.552	1.518	0.414
Lack of home government assistance/incentives	X_3	1.616	0.973	2.589	0.643
Unfavorable home rules and regulations	X_4	2.079	0	2.079	2.079
Different foreign customer habits/attitudes	X_5	1.015	1.084	2.099	-0.069
Poor/deteriorated economic conditions abroad	X_6	1.51	0	1.51	1.51
High tariff and nontariff barriers	X_7	1.334	0.811	2.145	0.523
Different sociocultural traits	X_8	1.316	0.099	1.415	1.217
Limited information to locate/analyze market	X_9	0.796	0.396	1.192	0.4
Problematic communication with foreign customers	X_{10}	0.189	1.625	1.814	-1.436
Lack of managerial time to deal with exports	X_{11}	1.257	0.118	1.375	1.139
Lack of excess capacity for export	X_{12}	0.17	1.079	1.249	-0.909
Shortage of working capital to finance exports	X_{13}	1.263	1.192	2.455	0.071
Adopting export product design/style	X_{14}	0	1.904	1.904	-1.904
Meeting export product quality standards	X_{15}	1.216	0.643	1.859	0.573
Meeting export packaging/labeling requirements	X_{16}	0.761	0.912	1.673	-0.151
Difficulty in matching competitors' price	X_{17}	0.173	1.846	2.019	-1.673
Obtaining reliable foreign representing	X_{18}	0.504	0.975	1.479	-0.471
Difficulty in supplying inventory abroad	X_{19}	0.376	1.251	1.627	-0.875
Excessive transportation/insurance cost	X_{20}	0.687	0	0.687	0.687
Adjusting export promotion activities	X_{21}	0.736	3.097	3.833	-2.361

represent all effects received by factor i. On the contrary, $r_i - c_i$ shows the net effect that factor i has on the whole system. Specifically, if the value of $r_i - c_i$ is positive, factor i is a net cause, exposing net causal effect on the system. When $r_i - c_i$ is negative, the factor is a net result clustered into effect group.

Constructing cause-effect relationship diagram based on $r_i + c_j$ and $r_i - c_j$. A cause-effect diagram can be drawn by mapping the dataset of $(r_i + c_j, r_i - c_j)$.

Empirical Example

Based on Uner et al. (2013), the barriers to export include 39 barriers. Based on the 21 more important barriers resulted from the statistical analysis of the questionnaires, another survey was conducted to determine their interrelationships. The degrees to which barriers have direct impacts on one another were asked

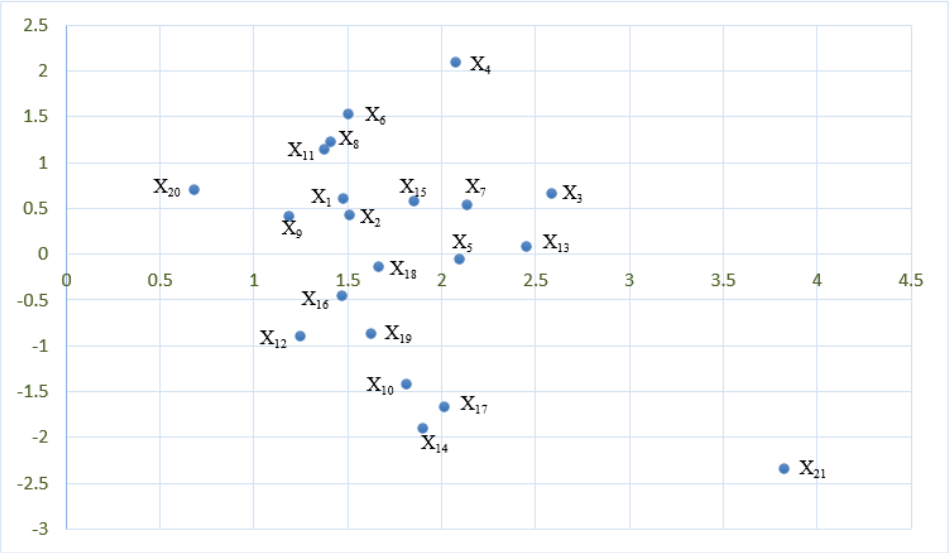

Figure 2. The cause-effect relationship diagram

from experts and filled in relation cells based on a 1-10 scale. Combining the individual matrixes into a group matrix based on the geometric mean, the initial direct-relation matrix (Table 3), the normalized direct-relation matrix, and the total-relation matrix (Table 4) were acquired by using Eqs. (1) and (2). In addition, the influential and influenced impacts (Table 5) were determined using Eqs. (3) and (4). Finally, the cause-effect relationship diagram (Figure 2) was acquired by mapping the dataset of $r_i + c_i$ and $r_i - c_i$.

As shown in Figure 2, all the important barriers are visually divided into two groups according to whether their value of ri - ci is positive or negative (Zhou et al., 2011). So, the cause group with the positive ri - ci value includes: unfamiliar export procedures/paperwork (X_1), slow collection of payment from abroad (X_2), lack of home government assistance/incentives (X_3), unfavorable home rules and regulations (X_4), poor/deteriorated economic conditions abroad (X_6), high tariff and nontariff barriers (X_7), different sociocultural traits (X_8), limited information to locate/analyze market (X_9), lack of managerial time to deal with exports (X_{11}), shortage of working capital to finance exports (X_{13}), meeting export product quality standards (X_{15}), and excessive transportation/insurance cost (X_{20}). Other factors, including different foreign customer habits/attitudes (X_5), problematic communication with foreign customers (X_{10}), lack of managerial time to deal with exports (X_{11}), lack of excess capacity for export (X_{12}), adopting export product design/style (X_{14}), meeting export packaging/labeling requirements (X_{16}), difficulty in matching competitors' price (X_{17}), obtaining reliable foreign representing (X_{18}), difficulty in supplying inventory abroad (X_{19}) and adjusting export promotion activities (X_{21}), situate in the effect group since their $r_i - c_i$ value is negative. There are many other valuable clues, which can be obtained from Fig. 2, that facilitate decision-making.

Among all barriers in cause group, 'unfavorable home rules and regulations' (X_4) has the highest *ri - ci*, which means that X_4 dispatches more impact on the whole system than it receives from other barriers. Besides, Table 5 shows that the degree of influential impact of X_4 is 2.079, which ranks first among all causal barriers. It is indicated that X_4 is a critical barrier that worth much more attention. The barriers having the next highest ri among cause group are 'lack of home government assistance/incentives' (X_3), 'poor/deteriorated economic conditions abroad' (X_6) and 'high tariff and nontariff barriers' (X_7), whose net effect scores ri are 1.616, 1.510 and 1.334, respectively. The impact that these barriers dispatch to the whole system is great. So, evidence suggests them as critical barriers.

The $r_i - c_i$ scores of X_1, X_2, X_8, X_9, X_{11}, X_{13}, X_{15} and X_{20} are positive, which suggests that these barriers are net cause barrier for the whole system. But their ri scores are normal or low, so these barriers do not have enough power to improve the system, and therefore are not critical barriers.

Among all 21 barriers, 'adjusting export promotion activities' (X_{21}) has the lowest ri - ci score. As can be observed in Table 5, the ri - ci score of X_{21} is -2.361. To further illustrate this phenomenon, the degree of influenced impact ci is 3.097, the highest among all system barriers. This suggests that although it is a net receiver, it has an apparent impact on other barriers and on the whole system. So, considering the important position of X_{21} in system, we identify it as a critical barrier. Additionally, among other barriers in effect group, the degree of influenced impact ci of 'adopting export product design/style' (X_{14}), 'difficulty in matching competitors price' (X_{17}) and 'problematic communication with foreign customers' (X_{10}) are 1.904, 1.846 and 1.625, respectively. So, due to their significant degree of influenced among effect barriers, they are critical for the system.

Because, X_5's influential impact is low and the impact it receives from other barriers is low to normal, which leads to negative value of $r_i - c_i$, X_5 does not have enough power to improve the system, and therefore is not critical. Meanwhile X_{11}, X_{12}, X_{16}, X_{18} and X_{19} cannot be identified as CSF for similar reasons.

Finally, we identify 'adjusting export promotion activities' (X_{21}) as the most critical barrier to

export of honey since it has the highest score (3.833). The other critical barriers based on the $r_i + c_i$ index are X_3, X_{13}, X_7, X_5, X_4, X_{17}, respectively. Among these, X_{21}, X_3, X_7, X_4, and X_{17} have beet already distinguished as critical barriers. The impacts that 'high tariff and nontariff barriers' (X_5) and 'shortage of working capital to finance exports' (X_{13}) dispatch to the whole system (r_i) or receive from it (c_i) are normal, but the outcome of the impacts ($r_i + c_i$) are high. So, we identify X13 and X5 as critical barriers due to their high ri + ci scores (2.455 and 2.099).

CONCLUSION

The developing countries should expand their exports in order to improve. But most of the companies in developing countries, such as Iran, encounter many export barriers while entering the markets of developed countries. This paper has proposed a graph theory-based method (DEMATEL) to identify critical barriers to honey export of Ardabil province, Iran. The procedure presented in this paper provides a relevant model to identify critical barriers among various influencing elements. In order to determine the importance of export barriers, Uner et al. (2013)'s export barriers were used and 21 more important barriers were categorized into the cause and effect groups, and a visible cause-effect relationship diagram was constructed.

Export barriers in each country depend on culture, power of companies, rules, and government regulations. In this study, 'adjusting export promotion activities' was identified as the most important export barrier of Iran. In some studies (Kaleka &Katsikeas, 1995; Morawitz, 1981; Figueiredo & Almeida, 1988), this factor is also considered as an important export barrier. 'Lack of home government assistance/incentives' was ranked second among export barriers. Also, New Zealand companies consider lack of governmental support and financial problems as barriers to export. Shaw and Darroch (2004) also introduced financial problems and lack of government assistance as the main export barriers. In this study, 'shortage of working capital to finance exports' was ranked as the third important barrier to Iranian exporters. Kaleka and Katsikeas (1995) and Bodur (1986) reported the same results. The fourth barrier was found to be 'high tariff and nontariff barriers'. Altintas et al. (2007) considers tariff and procedure problems as the main export barriers of Turkey. 'Different foreign customer habits/attitudes' was ranked the fifth barriers to honey export in Iran. Understanding the habits of foreign customers requires different kinds of data gathered from foreign markets. Da Rocha and Christensen (1994) and Alexandrides (1971) considered failure in identifying customer habits as the main export barrier. 'Unfavorable home rules and regulations' was ranked sixth, and difficulty in matching competitors' price was ranked seventh among barriers to honey export between Iranian companies. Kaleka and Katsikeas (1995) considered price competition in foreign markets as the main export barrier. But, based on Uner et al. (2013), this factor is not considered to be an export barrier in Turkish companies. 'Adopting export product design/style' was ranked the last. This factor is introduced as an export barrier in Brooks and Frances (1991), and problematic communication with foreign customers falls into the ninth level. The findings will be useful for academic and practitioners to implement barriers to export in other products.

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