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Analyzing the Competitiveness of Iran's Food and Beverage Industries Using Porter's Diamond Model

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Abstract

The burgeoning global population fuels a rising demand for food, necessitating careful examination of the food supply chain and its operations. This surge in demand intensifies global competition within the food industry, driven by heightened consumer awareness. In Iran, the food and beverage industries have consistently strived to address these critical concerns and foster an environment for improvement. Despite facing numerous challenges, the industry has demonstrated resilience and achieved a degree of development. However, a scientific assessment of the industry's competitiveness requires a rigorous analysis utilizing established methodologies. This research employs Porter's Diamond Model to evaluate the competitive landscape of Iran's food and beverage industries. Data for this study were collected through a questionnaire in 2022. The findings reveal that while competitiveness within the food and beverage industry appears to be generally favorable regarding basic factors, approximately 43% of the factors investigated exhibit weaknesses. This suggests a potential risk of losing competitive ground, particularly if the industry fails to cultivate an environment characterized by "appropriate strategy, structure, and competition." Moreover, more effective measures are crucial to enhance support from related industries. The role of government intervention and the impact of unforeseen events must also be considered for further industry improvement.

Keywords

Competitiveness, Porter's Diamond, Food and Beverage Industry

1. Introduction

The rapid growth of the global population is driving an increased demand for food, making it imperative to closely scrutinize the food supply chain and its operations (Bosona & Gebresenbet, 2013). Technological advancements over the past century have significantly invigorated this sector. Consequently, the global food industry has transformed into a highly competitive arena, driven by escalating consumer awareness regarding their dietary choices. These discerning consumers prioritize convenience, variety, adequate shelf life, low-calorie options, and minimal environmental impact (Priyadarshini et al., 2019). In today's dynamic market, success hinges on a company's ability to effectively influence consumer preferences and behaviors. Competition within the food industry intensifies daily, making competitiveness a paramount factor in assessing success across political, economic, and commercial spheres. An industry can only achieve a competitive edge and generate superior value compared to rival industries within competitive markets by maintaining a strong alignment with national environmental factors and striking a harmonious balance between its internal forces. Iran's food and beverage industries have consistently strived to address these critical concerns and foster an environment for development. Despite facing numerous challenges, the industry has demonstrated resilience and experienced significant growth, establishing itself as a major source of employment within the Iranian economy. According to the National Document of Land Planning of Iran (National document of land planning of Iran, 2020), food product manufacturing accounts for 16.2% of industrial workshop employment in the country. This highlights the industry's crucial role in mitigating unemployment within the nation. Furthermore, by establishing processing industries, increasing the number of stages in raw material processing, and integrating these processes with other products, the industry can significantly enhance product value. This research aims to comprehensively evaluate the competitiveness of the Iranian food industry at the national level, utilizing Porter's Diamond Model as the analytical framework. Extensive literature reviews have consistently emphasized the significance of competitiveness across various studies at different national levels, within specific industries, and at the individual business level. Numerous studies examining competitive advantage at the global level have cited Porter's Diamond Model (Aghdaie et al., 2012; Bakan & Dogan., 2012; Grant, 1991; Hamidzadeh et al., 2013; Hopkins, 2008; Hosseini & Roz Bahane., 2011; Hwang et al., 2015; Jafari et al., 2020; Khodadad Hosseini, 2017; Khodadad Hosseini et al., 2011; Khodamoradi et al., 2012; Kincaid, 2005; Mohammadzadeh et al., 2020; Rodrigues & Khan, 2015; Sebt & Mokhtariani, 2016; Stone & Ranchhod, 2006), recognizing it as a fundamental framework for analyzing national competitive advantage. Porter first introduced the concept of competitive advantage in his seminal work, "The Competitive Advantage of Nations," published in the 1990s. This book emphasizes that for a country to achieve global trade success, solely relying on apparent relative advantages is insufficient. Instead, economies must proactively create advantages by

thoroughly understanding their unique circumstances, industry structures, and capacity-building potential. By fostering a conducive global platform and competitive environment, while providing effective government guidance, nations can empower economic actors to carve out new domains in international trade. According to Porter, two primary factors determine profitability within a business market: the industry structure within which the business operates and the competitive positioning of the business within that specific industry. Industry structure defines the value generated by the economic activities of industry members and their ability to distribute this generated wealth (Porter, 1990a, 1990b; Porter, 1997; Porter, 1998; Smit, 2010). This research, building upon Porter's framework, evaluates the structure of the food and beverage sector and endeavors to identify the key strengths of the Iranian industry through the application of this practical model. Incorporating insights from global studies, this research contextualizes Iran's food industry challenges within an international framework. The review also emphasizes the impact of foreign investment, export policies, and government intervention on industry performance.

2. Methodology

This research employed Porter's Diamond Model to examine the competitiveness of the food and beverage industries. As illustrated in **Figure 1**, the forces introduced by Porter determine the attractiveness and competitiveness of an industry within competitive markets. According to Porter, these factors influencing corporate activities can be categorized into six primary elements:

- Factor Conditions;
- Demand Conditions;
- Related and Supporting Industries;
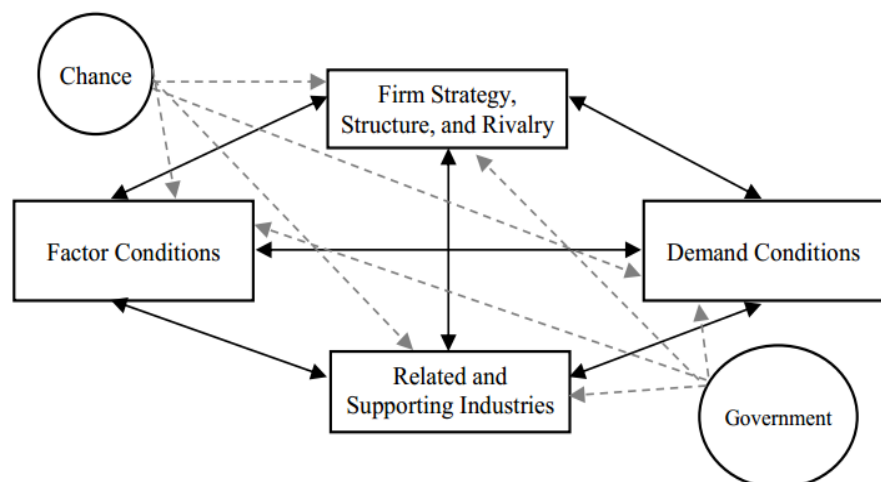- Firm Strategy, Structure, and Rivalry;
- Government;
- Chance.

Figure 1. Porter's diamond model.

Initially, Porter proposed four groups of national attributes (factor conditions, demand conditions, related and supporting industries, firm strategy, structure, and rivalry), collectively forming the "national diamond." This framework was later expanded to incorporate the factors of "chance" and "government" (Zhao et al., 2011). Porter emphasizes that this model represents a self-reinforcing system, meaning that the state of each element within the national diamond significantly influences the condition of the other elements (Wonglimpiyarat, 2018).

Porter's Diamond Model is a two-way interactive system where the impact of each factor on a nation's competitive advantage in a particular industry is contingent upon the status and conditions of other factors. This model effectively illustrates the intricate interdependencies among key variables within competitive nations. The Diamond Model is inherently dynamic and evolves over time. Moreover, an advantage in one factor can create and amplify advantages in other factors. Crucially, the Diamond Model emphasizes the profound influence of micro-environmental factors on industry competitiveness.

According to this model, the two external factors – government and chance – exert an indirect influence on the four primary factors. By impacting these primary factors, government policies and unforeseen events can significantly affect overall competitiveness (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Sebt & Mokhtariani, 2016):

1) **Factor Conditions:** This encompasses the factors involved in the production of goods or services, including raw materials, their quality and availability, skilled and unskilled labor, labor productivity and innovation, infrastructure, technology, capital, and the managerial capabilities essential for global competitiveness. These factors are typically categorized into two groups: general factors (raw materials, energy, and unskilled labor) and specialized factors (skilled and specialized labor, advanced technical knowledge, and advanced technology). It is crucial to recognize that these factors, which underpin competitive advantage, are generally not inherited but rather developed and nurtured by a nation (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Sebt & Mokhtariani, 2016).

2) **Domestic Demand Conditions:** Domestic demand conditions define the nature and characteristics of demand within domestic markets for a specific industry's products. The size and growth rate of domestic demand exert a significant influence on a nation's industrial competitiveness. Porter contends that a robust and expanding domestic market incentivizes investors to invest in technological advancements and enhance efficiency, thereby fostering a competitive advantage. Conversely, small and slowly growing domestic markets may compel companies to actively seek export opportunities. Three key characteristics of domestic demand are crucial for achieving a competitive advantage: the "composition of domestic demand," the "size and growth pattern of domestic demand," and the "mechanisms by which domestic demand directs a country's goods and services to foreign markets" (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Sebt & Mokhtariani, 2016).

3) Related and Supporting Industries: Related and supporting industries play a pivotal role in influencing a nation's competitive advantage. These industries can encompass suppliers of raw materials or equipment, distributors and retailers, distribution systems, research institutions, financial services such as banks and stock exchanges, transportation systems, universities, research centers, and industries that utilize similar technologies, raw materials, or laboratory facilities. Collaboration and interaction with these industries and institutions are essential for the development and refinement of products and services, ultimately enhancing overall competitiveness (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Mehrizi & Pakneit, 2008; Sebt & Mokhtariani., 2016).

4) Firm Strategy, Structure, and Rivalry: The nature and intensity of competition within an industry, along with the organizational structures and management approaches employed by firms, significantly influence a nation's competitive advantage. Consequently, the structures and strategies adopted by firms and industries have a direct impact on their performance and competitiveness (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Sebt & Mokhtariani, 2016).

5) Government Role: Government policies play a pivotal role in shaping a nation's competitiveness. Through its interventions in political, economic, and social spheres, as well as the implementation of laws and regulations, government policies can exert both positive and negative impacts on competitiveness. Monetary, fiscal, and trade policies, tax laws, support policies, administrative and organizational policies, import and export regulations, exchange rates, money supply, interest rates, inflation, government spending, and macroeconomic decisions, as well as formal and informal agreements among political authorities, and the establishment or termination of trade relations with other countries, constitute some of the most significant factors influencing the competitiveness of firms, industries, and nations, and are directly linked to government actions (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Sebt & Mokhtariani., 2016).

6) Chance: Chance plays a significant role in shaping the competitive landscape. Chance refers to events that occur beyond the control of firms, industries, and often, governments. Unforeseen events are occurrences that impact competitiveness – either positively or negatively – but happen randomly and outside the control of businesses, industries, and even governments. Unexpected events such as natural disasters, wars, economic sanctions, oil shocks, economic-political crises, or technological breakthroughs exemplify unforeseen occurrences (Ebrahimi et al., 2013; Khodadad Hosseini, 2017; Sebt & Mokhtariani, 2016).

To assess the competitiveness of the food and beverage industry in Iran based on Porter's Diamond model, a questionnaire-based data collection method was employed. The questionnaire comprised 47 items designed to evaluate the four factors of Porter's Diamond model, utilizing a five-point Likert scale (1: very weak, 5: very good) to measure the variables. To ensure the accuracy of the results, both academic and industry practitioners, including producers, managers, and stakeholders, were invited to participate in the questionnaire completion process. A

total of 13 experts in the field completed the questionnaires. It is worth noting that for this type of research, the opinions of 10 - 15 experts are generally considered sufficient (Sebt & Mokhtariani, 2016).

3. Results and Discussion

The results of the competitiveness assessment of the Iranian food and beverage industry are presented in **Tables 1-7**. To evaluate the status of each component, an average score was calculated. Based on the 5-point Likert scale of the questionnaire, a mean score above 3 indicates a favorable condition, a mean score of 3 indicates a neutral condition and a mean score below 3 indicates an unfavorable condition.

Table 1. Situation of factor conditions of the food and beverage industry.

Row	Basic factors	Average
1	Natural resource abundance	3.85
2	Low costs of energy and other inputs	3.46
3	Labor productivity	3.08
4	The skill level and diversity of the workforce	3.46
5	The capacity for innovation & research and develop	3.31
6	The capacity for international competitiveness	3.38
7	The capacity of the technology level to develop and create products	3.15
8	The capacity of the technology level to perform various business processes	3
9	The capacity of the technological level in the equipment and factories	3.46
10	The capacity of the technology level obtained from higher education institutions	2.85
11	The required standards of global consumer markets	3.54
12	The capacity of specialized associations related to the food and beverage industries	2.85
13	The capacity of higher education institutions	2.46
14	The capacity of necessary and basic infrastructure	3

(Resource: research findings).

As shown in **Table 1**, nine out of the 14 components exhibit scores greater than 3, indicating favorable conditions. The highest score, 3.85, corresponds to the "abundance of natural resources and raw materials required by industry." The average values of the other main factors in the table indicate that two factors: "The capacity of the technology level to perform various business processes" and "The capacity of necessary and basic infrastructure" are in a neutral state, while three factors: "The capacity of the technology level obtained from higher education institutions," "The capacity of specialized associations related to the food and beverage industries," and "The capacity of the higher education institutions" are in

an unfavorable state with average scores of 2.85, 2.85, and 2.46, respectively. In other words, the industry has a competitive advantage in terms of natural resources and raw materials, as shown by the high scores in resource abundance (3.85) and low-cost energy (3.46). However, limitations in technological capacity, skilled labor, and higher education institutions indicate a need for investment in research and development. The lack of collaboration between industry and academia, as well as insufficient funding for innovation, hinders long-term growth.

According to the results of **Table 2**, the country appears to be in a favorable situation regarding factors related to the demand conditions of the food and beverage industry, with all components exhibiting scores above 3. Specifically, "The level of customer needs relating to product quality" and "The level of customer needs relating to product services" achieved the highest scores, averaging 3.77 and 3.62, respectively. A strong domestic market exists, with increasing demand for quality and innovation. However, economic instability and inflation negatively impact consumer purchasing power.

Table 2. The situation of demand conditions of the food and beverage industry.

Row	Basic factors	Average
1	The quantity of demand & its growing	3.54
2	Stability of demand and purchasing power of consumers	3.08
3	Trading volume	3.31
4	The level of customer needs relating to product quality	3.77
5	The level of customer needs relating to the product price	3.46
6	The level of customer needs relating to the product services	3.62
7	The level of customer needs relating to product delivering	3.31
8	The qualitative level of contractual relations and how to implement them	3.15

(Resource: research findings).

Regarding related and supporting industries, as presented in **Table 3**, the average scores of four out of seven components indicate an unfavorable condition, suggesting a weakness in this area. The lowest score is associated with "The situation of bank transactions and money transfers," with an average of 1.54, which has been significantly impacted by sanctions against the country, particularly at the international level. Furthermore, "Access to banking facilities and a variety of financing options" was reported to be in an undesirable state, with an average score of 2.31. Limited financial services and export facilitation remain significant concerns. Weak banking infrastructure, lack of trade financing, and restrictive export policies hinder competitiveness.

Regarding the "strategy, structure, and competition" status of the food and beverage industries in the country, the findings indicate that four out of five components exhibit unfavorable scores, as shown in **Table 4**. The most critical issue

pertains to the "Level of cooperation with foreign companies and access to the expert workforce in the export sector" with an average score of 2.14. Following this, "Supporting laws and regulations to invest" with an average score of 2.29 is the second area of concern. "Understanding the producers of international markets and world economic developments" and "proximity of the food and beverage industries to cooperate" also demonstrate unfavorable conditions. Only "The level of competition between the food and beverage companies" with an average score of 3.29 appears to be in a suitable state. So, Iran's industry struggles with fragmented competition, regulatory inefficiencies, and limited international collaboration.

Table 3. The situation of the related and supporting industries of the food and beverage industry.

Row	Basic factors	Average
1	The existence of the related and supporting industries	3.38
2	Sufficiency of the related and supporting industries in terms of quantity	3.08
3	Access to local suppliers in the related industries	3.31
4	The existence of powerful export organizations	2.85
5	Access to banking facilities and a variety of financing options	2.31
6	The situation of bank transactions and money transfers	1.54
7	Competitiveness of the related and supporting industries	2.38

(Resource: research findings).

Table 4. The situation of strategy, structure, and rivalry of the food and beverage industry.

Row	Basic factors	Average
1	Understanding the producers of international markets and world economic developments	2.43
2	The level of competition between the food and beverage companies	3.29
3	Supporting laws and regulations to invest	2.19
4	The level of cooperation with foreign companies and access to the expert workforce in the export sector	2.14
5	proximity of the food and beverage industries to cooperate	2.58

(Resource: research findings).

One of the factors later added to the Porter Diamond model is the role of governments, which indirectly influence the four primary factors and can also affect competitiveness through their impact on these factors. Overall, as reflected in **Table 5**, the status of government-related components reveals that six out of the eight components are in an undesirable state. The "inflation rate" with a score of 2.69 presents the most critical situation within this group. Within this group, only two factors: "Currency fluctuations for the trading of the products" and "Removing

the preferred currency of inputs such as livestock and poultry inputs, etc." demonstrate a favorable status. Government policies play a mixed role in competitiveness. While tariff protections exist, currency fluctuations and bureaucratic inefficiencies pose challenges. Reforms in trade policies, improved regulatory frameworks, and incentives for foreign direct investment (FDI) could enhance sectoral competitiveness.

Table 5. The role of government in the food and beverage industry.

Row	Basic factors	Average
1	Applying preferential tariffs to export the products	2.92
2	Currency fluctuations for the trading of the products	3.38
3	Removing the preferred currency of inputs such as livestock and poultry inputs, etc.	3.38
4	Allocation of incentives in food and beverage industries	2.75
5	Government tax policies regarding manufacturing companies	2.85
6	Interest rate	2.92
7	Inflation rate	2.69
8	Other Policies	2.83

(Resource: research findings).

Chance events, which are indirectly incorporated within the Porter Diamond model, remain unpredictable and can significantly impact the four primary components. Table 6 illustrates the negative impacts of accidental events on the food and beverage industry, specifically affecting "Technological changes," "Sanctions," and "Political decisions of foreign governments." The most adverse effects were observed for "Political decisions of foreign governments," averaging 2.77.

Table 6. The role of chance in the food and beverage industry.

Row	Basic factors	Average
1	Price fluctuations	3.15
2	Environmental effects such as water scarcity and climate change	3
3	Technological changes	2.92
4	Sanctions	2.85
5	Political decisions of foreign governments	2.77

(Resource: research findings).

Table 7 presents average scores across various factors in the food and beverage industries. The lowest score, 2.38, corresponds to "strategy, structure, and rivalry," reflecting an undesirable situation. The next unfavorable score is 2.69 for "Related and supporting industries." Additionally, "the role of chance" and "the

government roles" also indicate adverse conditions. Conversely, "domestic demand conditions," with an average score of 3.40, and "internal factor conditions," at 3.20, show favorable situations.

**Table 7.** The situation of various factors in the food and beverage industry of the country.

Row	Basic factors	Average
1	Factor conditions	3.2
2	Demand conditions	3.4
3	Related and supporting industries	2.69
4	Strategy, structure, and rivalry	2.38
5	The role of government	2.97
6	The role of chance	2.94

(Resource: research findings).

Additionally, a separate question in Porter's Diamond model questionnaire assessed the impact of removing the preferential exchange rate and price liberalization on each sub-sector of the food and beverage industry. The consensus among experts was that this policy would hurt all sub-sectors, and the degree of this impact was moderate.

4. Conclusion

An analysis of the food and beverage industry's competitive landscape in Iran reveals a mixed picture. As summarized in **Figure 2**, the results presented in **Tables 1-6** indicate that while the competitiveness of the food and beverage industry appears favorable based on the assessed components, with more than
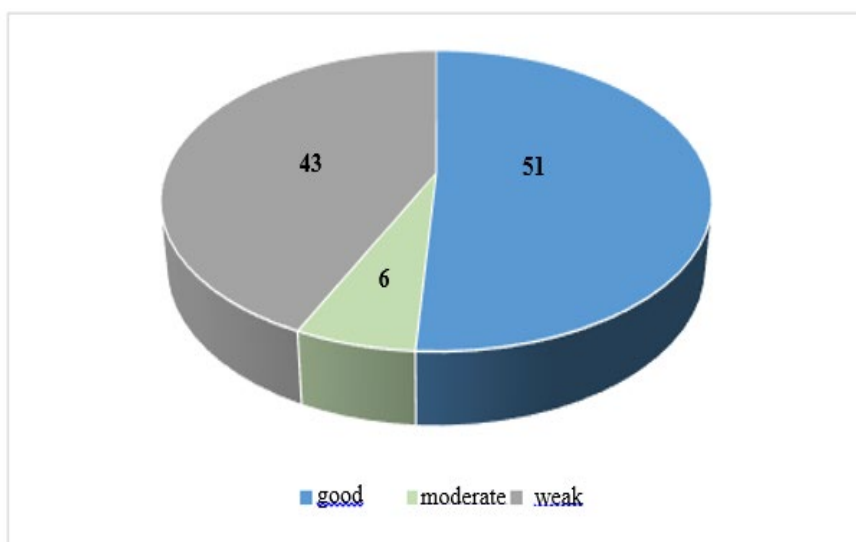
(Resource: research findings).

Figure 2. The situation of competitiveness of Iran's Food and Beverage Industry (percent).

half of the assessed components deemed satisfactory, it faces significant challenges. Approximately 43% of the factors are in an unfavorable state, and 6% are in a neutral state. Therefore, there is a risk of losing the industry's competitive position, particularly if the industry fails to foster an environment of appropriate strategy, structure, and competition. Furthermore, more effective actions are crucial to enhance the performance of related and supporting industries. The role of the government and the impact of unforeseen events are also critical factors for enhancing competitiveness.

In other words, successful strategies are crucial to address these challenges and bolster industry performance. Government involvement and the impact of unforeseen events are also critical factors for enhancing competitiveness. Without proactive measures, the industry may lose its competitive edge. Furthermore, Iran's food and beverage industry faces a mix of strengths and challenges in its competitive landscape. Strategic policy reforms improved financial and export mechanisms, and increased investment in technology and education can enhance the industry's competitiveness. Strengthening trade policies and fostering international collaborations could also support long-term growth.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Amiri Aghdaie, S. F., Seidi, M., & Riasi, A. (2012). Identifying the Barriers to Iran's Saffron Export by Using Porter's Diamond Model. *International Journal of Marketing Studies, 4,* 129. https://doi.org/10.5539/ijms.v4n5p129

Bakan, I., & Dogan, I. F. (2012). Competitiveness of the Industries Based on the Porter's Diamond Model: An Empirical Study. *International Journal of Research and Reviews in Applied Science, 11,* 441-455.

Bosona, T., & Gebresenbet, G. (2013). Food Traceability as an Integral Part of Logistics Management in Food and Agricultural Supply Chain. *Food Control, 33,* 32-48. https://doi.org/10.1016/j.foodcont.2013.02.004

Ebrahimi, A., Jafari, Z., Ahmadi, A., & Nasrolahi Vosta, L. (2013). Performance Evaluation of Stone Export. *Journal of Strategic Management Studies, 4,* 163-187. (In Persian)

Grant, R. M. (1991). Porter's "Competitive Advantage of Nations": An Assessment. *Strategic Management Journal, 12,* 535-548. https://doi.org/10.1002/smj.4250120706

Hamidzadeh, M. R., Farsijani, H., & Moghaddas, P. (2013). Dredging Industry Attractiveness Measurement and Analysis in Iran through Porter's Five Competitive Forces. *Journal of Industrial Management Perspective (JIMP), 2,* 35-60. (In Persian)

Hopkins, H. (2008). Applying Michael Porter's Extended Rivalry Model to the Robotics

Industry. *Industrial Robot: An International Journal, 35,* 397-399.
https://doi.org/10.1108/01439910810893563

Hosseini, M., & Roz Bahane, D. (2011). Developing Porter's Pattern of Competitive Advantage and Its Application in the Petroleum Industry of Iran. *Strategic Management Studies, 2,* 63-82. (In Persian)

Hwang, B. N., Lin, G. T., Hsieh, P. S., & Hsi, P. H. (2015). Development of a Cause- and Effect Model for Analyzing the National Competitiveness of the Electric Vehicle Industry. *Journal of Scientific & Industrial Research, 74,* 605-608.

Jafari, A., Hasanpour, E., Mirabi, V. R., & Ahmadi, F. (2020). Study and Analysis of the Role of External Factors of the National Diamond Model by Michael Porter in Get, Preservation, and Development of Competitive Power (Case Study: Ports and Maritime of Bushehr). *Journal of Transportation Research, 16,* 55-73. (In Persian)

Khodadad Hosseini, H. (2017). Measuring Iran's Efficiency in Competitive Advantage Compared to Selected Countries and its Sensitivity Analysis in Contrast to Pioneer Countries in the World and the Area. *Commercial Strategies, 23,* 29-42. (In Persian)

Khodadad Hosseini, H., Azar, A., & Esmaeli, S. (2011). Measuring Relative Efficiency of Competitive Advantage Iranian Using Quantitative Porter Diamond Model, Comparing to Selective Countries-DEA Approach. *Journal of Business Management, 3,* 91-112. (In Persian)

Khodamoradi, S., Jamali, A., Ebrahimi, A., & Afkhami, A. (2012). A Model for Measuring the Competitiveness of Industries in Iran's Capital Market Based on Porter 5F's Model: Using the Herfindahl-Hirschman Index. *Iranian Journal of Trade Studies, 15,* 101-134. (In Persian)

Kincaid, B. L. (2005). *The Competitive Advantage of the Cluster Within Lesser Developed Countries of the South Pacific: An Empirical Case Study Extending the Porter Diamond Model.* Doctoral Dissertation, Capella University.

Mehrizi, M. H. R., & Pakneit, M. (2008). Comparative Analysis of Sectoral Innovation System and Diamond Model (the Case of Telecom Sector of Iran). *Journal of Technology Management & Innovation, 3,* 78-90. https://doi.org/10.4067/s0718-27242008000100008

Mohammadzadeh, H., Karbasi, A., & Mohammadi, H. (2020). Analysis of Competitiveness of Iran's Saffron Exporting Companies in Global Markets. *Saffron Agronomy and Technology, 8,* 261-276. (In Persian)

National Document of Land Planning of Iran (2020).

Porter, M. E. (1990a). *On Competition: A Harvard Business Review Book.* Harvard Business School Publishing.

Porter, M. E. (1990b). *The Competitive Advantage of Nations.* Basic Books.

Porter, M. E. (1997). How Competitive Forces Shape Strategy. *Harvard Business Review, 57,* 137-145.

Porter, M. E. (1998). *Competitive Advantage Creates and Sustains Superior Performance.* Free Press.

Priyadarshini, A., Rajauria, G., O'Donnell, C. P., & Tiwari, B. K. (2019). Emerging Food Processing Technologies and Factors Impacting Their Industrial Adoption. *Critical Reviews in Food Science and Nutrition, 59,* 3082-3101.
https://doi.org/10.1080/10408398.2018.1483890

Rodrigues, G., & Khan, Z. R. (2015). Competitiveness of Clothing Industry Based on Porter's Diamond Model: SAFTA Countries. In *Proceedings of Academics World International Conference* (pp. 18-23). International Institute of Engineers and Researchers.

Sebt, M. H., & Mokhtariani, M. (2016). Analysis of Construction Industry in Iran and Giving Recommendations for Improving Its Competitiveness. *Amirkabir Journal of Civil Engineering, 48,* 111-119. (In Persian)

Smit, A. J. (2010). The Competitive Advantage of Nations: Is Porter's Diamond Framework a New Theory That Explains the International Competitiveness of Countries? *Southern African Business Review, 14,* 105-130.

Stone, H. B. J., & Ranchhod, A. (2006). Competitive Advantage of a Nation in the Global Arena: A Quantitative Advancement to Porter's Diamond Applied to the UK, USA and BRIC Nations. *Strategic Change, 15,* 283-284. https://doi.org/10.1002/jsc.770

Wonglimpiyarat, J. (2018). The Role of Government in Porter's Diamond Model: Comparative Cases of Singapore and Thailand. *International Journal of Technology, Policy and Management, 18,* 73-88. https://doi.org/10.1504/ijtpm.2018.10008887

Zhao, Z., Zhang, S., & Zuo, J. (2011). A Critical Analysis of the Photovoltaic Power Industry in China—From Diamond Model to Gear Model. *Renewable and Sustainable Energy Reviews, 15,* 4963-4971. https://doi.org/10.1016/j.rser.2011.07.057