# Exploring Socio-Economic Barriers of Green Entrepreneurship in Iran and Their Interactions Using Interpretive Structural Modeling

Younis Jabarzadeh, Rahim Sarvari, Negar Ahmadi Alghalandis

*Abstract*—Entrepreneurship at both individual and organizational level is one of the most driving forces in economic development and leads to growth and competition, job generation and social development. Especially in developing countries, the role of entrepreneurship in economic and social prosperity is more emphasized. But the effect of global economic development on the environment is undeniable, especially in negative ways, and there is a need to rethink current business models and the way entrepreneurs act to introduce new businesses to address and embed environmental issues in order to achieve sustainable development. In this paper, green or sustainable entrepreneurship is addressed in Iran to identify challenges and barriers entrepreneurs in the economic and social sectors face in developing green business solutions. Sustainable or green entrepreneurship has been gaining interest among scholars in recent years and addressing its challenges and barriers need much more attention to fill the gap in the literature and facilitate the way those entrepreneurs are pursuing. This research comprised of two main phases: qualitative and quantitative. At qualitative phase, after a thorough literature review, fuzzy Delphi method is utilized to verify those challenges and barriers by gathering a panel of experts and surveying them. In this phase, several other contextually related factors were added to the list of identified barriers and challenges mentioned in the literature. Then, at the quantitative phase, Interpretive Structural Modeling is applied to construct a network of interactions among those barriers identified at the previous phase. Again, a panel of subject matter experts comprised of academic and industry experts was surveyed. The results of this study can be used by policymakers in both the public and industry sector, to introduce more systematic solutions to eliminate those barriers and help entrepreneurs overcome challenges of sustainable entrepreneurship. It also contributes to the literature as the first research in this type which deals with the barriers of sustainable entrepreneurship and explores their interaction.

*Keywords*—Green entrepreneurship, barriers, Fuzzy Delphi Method, interpretive structural modeling.

## I. INTRODUCTION

TODAY, countries face major economic problems, and entrepreneurship is therefore essential in fostering economic development and innovation [1]. Entrepreneurship is considered as a key element [2], meaning it is a vital source for economic growth, economic competitiveness, job creation, and the advancement of social benefits [3].

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Global progress has forced organizations to gain competitive advantage. While this progress has increased the economies of the countries, it has also caused great environmental damage [4]. Given these concerns, there is an urgent need to change current business practices. Recently, researchers in the field of entrepreneurship have increasingly devoted their attention to the interactions between business and the environment [5], [6]. And in this context, the issue of green entrepreneurship or sustainable entrepreneurship has been considered with the aim of producing environmentally friendly products.

The green entrepreneurship profile is a fascinating topic. On the one hand, risk appetite, the source of internal control and the need for success are three of the most important characteristics of entrepreneurs; on the other hand, to describe green entrepreneurs, other factors, such as specific environmental trends, must be considered [7]. As a first factor, green entrepreneurs, like other entrepreneurs, taking risks by exploring some new and unknown areas; second, their activities have a positive cumulative effect on nature, and the third factor is their own opinions or personal values [8]. The activities of Green Entrepreneurs are different in industrialized and developing countries. There is a fundamental difference between looking at green entrepreneurship in developed and developing countries. Developed countries and international organizations have a lot of emphasis on (green) and market opportunities, while developing countries tend to focus more on the term entrepreneurship and market needs [9].

Environmental entrepreneurship emerges as a cross-product of the environment and entrepreneurship and aims to provide positive environmental outcomes when producing goods and services, and hence, we can say that there is a direct link between entrepreneurial life. There is an environmental and entrepreneurial environment [4]. Research on emerging green entrepreneurship examines the extent to which entrepreneurs focus on environmental issues, not only can contribute to economic growth, but also reduce environmental degradation [5]. Indeed, researchers believe that green entrepreneurs have a lot of potential to help dominate environmental challenges through the introduction of new and environmentally friendly products [10]. In other words, entrepreneurs are the factors of change and modernization in economics, and they are somehow important actors in the transformation and transition to a green economy [11]. Therefore, research in this area provides a valuable insight into the impact of green entrepreneurship activities beyond economic growth. But the

resources available in this area are scarce, and in particular, past research is largely theoretical, or based on relatively small case studies, rather than empirical evidence based on large-scale data that has hampered progress [5], [6].Also, despite the benefits and advantages of green entrepreneurship in different sectors, there are also barriers and challenges that create friction in the development of entrepreneurial activities and largely hinder the prosperity of green entrepreneurship. In the meantime, the economic and social barriers are of great importance, and for this reason, we intend to identify these barriers in Iran and present them in this study. Therefore, in this study, using the fuzzy Delphi method to identify the economic and social barriers and finally, to interpret the interactions between identified barriers, structural interpretation modeling techniques have been used. As a result of this research, the following questions will be answered:

What are the economic and social barriers and challenges of green entrepreneurship in Iran?

How is the relationship between identified obstacles and challenges?

## II. RESEARCH BACKGROUND

### A. Green Entrepreneurship

Many researchers support entrepreneurship as a response to widespread socio-environmental problems [5], [12]. In addition to traditional commercial entrepreneurship aimed at maximizing profits [13]-[16], researchers have identified several other types of entrepreneurship in recent years. They include social entrepreneurship [17]-[20]; Sustainable Entrepreneurship [21], [22] and Green Entrepreneurship. The concept of green entrepreneurship, environmental entrepreneurship, ecological entrepreneurship, and sustainable entrepreneurship are also called [8], [22]-[27], [12]. Although there are some apparent differences in these definitions, they all emphasize the positive environmental outcomes and benefits. Green entrepreneurship can be defined as the launch of a new company in environmental services or industrial production focusing on natural resources [28]. Dean and McMullen define green entrepreneurship as a process for defining and exploiting existing economic opportunities that are environmentally compatible with market failures [27]. Anderson and Leal have presented a broad definition of green entrepreneurship with an emphasis on environmental outcomes: entrepreneurs using commercial tools for outdoor preservation, wildlife habitat development, rescue of endangered species and, in general, quality improves the environment [29]. Looking at these definitions, researchers are still looking to discover the phenomenon of green entrepreneurship. Although researchers have come to the conclusion that green entrepreneurship can be a driving force for a new economic start for modern economies [30]; however to date, there is no general definition of green entrepreneurship [5]-[7], because this term is the interaction and combination of various environmental factors [31]. Schaper provides a framework for defining green entrepreneurship with a combination of different ideas from green entrepreneurs. He says green entrepreneurs are diverse, but in principle, all green entrepreneurs can be identified using three distinct features. The first feature is that all entrepreneurial activities are green and entrepreneurial. The second feature, according to Schaper that separates green entrepreneurs from their business partners, is the net effect of their business activities on the natural environment and changes in the direction of a sustainable future. The latter feature that distinguishes all green entrepreneurs from business entrepreneurs is a set of ideals and values [10]. Green entrepreneurs, as a subset of entrepreneurs, share five motives: Green value, market gaps, life-style, self-esteem, and passion for industry, products or services [32].

According to the definitions and the stated content, green entrepreneurship can be defined as follows: Green entrepreneurship refers to individuals and organizations that engage in entrepreneurial activities that create positive environmental outcomes by delivering green products or services. In general, green entrepreneurship is about creating environmental benefits.

### B. Barriers of Green Entrepreneurship

So far, researchers have identified various barriers to green entrepreneurship. However, the interesting controversial contribution to the green entrepreneurship barriers was created by Linnanen. In particular, he has provided a framework for barriers to green entrepreneurship. According to Linnanen, there are three categories of barriers that need all green entrepreneurs to overcome success in offering green product offers. The first obstacle described by Lynn is the challenge of creating a market. He argues that there is still a lack of awareness among the general public about the environment, and consumer behavior is slowly changing [33]. The second barrier identified by Linnanen is a barrier to financing. And the third obstacle is the ethical justification of green entrepreneurs for existence. He explains that many of his green entrepreneurs differentiate themselves with their distinct sets of values, their attitude toward their environment and their moral reasoning [34].

Ulutas and Alkaya identified in their research in Turkey, the barriers to green entrepreneurship as laws and government, market demands, and economic and educational skills [23]. In another study, factors like the lack or limited knowledge of green technology, high investment costs, lack of funding, and the inability to understand the potential benefits of the green business were identified as green entrepreneurship barriers [35]. Similarly, Abuzeinab et al. examined the barriers to green businesses that identified the factors of government constraints, financial constraints, sector constraints, company constraints, and lack of demand as green business barriers [36]. Also, according to Hamdouch and DePert, financial and economic barriers are the most important barriers for green entrepreneurs [37].

Looking at the published literature, it can generally be concluded that despite the fact that green entrepreneurship has attracted more attention from researchers over the past years, academic literature is still low in this area, so that the total

number of studies existing is limited. Also, the connection between these barriers is not clear. In summary, studies in this area can be found in Table I.

TABLE I
SUMMARY OF PREVIOUS RESEARCH

| | Identified Barriers |
|---|---|
| 1 | Government constraints, financial constraints, sector constraints, company constraints and lack of demand [36] |
| 2 | The lack or limitation of green technology knowledge, high investment costs, lack of funding, and inability to understand the potential benefits of green business [35] |
| 3 | Financial barriers and economic barriers [37] |
| 4 | Laws and government, government demands and economic and educational skills [23] |

## III. METHODOLOGY

In order to achieve the goals of the present research, in the first step, a comprehensive review of the literature and the evaluation of the results of past studies, identified a number of important indicators related to the social and economic barriers of green entrepreneurship. In the next step, using the Fuzzy Delphi method among experts, including university professors, entrepreneurs and industry experts, the economic and social barriers of green entrepreneurship were extracted. In the final step, using these indicators and using structural interpretation modeling method, these barriers were analyzed and their relationship was discussed. The methods mentioned are briefly summarized below.

### A. Fuzzy Delphi Method

Delphi is a specialized review to predict the future, based on which different results can be extracted. In this research, the first step was to collect the views of the decision group and allocate the triangular fuzzy number from the viewpoint of the experts, according to the chosen word for them. In order to calculate the value of the evaluation, the triangular fuzzy number of each criterion is given by the experts. In this study, the geometric mean technique is used to find experts' opinion about a criterion, in such a way that the value of the evaluation of criterion j from the expert's view of i is between the n expert $W_{ij} = (a_{ij}, b_{ij}, c_{ij})$, in which i = 1,2, ..., n and j = 1,2, ..., m. Then, the fuzzy value of criterion j is calculated as follows:

$$Wj = (a_j, b_j, c_j), \ a_j = \min\{a_{ij}\}, \ bj = 1/n\sum_{i=1}^{n} b_{ij}, \ c_j = \max\{c_{ij}\}$$

The following mathematical relation is used to defuzzification of the triangular number:

$$s_j = \frac{a_j + 4b_j + c_j}{6} \qquad j = 1, 2, \ldots, m$$

In the end, to derive the criteria, we will consider to some extent to accept or not accept that criterion. In this research, according to 30-70 Law, the boundary of acceptance of the criterion is around 7. If the resulted $s_j$ value is near or above 7, it is considered as acceptable and otherwise it is eliminated from the list.

### B. Interpretative Structural Modeling

Interpretative structural modeling is a good technique for analyzing the impact of an element on other elements. Interpretative structural modeling method analyzes the relationship between indices by analyzing the criteria at several different levels. The ISM methodology contributes greatly to ordering the complex relationships between elements of a system. The implementation of the ISM technique requires seven steps. First, the criteria related to the problem are identified and then the elements of Structural Self – Interaction Matrix (SSIM) are obtained. Then, the Initial reachability matrix and Final reachability matrix extracted and adapted in the next step. In the next step, the matrix elements are matched and finally the model is mapped and the key criteria are determined. Each of them will be described further.

## IV. RESEARCH FINDINGS

### A. Fuzzy Delphi

Researchers first explored the main economic and social barriers to green entrepreneurship by reviewing literature. In order to identify these obstacles, a questionnaire tailored to the Fuzzy Delphi method was prepared and provided to experts and experts in this field to identify their significance and thereby identify key indicators. Given that in the final list of indicators, 20 indicators were developed and compiled, according to the 30-70 law, 13 indicators were identified as the economic and social barriers of green entrepreneurship as follows:

TABLE II
IDENTIFIED BARRIERS

| | Dimensions | Barriers |
|---|---|---|
| 1 | | High investment costs |
| 2 | | High risk of green products |
| 3 | | The difficulty of gaining competitive advantage in green entrepreneurship |
| 4 | Economic | Lack of demand in the market |
| 5 | | Lack of consumer awareness of green products and services |
| 6 | | The lack of awareness of consumers about the direct impact of their environment-friendly measures |
| 7 | | Lack of support from consumers |
| 8 | | The lack of an appropriate institutional framework to support green entrepreneurship |
| 9 | | Lack of regulations, standards and special law for green entrepreneurship |
| 10 | Social | Lack of policy and the green national perspective |
| 11 | | Failure to understand the potential benefits of green products |
| 12 | | New concept of green entrepreneurship for stakeholders |
| 13 | | Low risk culture in society |

### B. Interpretative Structural Modelling

To implement the ISM technique, the following steps should be followed:

Step I. Identify the Indicators of the Economic and Social Barriers to Green Entrepreneurship

These indicators were identified in the previous sections.

Step II. Creating Structural Self–Interaction Matrix (SSIM)

After identifying the variables, it is time to enter these variables in the SSIM matrix. This matrix is a matrix of dimension variables in which the variables are listed in the first row and column. Then the relationships between two variables are determined by the symbols which are: V: Agent i is the basis for reaching the j factor. A: The factor j is the basis for reaching the factor i. X: There is a two-way relationship between the factor i and j. O: There is no connection between i and j. For this purpose, a questionnaire was designed that is as general as Table III. In this way, the 13 indicators selected in the first row and first column of the table were asked, and the experts were asked to type the communications according to the symbols (V, A, X, O). The results are shown in Table III.

TABLE III
SSIM MATRIX

| Variables | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | V | A | O | O | O | O | O | O | O | O | O | O |
| 2 | | A | A | A | A | O | A | A | O | O | A | O |
| 3 | | | A | O | O | O | O | O | O | O | O | O |
| 4 | | | | A | A | A | O | O | A | O | O | A |
| 5 | | | | | A | O | O | A | A | O | O | O |
| 6 | | | | | | O | O | O | A | O | O | O |
| 7 | | | | | | | A | A | A | O | O | O |
| 8 | | | | | | | | X | A | V | V | O |
| 9 | | | | | | | | | A | O | O | O |
| 10 | | | | | | | | | | V | X | O |
| 11 | | | | | | | | | | | A | O |
| 12 | | | | | | | | | | | | O |

Step III. Create an Initial Reachability Matrix

By converting the symbols of the SSIM matrix relationships to zero and one, the following matrix can be obtained by the following rules. For this extraction, the matrix must replace the numbers X, V and zero with each row in place of the A, O marks in the SSIM matrix. The results are shown in Table IV.

TABLE IV
INITIAL REACHABILITY MATRIX

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 9 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 13 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Step IV. Create an Final Reachability Matrix

After the Initial reachability matrix is obtained, its internal consistency must be established. Thus, if the index j leads to the index i and the index i leads to the index k, then the index j must be followed by the k index. In this matrix, the power of influence and the degree of dependence of each index are also shown. The results can be seen in Table V. The numbers marked * indicate that the Initial reachability matrix is zero and has become the number 1 after compatibility.

TABLE V
FINAL REACHABILITY MATRIX

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Power of influence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 3 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 4 | 1* | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 0 | 1 | 1* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 6 | 0 | 1 | 1* | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 7 | 0 | 1* | 1* | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 8 | 0 | 1 | 0 | 1* | 0 | 0 | 1 | 1 | 1 | 1* | 1 | 1 | 0 | 8 |
| 9 | 0 | 1 | 0 | 1* | 1 | 0 | 1 | 1 | 1 | 0 | 1* | 1* | 0 | 8 |
| 10 | 0 | 1* | 1* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 11 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 12 | 0 | 1 | 1* | 1* | 0 | 1* | 1* | 1* | 1* | 1 | 1 | 1 | 0 | 10 |
| 13 | 0 | 1* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| Dependency | 3 | 12 | 7 | 9 | 4 | 3 | 5 | 4 | 4 | 3 | 5 | 4 | 1 | |

Step V. Leveling

In order to determine the relationships and the level of barriers, the output set and input set for each indicator were extracted from the received matrix. The output set included the index itself and the indicators that affected it. The set of inputs included the index itself and the index of indicators that affected it. Then, the set of bilateral relations of each of these indicators was determined. Indicators are ranked according to the obtained sets. Typically, the indicators that have the same set of outputs and sets of two-way relationships form the top-level indicators. Then, the next levels were determined by the same process. The results are presented in Table VI.

Step VI. Draw a Network Interaction Model

After determining the relationships and level of variables,

network interactions model was mapped using the data Table VI. For this purpose, first, the variables are arranged from top to bottom according to their level. These relationships can be seen in Fig. 1.
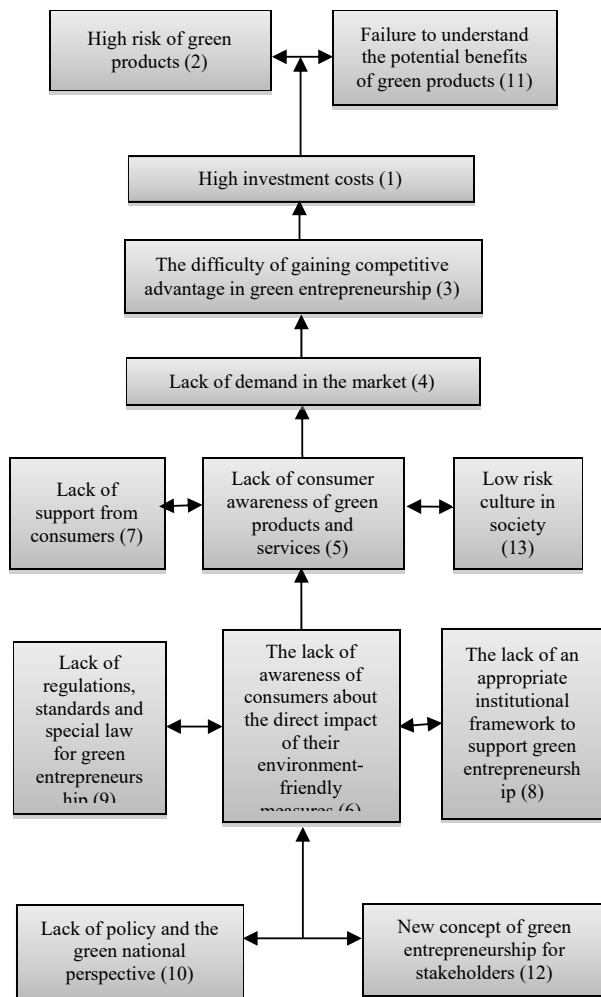


Fig. 1 ISM Model for Socio-economic barriers of green entrepreneurship in Iran

TABLE VI
LEVELING

|  | Antecedent set | Reachability set | Common set | Level |
|---|---|---|---|---|
| 1 | 1,3,4 | 1,2 | 1 | Second |
| 2 | 1,2,3,4,5,6,7,8,9,10,12,13 | 2 | 2 | First |
| 3 | 3,4,5,6,7,10,12 | 1,2,3 | 3 | Third |
| 4 | 4,5,6,7,8,9,10,12,13 | 1,2,3,4 | 4 | Fourth |
| 5 | 5,6,9,10 | 2,3,4,5 | 5 | Fifth |
| 6 | 6,10,12 | 2,3,4,5,6 | 6 | Sixth |
| 7 | 7,8,9,10,12 | 2,3,4,7 | 7 | Fifth |
| 8 | 8,9,10,12 | 2,4,7,8,9,10,11,12 | 8,9,10,12 | Sixth |
| 9 | 8,9,10,12 | 2,4,5,7,8,9,11,12 | 8,9,12 | Sixth |
| 10 | 8,10,12 | 2,3,4,5,6,7,8,9,10,11,12 | 8,10,12 | Seventh |
| 11 | 8,9,10,11,12 | 11 | 11 | First |
| 12 | 8,9,10,12 | 2,3,4,6,7,8,9,10,11,12 | 8,9,10,12 | Seventh |
| 13 | 13 | 2,4,13 | 13 | Fifth |

Step VII. Analyze Penetration Power and Dependency

In this step, the power of penetration matrix-the degree of dependence of the indicators of the economic and social barriers of green entrepreneurship was extracted. With regard to penetration power and degree of dependence, they were divided into four areas. The four areas are: independence, dependency, communication and non-dependence. Fig. 2 shows this matrix.



Fig. 2 Penetration power matrix-degree of dependence of socio-economic barriers to green entrepreneurship

V. CONCLUSION

Today the environment has become a major component of business. The global economy is shifting towards a green economy. Green entrepreneurship is a worthwhile phenomenon that attracted a lot of attention, but there is still little research in this area. As more natural resources are exploited, as well as climate change and environmental degradation created by businesses, policy makers and researchers have shifted to the urgent need to move towards a more sustainable environmental development path. Encouraging the use of more sustainable technologies and cleaner technologies, the focus is on green entrepreneurship or sustainable entrepreneurship aimed at the production of environmentally friendly products.

The purpose of this study was to identify the economic and social barriers of green entrepreneurship and to analyze these barriers in Iran. Initially, a Fuzzy Delphi method was used to identify these barriers. For this purpose, the researchers identified 20 indicators by reviewing the literature and a questionnaire was put to the experts. In several stages, 20 indicators of, 13 indicators were identified as the economic and social barriers of green entrepreneurship. These are the indicators: High investment costs, High risk of green products, Difficulty of gaining competitive advantage in green entrepreneurship, Lack of demand in the market, Lack of consumer awareness of green products and services, Lack of awareness of consumers about the direct impact of their environment-friendly measures, Lack of support from consumers, Lack of an appropriate institutional framework to support green entrepreneurship, Lack of regulations, standards and special law for green entrepreneurship, Lack of policy and the green national perspective, New concept of green

entrepreneurship for stakeholders, Failure to understand the potential benefits of green products, and Low risk culture in society.

In order to analyze the relationships between them and present their structural model, interpretive structural modeling techniques were used. And using these barriers to identify and level. One of the other results of the research is the influence of the influence-dependence matrix (Fig. 2). In this matrix, the indicators of the economic and social barriers of green entrepreneurship are classified into four indicators according to the influence of each index on other indicators and the degree of dependence of each indicator. Variables that have the least degree of dependency and power of influence on other variables have been placed in Region 1, which is called the Independence Area. These elements are somewhat separate from other variables and have little communication. Variables with a high degree of dependency and low penetration power to other variables were placed in Area 2 that made it the area Affiliation. Variables that have a lot of influence and a high degree of dependency, and indeed a two-way relationship, are in the area of communication, which is called District 3. Any changes in these variables will change other variables. Finally, variables that have a lot of influence and dependency Few, in an irregular area, known as Area 4.

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