

# Identification of green finance strategies in Iran's banking sector and its political effects on structural changes in the industry sector

Ali Asghar Dadkhah Turkdari<sup>a</sup>, Ezatollah Abbasian<sup>b,\*</sup>, Mohsen Ebrahimi<sup>c</sup>

<sup>a</sup>Department of Management, Aras International Campus, University of Tehran, Tehran, Iran

<sup>b</sup>Department of Management, University of Tehran, Tehran, Iran

<sup>c</sup>Department of Economics, Kharazmi University, Tehran, Iran

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## Abstract

Green financing is a strategy for the financial sector in the direction of sustainable development, which is being considered all over the world today. Green mortgages, green car loans, alternative energy ventures, eco-friendly deposits, and green credit cards are just a handful of innovative green financial products currently being offered in the world. In this regard, the main purpose of this research is to identify green financing strategies in Iran's banking sector and their political effects on the structural changes of the industry sector. In this research, there are two main questions: 1. What are the green financing strategies in Iran's banking sector? 2. What is the policy effect of green financing on the structural changes in the industry sector? In this research, the data needed to test the research hypothesis has been collected using the questionnaire tool as well as the library method. Descriptive statistics and inferential statistics methods have been used to analyze the collected data. In the inferential analysis part of the research, the gray relation analysis method has been used. The results show that the green financing index is most closely related to the investment level of the industry sector; Also, there is the lowest intensity of the relationship between green finance and the index of the added value share of value added in the industry sector. All, the evidence shows that green financing is related to many structural variables of the industry; but the intensity of the relationship will be different depending on the type of variable.

Keywords: Green Finance (GF), banking industry, Grey Relational Analysis (GRA)  
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## 1 Introduction

Green finance (GF) is a strategy for sustainable development in the financial sector, and it has been taken into consideration worldwide, but financial development in the financial system of every country is a basis for green financing. Green mortgages, green car loans, alternative energy venture capital, eco-savings deposits, and green credit

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\*Corresponding author

Email addresses: [turkan123@yahoo.com](mailto:turkan123@yahoo.com) (Ali Asghar Dadkhah Turkdari), [e.abbasian@ut.ac.ir](mailto:e.abbasian@ut.ac.ir) (Ezatollah Abbasian), [ebrahimi@khu.ac.ir](mailto:ebrahimi@khu.ac.ir) (Mohsen Ebrahimi)

cards are a few innovative green financial products that have been offered in the world. In an era, when there are many environmental risks and opportunities, it is necessary to invent options for adapting environmental issues to various types of loans and financing methods.

To develop and generalize the criteria of green banking, give direction to the transfer of a green economy, and realize the sustainable development fields, we need a set of specific standards and guidelines about sectors and topics in the form of regulations so that executives and banks act within the general framework of the aforementioned regulations in allocating bank resources to investment projects. The headings and the mechanism of realization of these cases are foreseen in green financing, and thus the banks have to allocate their financial resources to projects that already have specific cases related to the green economy and their operational solution in their designs, and thus they can avoid waste of resources. Therefore, the present study aimed to identify green finance strategies in Iran's banking sector and their political effects on structural changes in the industry sector.

## 2 Theoretical bases and research background

Green finance is an emerging branch of finance. No clear definition has been unanimously presented or agreed upon by economists and global institutions. However, different researchers, institutions, and countries have reached a practical definition [1]. An interesting interpretation is that some institutions, instead of defining green finance, have presented it as an alternative to using the term "sustainable financial system". However, their tools and mechanisms remain the same. According to UNEP, a financial system that includes creating values and facilitating the exchange of financial assets in a way that real wealth can be used to fulfill the needs of an environmentally sustainable and inclusive economy over a longer period is called a sustainable financial system. Various other definitions have been provided by the Green Finance Study Group according to which green finance means financing to promote the use of technology in a way that reduces pollution. As presented by the OECD, financing aims to achieve economic growth in addition to reducing overall pollution, improving efficiency in waste management, and using natural resources. There is also a similar definition for green finance, including pollution control and reduction of climatic changes [6].

Therefore, green finance is considered an essential element of sustainable banking with a great effect on the development of a sustainable economy and business. According to the European Commission, the idea of green financing in financial services includes investment decisions that integrate environmental, social, and governance principles to ensure the satisfaction of customers and society as a whole. Green finance is a comprehensive method that combines different approaches to improve the economic, social, and environmental performance of the monetary system, which is evaluated through environmental, social, and governance criteria, i.e. factors that are essential parts of sustainability. Major green finance activities include green bonds, microfinance, sustainable funds, impact investing, active ownership, credit for sustainable development, and improving the whole financial system in a more sustainable way. According to the EU high-level expert group on sustainable finance (2017), green finance can be broadly described as a financial system that evaluates the challenges of sustainable development, sustainable housing, retirement, infrastructure, technological development, water and weather change mitigation, and other long-term educational and social issues.

Financial and natural resources are important indices that significantly help reduce environmental degradation and promote economic growth in the globalization era [7]. Green finance integrates financial and natural resources according to social welfare and directs financial resources towards energy-saving and emission-reducing productive activities through environmental regulations to achieve sustainable development while ensuring economic growth [3]. On the one hand, green finance can promote environmental protection and governance [10], and change the direction of resource allocation from highly polluting and energy-consuming industries to industries with advanced production concepts and environmental technologies [4], and on the other hand, environmental protection regulations can also promote green financing [2]. As confirmed by several studies, regulations are spatially heterogeneous in promoting green finance in different regions [9]. In recent years, research on green finance and its policies has attracted the attention of a large number of researchers. Several researchers have developed and defined a framework for green financing. Lindenberg defines the concept of green financing as the policies of financial institutions to maintain a green economy. The concept of the "financial" aspect of green financing shows the allocation and investment of capital through the financial system. The "green" feature needs the extension of the allocation of financial resources to environmental protection, clean energy, green buildings, climatic changes, and corporate governance in all economic sectors [11].

### 3 Research method

In the present research, the necessary data to test the research hypothesis were collected from the questionnaires through the desk method and were used for analysis. Descriptive and inferential statistics were used to analyze the data. The Grey Relational Analysis (GRA) was used in the inferential analysis phase. There were two main questions in the research:

1. What are the green finance strategies in Iran's banking sector?
2. What is the political effect of green finance on structural changes in the industry sector?

The main items related to the green finance strategy in the banking sector were first identified by reviewing articles, reports, and interviews with 15 experts (including bank presidents vice presidents, and professors) to answer the first question. Based on these items, a questionnaire was designed and distributed among 350 individuals, including presidents, and vice presidents of different banks, as well as several professors and green finance strategies in Iran, were identified based on their answers.

Answering the second question required access to time series information of variables. Since there was no information about the size of green financing in Iran and the agriculture group was more closely related to the green economy and sustainable development than the industry and services group, the present research utilized the index of the ratio of facilities granted to the agricultural sector to the total facilities granted by banks and credit institutions as an alternative index for green finance in Iran, and then analyzed its relationship with some indices of the industry sector using the grey relational analysis. The data of this research section were collected from the Central Bank, Ministry of Industry, Mine, and Trade, and the Statistical Centre of Iran and covered the period of 1978 to 2021.

#### A- The researcher-made questionnaire

The following questionnaire was used to collect data and detect green finance strategies after interviewing experts and reviewing various reports and articles:

Table 1: The questionnaire for identifying green finance strategies in the banking sector

<p><b>Section 1: Respondents' personal details</b></p> <p>Gender: Male <input type="checkbox"/> Female <input type="checkbox"/></p> <p>Job:</p> <p>Educational degree:</p> <p>Work experience (years):</p>
<p><b>Section 2: Characteristics of green finance in Iran's banking system</b></p> <p>1. Do you know about laws, regulations, and guidelines for green finance and sustainable development? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>2. Do banks offer special credit for green financing? <input type="checkbox"/> Yes <input type="checkbox"/> No. If yes, which domain the financing is mainly allocated to? <input type="checkbox"/> Agriculture and natural resources <input type="checkbox"/> Science and technology <input type="checkbox"/> Insurance <input type="checkbox"/> Energy <input type="checkbox"/> Others</p> <p>3. In your opinion, does the encouragement of green credit help sustainable economic and social development? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>4. Do banks have any unit to identify and control the environmental risks of credits? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>5. Do banks have products and services that seek business opportunities compatible with the environment and society? (Expansion of credit in clean, green, and eco-friendly regions?) <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>6. What kind of support do banks need to participate in green credit? (Give scores of 1 to 7 based on prioritization) <input type="checkbox"/> legal <input type="checkbox"/> technical assistance <input type="checkbox"/> participation awards <input type="checkbox"/> access to information <input type="checkbox"/> Financial support <input type="checkbox"/> Support through interest rate <input type="checkbox"/> Others</p> <p>7. Have banks included sustainable development goals in their strategies? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>

The research questionnaire consisted of three main sections; first, questions about respondents' personal details; second, two-choice and multiple-choice questions about characteristics of green financing in Iran's banking sector; and in the third section, the respondents were asked to answer each question about green financing on the Likert scale.

The third section: Identifying the green finance strategy based on the Likert scale						
In your opinion, what is the status of Iranian banks based on each of the following items?		Very weak	Weak	Moderate	Good	Very good
1	Clear environmental conservation policies in development programs of banks					
2	Green targeting of banks according to their existential mission					
3	Dynamic planning and provision of specialized human resources in the field of green financing					
4	Focusing on improving the level of environmental health					
5	Understanding the existing conditions and requirements of green projects					
6	Compatibility of bank laws to national green policies					
7	Appropriate financial resources and timely allocation of resources attracted to green projects					
8	Banks' practical commitment to social values and standards in conserving the environment					
9	Public view about environmental protection and the tendency to green deposits in banks					
10	Prioritization of projects with green financing in banks					
11	Special conditions for green projects and long-term return on investment period					
12	Motivational measures to increase employees' familiarity with green finance rules					
13	The existence of bank performance evaluation in the field of financing green projects					
14	Senior bank managers' views on green finance of companies					
15	Dividing long-term goals into medium-term and short-term green goals					
16	Continuous monitoring of banks' green programs and effective legal prosecutions					
17	Loan rate discount for green projects					
18	Facilitating the conditions for receiving loans for projects based on sustainable development					
19	Making some loans subject to environmental requirements					

Table 2 examines the reliability of the third section of the questionnaire. The research questionnaire had acceptable reliability since Cronbach's alpha coefficient was greater than 0.7.

Table 2: Reliability of measurement tools

Number of items	Cronbach's alpha
19	0.74

Source: research findings

### B- Descriptive analysis of participants in the questionnaire

Among a total of 350 respondents to the items of the questionnaire, 311 were males and 39 were females, which constituted 89% and 11% of the samples respectively, and 11.1% of the samples were university professors, 73.4% were bank presidents, and 15.4% were bank vice presidents.

Table 3: Frequency distribution of participants in the questionnaire in terms of job

Job	Absolute frequency	Relative frequency	Cumulative frequency
Professor	39	11.1	11.1
Bank president	257	73.5	84.6
Bank vice presidents	54	15.4	100

Source: research findings

A total of 49.7% of the research samples had bachelor's degrees, 36.3% had master's degrees, and 14% had Ph.D. degrees.

Table 4: Frequency distribution of participants in the questionnaire in terms of education level

Education level	Absolute frequency	Relative frequency	Cumulative frequency
Bachelor	174	49.7	49.7
Master	127	36.3	36.3
Ph.D.	49	14.0	14.0

Source: research findings

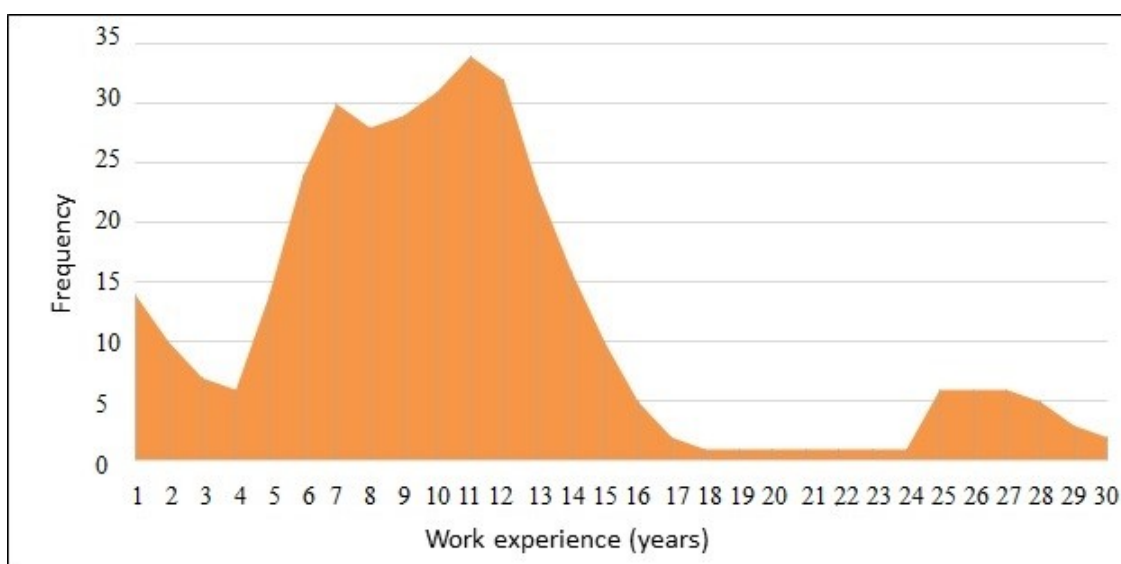


Figure 1: Distribution of the participants' work experience in the questionnaires

Figure 1 shows the distribution of work experience of the participants in the questionnaire. As shown, most samples had 5 to 15 years of work experience (77.4%).

## Findings

### Descriptive analysis of characteristics of green finance in Iran's banking system

The second section of the questionnaire asks questions from participants, and their answers are analyzed as follows.

- **Are they aware of laws, regulations, and guidelines of green finance and sustainable development?**

A total of 238 participants (68% of the sample) did not know about the rules, regulations, and guidelines of green finance and 112 participants (32%) reported that they knew about them.

Table 5: Knowledge about green finance rules and regulations

Response	Absolute frequency	Relative frequency	Cumulative frequency
No	238	68.0	68.0
Yes	112	32.0	100.0

Source: research findings

- Do banks offer special credit for green financing?

Table 6: Existence of special bank credit for green financing

Response	Absolute frequency	Relative frequency	Cumulative frequency
No	240	68.6	68.6
Yes	110	31.4	100.0

Source: research findings

If the answer is yes, which domain the financing is mainly allocated to?

Environment  Science and Technology  Insurance  Energy  Others

A total of 68.6% of the participants reported that Iranian banks did not give special credit to green financing, and 31.4% knew about the existence of special credit in this domain, and according to them, the majority of these facilities were paid to the agriculture and natural resources sectors.

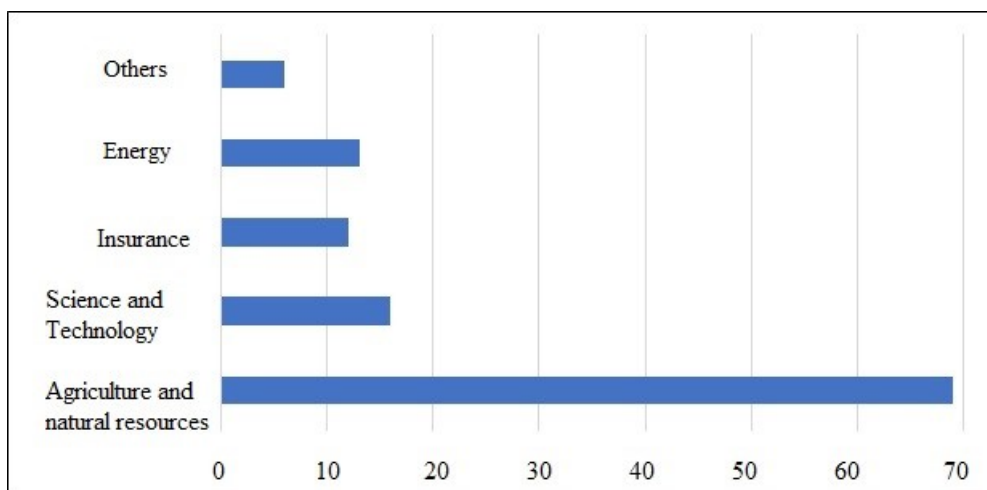


Figure 2: Sectors' share of green financing based on respondents' opinions. (Source: research findings)

- In your opinion, does the encouragement of green credit help sustainable economic and social development?

Table 7: The effect of green finance on economic and social development

Response	Absolute frequency	Relative frequency	Cumulative frequency
No	39	11.1	11.1
Yes	311	88.9	100.0

Source: research findings

A total of 88.9% of the participants in the questionnaire believed that the mobility of green credits could help economic and social development, and 11.1% did not believe so.

- Do banks have a unit to identify and control the environmental risks of credits?

Table 8: Existence of a unit to identify and control environmental risks in the bank

Response	Absolute frequency	Relative frequency	Cumulative frequency
No	315	90.0	90.0
Yes	35	10.0	10.0

Source: research findings

A total of 90.0% of the participants in the questionnaire reported that there was no unit to control the environmental risks of the granted facilities in the banks.

- **Do banks have products and services that seek business opportunities compatible with the environment and society? (Extension of credit in clean, green, and eco-friendly regions?)**

Table 9: Provision of eco-friendly commercial products and services

Response	Absolute frequency	Relative frequency	Cumulative frequency
No	310	88.6	88.6
Yes	40	11.4	10.0

Source: research findings

A total of 88.6% of the participants in the questionnaire reported that there was no product or service in the bank that sought business opportunities compatible with the environment and society.

- **What kind of support do banks need to participate in green credit? (Give scores from 1 to 7 based on prioritization).**

Legal  Technical assistance  Participation awards  Access to information  Financial support  Support through interest rate  Other

Table 10: The priority of necessary support to participate in green financing based on the respondents' maximum opinions

	Score	Priority	Percentage of participants
Legal	4	4	70.3
Technical assistance	3	5	85.1
Participation awards	2	6	80.6
Access to information	5	3	70.3
Financial support	6	2	70.6
Support through interest rate	7	1	74.3
Other	1	7	82.9

Source: research findings

According to Table 10, about 74% of the respondents gave the highest score and priority to support through interest rates, followed by financial support, access to information, legal support, technical assistance, participation awards, and others.

- **Have banks included sustainable development goals in their strategies?**

Table 11: Inclusion of sustainable development goals in banks' strategies

Response	Absolute frequency	Relative frequency	Cumulative frequency
No	234	66.9	66.9
Yes	116	33.1	10.0

Source: research findings

A total of 66.9% of participants in the questionnaire reported that banks did not consider sustainable development goals in their strategy.

### Identifying the priorities of the green financing strategy based on the Likert scale

Table 12 shows the mean, maximum, minimum, and standard deviation of the scores to items by the respondents. As presented in the table, based on the respondents' opinions, all items scored low on average, and thus the green

financing strategies were weak in the banks. The index “Motivational measures to increase employees’ familiarity with green financing rules” with an average score of 2.1 obtained a higher score than other items. Furthermore, the items “the senior bank managers’ views on green financing in companies”, ”loan rate discount for green projects”, and “facilitating the conditions for receiving facilities for projects based on sustainable development” with an average score of 1.98 obtained lower scores than other items.

Table 12: Descriptive indices of the scores assigned to the bank financing strategy items

	Mean	Maximum	Minimum	Sd
Clear environmental conservation policies in development programs of banks	2.04	4	1	0.568
Green targeting of banks according to their existential mission	2.06	4	1	0.588
Dynamic planning and provision of specialized human resources in the field of green financing	2.04	3	1	0.568
Focusing on improving the level of environmental health	2.02	4	1	0.596
Understanding the existing conditions and requirements of green projects	2.03	3	1	0.573
Compatibility of bank laws to national green policies	2.09	4	1	0.595
Appropriate financial resources and timely allocation of resources attracted to green projects	2.01	4	1	0.584
Banks’ practical commitment to social values and standards in conserving the environment	2.02	3	1	0.586
Public view about environmental protection and the tendency to green deposits in banks	2.03	4	1	0.578
Prioritization of projects with green financing in banks	2.06	4	1	0.576
Special conditions for green projects and long-term return on investment period	2.01	3	1	0.629
Motivational measures to increase employees’ familiarity with green finance rules	2.1	3	1	0.639
The existence of bank performance evaluation in the field of financing green projects	1.99	3	1	0.566
Senior bank managers’ views on green finance of companies	1.98	3	1	0.566
Dividing long-term goals into medium-term and short-term green goals	2.01	3	1	0.581
Continuous monitoring of banks’ green programs and effective legal prosecutions	2.03	4	1	0.598
Loan rate discount for green projects	1.98	3	1	0.566
Facilitating the conditions for receiving loans for projects based on sustainable development	1.98	3	1	0.566
Making some loans subject to environmental requirements	2.05	5	1	0.658

Source: research findings

They can be prioritized based on the mean score of each item. Figure 3 shows the results of this approach.



Figure 3: Prioritization of green finance strategies in the national banking system (Source: research findings)

### The relationship between green finance and structural changes in the industry sector

In the present research, the share of loans paid to the agricultural sector from the total loans was considered as an index of green finance in the banking system. Figure 4 shows the trend of the share of the loans paid to the agricultural sector from the total facilities granted by banks and credit institutions (green finance index) from 1978 to 2021.

As shown in Figure 4, the share of the agricultural sector in the total balance of facilities granted by banks and credit institutions (green finance index) was on the rise from 1978 to 1999; however, the increasing trend of this index



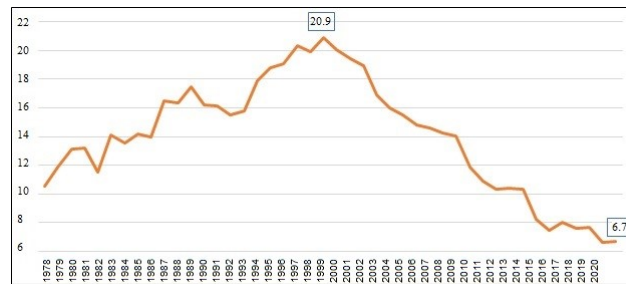


Figure 4: The trend of share of green finance from the total credits granted in the national banking system (percentage)  
Source: Central Bank

stopped in 1999 and its decreasing trend began, and it reached 6.7% in 2021 from 20.9% in 1999, indicating that due to structural changes of Iran's economy in recent years, green finance had a less contribution to Iran's economy.

The present research used various indices to examine structural changes in the industry sector and its correlation with green finance as follows:

- The number of industrial establishment permits in Iran
- The industrial investment value in Iran
- Employment of new industrial establishment permits
- The value of industrial production in Iran
- The index of dependency in the industry sector
- The value-added share of the industry sector in the gross domestic product
- Women's share of employment in the industrial sector

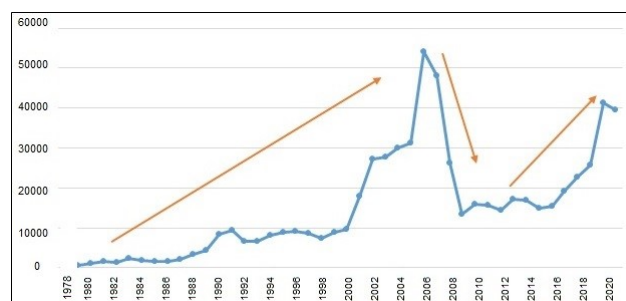


Figure 5: The trend of the number of industrial establishment permits in Iran  
Source: Ministry of Industry, Mine, and Trade

As shown in Figure 5, there were many changes in the number of industrial permits issued during different years. For example, more than 54 thousand industrial permits were issued in Iran in 2006. From 1978 to 2006, the trend of this index was increasing and the number of industrial permits issued increased from 445 to 54136. From 2006 to 2009, the number of industrial permits decreased sharply in Iran and dropped to 13318 in 2009. Then, the upward trend of this index started again, and according to statistics, about 40000 industrial permits were issued in 2021.

Figure 6 shows the trend of investment changes in the industry sector at current prices. From 1978 to 2007, the trend of this index was increasing and the level of investment reached 382.6 billion Rials to more than 1657 thousand billion Rials. The value of this index was decreasing from 2007 to 2012, and it decreased to 548.1 thousand billion Rials in 2012. From 2012 to 2021, the value of investment permits in the industry sector increased from 548.1 thousand billion Rials to 7011.9 thousand billion Rials. Due to the drastic changes in the level of prices in Iran's economy, not considering inflation can provide a wrong analysis of the investment. Figure 7 shows the trend of this index at the fixed price of 2016.

Figure 7 shows the trend of investment changes in the industry sector at fixed prices for 2016. In terms of real value, the largest level of industrial investment was in 1990 when was coincided with the structural reforms of Iran's

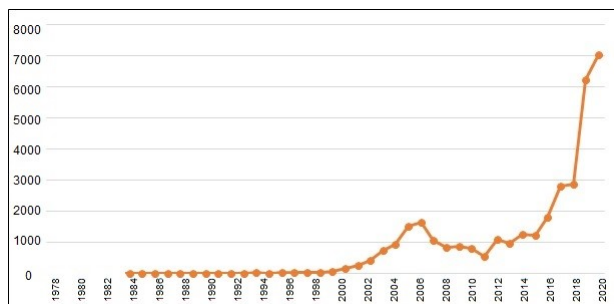


Figure 6: The trend of the investment value of new industrial establishment permits at the current price (billions of Rials) in Iran  
Source: Ministry of Industry, Mine, and Trade

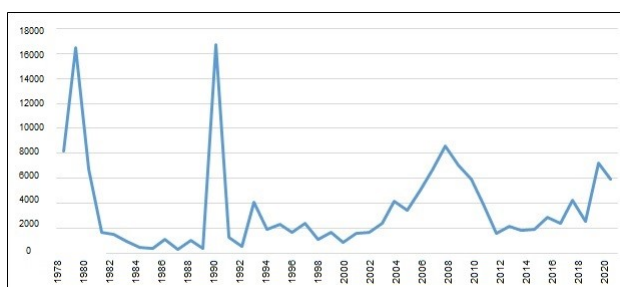


Figure 7: The trend of the investment value of new industrial establishment permits at a fixed price of 2016 (billions of Rials) in Iran  
Source: Ministry of Industry, Mine, and Trade

economy. The lowest value of this index was in 1989 when the real value of the industrial investment was about 347 billion Rials.

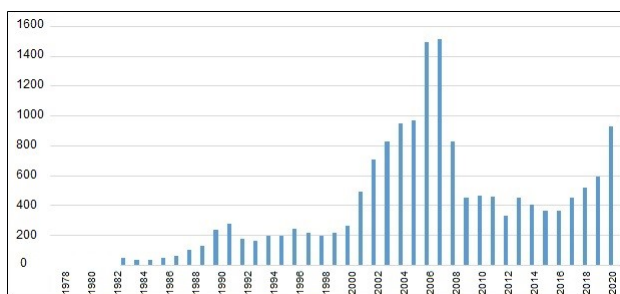


Figure 8: Trend of using new industrial establishment permits in Iran (thousands of people)  
Source: Ministry of Industry, Mine, and Trade

The level of employment is another important variable of the industrial sector. Figure 8 shows the trend of employment changes in the industrial sector. As shown, the highest level of industrial employment was seen in 2007 and the lowest level in 1978. The trend of this index was upward from 1978 to 2007, but its relative increasing trend stopped in 2007 and had a downward trend until 2012. This index was increasing again from 2013 to 2021. According to the latest information, about 96000 new industrial employment permits were issued in 2021.

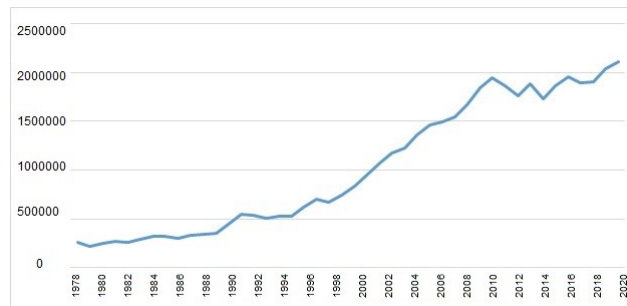


Figure 9: The trend of the industrial production value at fixed prices of 2016 (billions of Rials) in IranSource: Central Bank

According to Figure 9, the value of Iran's industrial products at the fixed price of 2016 had a relatively upward trend and reached from 256 thousand billion rials in 1978 to 2107 thousand billion rials in 2021.

The dependency index is another main index of the industry which is obtained from the ratio of the value of imported raw materials to the total value of raw materials. Figure 10 shows the trend of this index during the above-mentioned period.



Figure 10: The trend of the dependency index in the industry sector (percentage) Source: Statistical Centre of Iran and researcher's estimates

According to Figure 10, the industry dependency index had a relatively downward trend. This index was about 46% in 1978 and decreased to 4.5% based on estimates in 2021; in other words, the industry's dependency on imported raw materials decreased significantly; however, due to the key importance of imported raw materials, the industry was still very sensitive to this index.

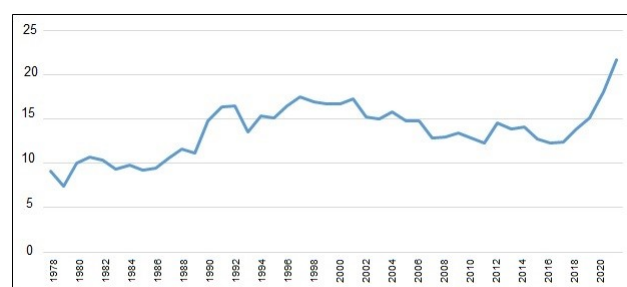


Figure 11: Value-added share of the industry sector from the GDP (percentage)Source: Central Bank

The share of industrial value-added in the total production of any country is an important variable and the structure of the industrial sector. According to Figure 11, the share of the industry sector in the total production of Iran was between 7.5% and 21.7% during the research period. The important point of the figure is that the index increased significantly from 2019 to 2021 mainly due owing to the increase in international sanctions and Iran's focus on domestic production. During this period, many goods, which were previously supplied by imports, were manufactured by domestic industries, and thus the share of industrial production in national production increased.

The women's share in employment in the industrial sector is another structural variable with the trend presented in Figure 12. As shown, the women's share in industrial employment increased relatively significantly in recent years, and women also entered the industrial employment domains in a way that the women's share in industrial employment

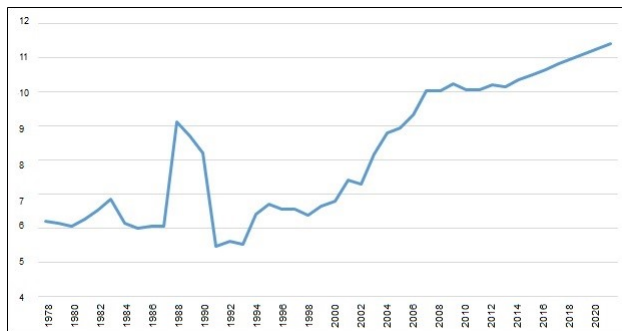


Figure 12: Women's share of employment in the industrial sector (percentage)Source: Central Bank and researcher's estimates

increased from 7.2% in 2002 to 11.4% in 2021.

### Analyzing the relationship between green finance with each of the indices using grey relational analysis

The values of all variables should be first normalized to perform the grey relational analysis. Therefore, the values of all variables will be on a unit scale in the range of zero and one. Table 13 presents the results of the normalization of values.

In the second step, the deviation of each time series was calculated in grey relational analysis. To this end, the difference between each normalized observation with its maximum value (value 1) was calculated. Table 14 present the results of this step for all variables.

The coefficients of the grey relational analysis were calculated in the third step. Table 15 presents the results of this step.

Finally, the intensity of the relationship between the variables of the industry sector and green finance in the grey relational analysis was provided by the grey relational coefficient. Figure 13 shows the grey relational coefficient of each index with green finance from 1978 to 2021.

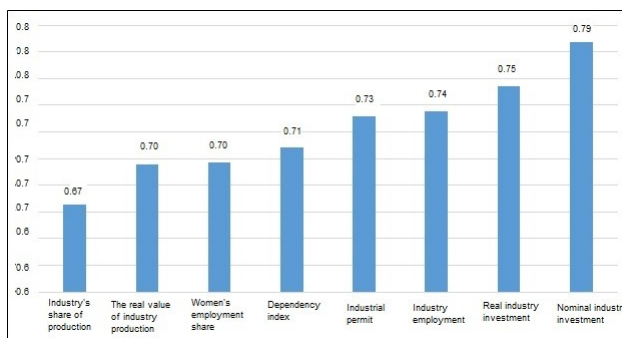


Figure 13: Grey relational coefficient of industry sector variables with green financingSource: Researcher's calculations

The higher the gray relational coefficient is, the greater the intensity of the relationship between the variables. If the gray relational coefficient is greater than 0.7, the intensity of the relationship between two variables is relatively high. According to Figure 13, the green finance index has the maximum relationship with the investment level of the industry sector, and also there is the lowest intensity of the relationship between green finance and the value-added share of the industry sector in the GDP. The evidence indicates that green finance is related to many structural variables of the industry but the intensity of the relationship is different depending on the type of variable.

### Conclusion and political suggestions

Green finance is the key concept of financial affairs, and proper financial management leads organizations toward sustainable development and measures. Organizations have increased their focus on social expectations and have started to consider them as an important part of business strategies. Many organizations now respond positively

Table 13: Normalized values of variables for use in grey relational analysis

Year	Industry employment	Real industry investment	Nominal industrial investment	The real value of industry production	Dependency index	Industry's share of production	Women's employment share	Industrial permit	Green finance
1978	1.000	0.521	1.000	0.982	0.198	0.886	0.878	1.000	0.726
1979	0.999	0.014	1.000	1.000	0.198	1.000	0.890	0.996	0.631
1980	0.992	0.610	1.000	0.985	0.185	0.819	0.902	0.989	0.543
1981	0.988	0.917	1.000	0.975	0.000	0.772	0.869	0.976	0.539
1982	0.988	0.927	1.000	0.981	0.115	0.800	0.824	0.982	0.657
1983	0.974	0.962	1.000	0.965	0.043	0.869	0.769	0.962	0.478
1984	0.983	0.991	1.000	0.946	0.048	0.836	0.887	0.974	0.516
1985	0.983	0.995	1.000	0.949	0.168	0.879	0.915	0.978	0.469
1986	0.975	0.955	1.000	0.960	0.362	0.858	0.903	0.980	0.483
1987	0.963	1.000	1.000	0.943	0.711	0.782	0.903	0.970	0.309
1988	0.938	0.959	1.000	0.939	0.674	0.712	0.389	0.944	0.321
1989	0.921	0.998	0.999	0.933	0.623	0.738	0.456	0.929	0.243
1990	0.851	0.000	0.998	0.880	0.565	0.483	0.541	0.854	0.328
1991	0.823	0.943	0.998	0.830	0.536	0.375	1.000	0.832	0.335
1992	0.888	0.986	0.999	0.832	0.468	0.365	0.976	0.886	0.378
1993	0.897	0.772	0.998	0.847	0.428	0.573	0.991	0.884	0.358
1994	0.874	0.906	0.997	0.838	0.645	0.444	0.841	0.857	0.213
1995	0.875	0.880	0.997	0.838	0.651	0.459	0.793	0.844	0.149
1996	0.845	0.919	0.995	0.787	0.653	0.368	0.819	0.839	0.130
1997	0.861	0.872	0.996	0.748	0.666	0.296	0.818	0.850	0.042
1998	0.878	0.954	0.994	0.759	0.604	0.336	0.846	0.871	0.072
1999	0.864	0.916	0.995	0.723	0.715	0.349	0.804	0.841	0.000
2000	0.830	0.966	0.990	0.675	0.799	0.348	0.780	0.828	0.058
2001	0.681	0.924	0.974	0.615	0.742	0.308	0.674	0.674	0.103
Year	Industry employment	Real industry investment	Nominal industrial investment	The real value of industry production	0.785	Industry's share of production	Women's employment share	Industrial permit	Green finance
2002	0.536	0.920	0.961	0.552	0.816	0.454	0.694	0.502	0.137
2003	0.457	0.873	0.938	0.492	0.715	0.474	0.544	0.492	0.282
2004	0.376	0.765	0.893	0.466	0.707	0.418	0.440	0.451	0.342
2005	0.364	0.809	0.867	0.398	0.814	0.484	0.416	0.425	0.376
2006	0.015	0.714	0.785	0.341	0.836	0.488	0.355	0.000	0.428
2007	0.000	0.615	0.764	0.326	0.805	0.622	0.233	0.110	0.441
2008	0.457	0.496	0.849	0.301	0.944	0.615	0.234	0.520	0.464
2009	0.707	0.587	0.879	0.235	0.982	0.584	0.201	0.760	0.483
2010	0.698	0.659	0.874	0.142	0.966	0.619	0.229	0.713	0.632
2011	0.702	0.780	0.886	0.087	0.97	0.663	0.229	0.714	0.702
2012	0.787	0.922	0.922	0.131	1.000	0.502	0.204	0.739	0.739
2013	0.707	0.890	0.843	0.186	0.901	0.550	0.212	0.687	0.734
2014	0.739	0.909	0.862	0.120	0.901	0.537	0.180	0.695	0.737
2015	0.764	0.902	0.821	0.202	0.893	0.633	0.155	0.731	0.886
2016	0.765	0.845	0.824	0.129	0.883	0.661	0.129	0.721	0.940
2017	0.708	0.875	0.740	0.078	0.862	0.653	0.103	0.651	0.900
2018	0.661	0.763	0.599	0.112	0.901	0.551	0.077	0.588	0.930
2019	0.612	0.866	0.591	0.108	0.971	0.462	0.052	0.529	0.926
2020	0.392	0.581	0.114	0.035	1.000	0.255	0.026	0.239	1.000
2021	0.370	0.658	0.000	0.000	0.198	0.000	0.000	0.270	0.993

Source: Research calculations

to consumers' demands and provide the basis for all their stakeholders to discover opportunities along with their employees. In this situation, financial management plays a key role to promote business practices and sustainable development.

To identify the priorities of the green financing strategy based on the Likert scale and since the items were scored on the Likert scale from 1 to 5, as presented in the research findings, all the items had average scores of low based on the respondents' opinions, and thus the green finance strategies were weak in the banks. The "motivational measures to increase employees' familiarity with green finance rules" index with an average score of 2.1 obtained a higher score than other items. Furthermore, the "senior bank managers' views on green finance of companies", "loan rate discount for green projects" and "facilitating the conditions for receiving loans for projects based on sustainable development" with an average score of 1.98 received lower scores than other items. Therefore, the managers and policy-makers of the domestic financial markets are suggested to take necessary supporting measures based on the scores of the relevant strategies to pay attention and take considerations related to green finance according to the 19 priorities introduced in Figure 3 of this research in a way that the strategy with a lower score in this prioritization needs more support measures. The grey relational analysis of the industry sector variables with green finance indicated that the green finance index had the highest relationship with the investment level of the industry sector. Furthermore, there was

Table 14: Calculation of deviation of time series for using in grey relational analysis

Year	Industry employment	Real industry investment	Nominal industrial investment	The real value of industry production	Dependency index	Industry's share of production	Women's employment share	Industrial permit	Green finance
1978	0.000	0.479	0.000	0.018	0.802	0.114	0.122	0.000	0.274
1979	0.001	0.986	0.000	0.000	0.802	0.000	0.110	0.004	0.369
1980	0.008	0.390	0.000	0.015	0.815	0.181	0.098	0.011	0.457
1981	0.012	0.083	0.000	0.025	1.000	0.228	0.131	0.024	0.461
1982	0.012	0.073	0.000	0.019	0.885	0.200	0.176	0.018	0.343
1983	0.026	0.038	0.000	0.035	0.957	0.131	0.231	0.038	0.522
1984	0.017	0.009	0.000	0.054	0.952	0.164	0.113	0.026	0.484
1985	0.017	0.005	0.000	0.051	0.832	0.121	0.085	0.022	0.531
1986	0.025	0.045	0.000	0.040	0.638	0.142	0.097	0.020	0.517
1987	0.037	0.000	0.000	0.057	0.289	0.218	0.097	0.030	0.691
1988	0.062	0.041	0.000	0.061	0.326	0.288	0.611	0.056	0.679
1989	0.079	0.002	0.001	0.067	0.377	0.262	0.544	0.071	0.757
1990	0.149	1.000	0.002	0.120	0.435	0.517	0.459	0.146	0.672
1991	0.177	0.057	0.002	0.170	0.464	0.625	0.000	0.168	0.665
1992	0.112	0.014	0.001	0.168	0.532	0.635	0.024	0.114	0.622
1993	0.103	0.228	0.002	0.153	0.572	0.427	0.009	0.116	0.642
1994	0.126	0.094	0.003	0.162	0.355	0.556	0.159	0.143	0.787
1995	0.125	0.120	0.003	0.162	0.349	0.541	0.207	0.156	0.851
1996	0.155	0.081	0.005	0.213	0.347	0.632	0.181	0.161	0.870
1997	0.139	0.128	0.004	0.252	0.334	0.704	0.182	0.150	0.958
1998	0.122	0.046	0.006	0.241	0.396	0.664	0.154	0.129	0.928
1999	0.136	0.084	0.005	0.277	0.285	0.651	0.196	0.159	1.000
2000	0.170	0.034	0.010	0.325	0.201	0.652	0.220	0.172	0.942
2001	0.319	0.076	0.026	0.385	0.258	0.692	0.326	0.326	0.897
2002	0.464	0.080	0.039	0.448	0.215	0.54	0.306	0.498	0.863
2003	0.543	0.127	0.062	0.508	0.184	0.526	0.456	0.508	0.718
2004	0.624	0.235	0.107	0.534	0.285	0.582	0.560	0.549	0.658
2005	0.636	0.191	0.133	0.602	0.293	0.516	0.584	0.575	0.624
Year	Industry employment	Real industry investment	Nominal industrial investment	The real value of industry production	0.186	Industry's share of production	Women's employment share	Industrial permit	Green finance
2006	0.985	0.286	0.215	0.659	0.164	0.512	0.645	1.000	0.572
2007	1.000	0.385	0.236	0.674	0.195	0.378	0.767	0.890	0.559
2008	0.543	0.504	0.151	0.699	0.056	0.385	0.766	0.480	0.536
2009	0.293	0.413	0.121	0.765	0.018	0.416	0.799	0.240	0.517
2010	0.302	0.341	0.126	0.858	0.034	0.381	0.771	0.287	0.368
2011	0.298	0.220	0.114	0.913	0.03	0.337	0.771	0.286	0.298
2012	0.213	0.078	0.078	0.869	0.000	0.498	0.796	0.261	0.261
2013	0.293	0.110	0.157	0.814	0.099	0.450	0.788	0.313	0.266
2014	0.261	0.091	0.138	0.880	0.099	0.463	0.820	0.305	0.263
2015	0.236	0.098	0.179	0.798	0.107	0.367	0.845	0.269	0.114
2016	0.235	0.155	0.176	0.871	0.117	0.339	0.871	0.279	0.060
2017	0.292	0.125	0.260	0.922	0.138	0.347	0.897	0.349	0.100
2018	0.339	0.237	0.401	0.888	0.099	0.449	0.923	0.412	0.070
2019	0.388	0.134	0.409	0.892	0.029	0.538	0.948	0.471	0.074
2020	0.608	0.419	0.886	0.965	0.000	0.745	0.974	0.761	0.000
2021	0.630	0.342	1.000	1.000	0.802	1.000	1.000	0.730	0.007

Source: Research calculations

the lowest intensity of the grey relation between green finance and the value-added share of the industry sector in the GDP. The evidence indicated that green finance was related to many structural variables of the industry but the

Table 15: Calculation of grey relational analysis coefficients

Year	Industry employment	Real industry investment	Nominal industrial investment	The real value of industry production	Dependency index	Industry's share of production	Women's employment share	Industrial permit	Green finance
1978	1.000	0.653	1.000	0.981	0.529	0.888	0.887	1.000	0.767
1979	0.999	0.477	0.999	1.000	0.529	1.000	0.897	0.996	0.709
1980	0.991	0.698	1.000	0.984	0.525	0.833	0.907	0.988	0.663
1981	0.987	0.916	1.000	0.973	0.474	0.798	0.880	0.975	0.661
1982	0.987	0.925	1.000	0.979	0.504	0.818	0.845	0.980	0.724
1983	0.972	0.960	1.000	0.962	0.485	0.873	0.806	0.960	0.633
1984	0.982	0.990	1.000	0.943	0.486	0.846	0.895	0.972	0.650
1985	0.982	0.994	1.000	0.947	0.52	0.881	0.919	0.977	0.629
1986	0.973	0.952	1.000	0.958	0.585	0.864	0.908	0.978	0.635
1987	0.961	1.000	1.000	0.940	0.757	0.805	0.908	0.968	0.566
1988	0.936	0.956	1.000	0.936	0.734	0.757	0.611	0.942	0.570
1989	0.920	0.998	1.000	0.930	0.705	0.775	0.638	0.927	0.543
1990	0.858	0.474	0.993	0.883	0.674	0.635	0.676	0.861	0.573
1991	0.835	0.941	0.999	0.841	0.66	0.590	1.000	0.843	0.575
1992	0.889	0.985	1.000	0.843	0.629	0.586	0.976	0.888	0.592
1993	0.897	0.798	0.997	0.855	0.611	0.678	0.991	0.885	0.583
1994	0.877	0.905	0.998	0.848	0.717	0.618	0.858	0.863	0.534
1995	0.878	0.882	0.996	0.848	0.72	0.625	0.823	0.852	0.514
1996	0.853	0.918	0.997	0.809	0.721	0.587	0.841	0.848	0.509
1997	0.866	0.876	0.995	0.781	0.729	0.561	0.841	0.857	0.484
1998	0.880	0.952	0.997	0.789	0.695	0.576	0.862	0.875	0.492
1999	0.869	0.914	0.995	0.764	0.76	0.580	0.830	0.850	0.474
2000	0.841	0.964	0.997	0.735	0.817	0.580	0.814	0.840	0.489
2001	0.738	0.922	0.994	0.700	0.777	0.565	0.747	0.724	0.501
2002	0.660	0.918	0.992	0.667	0.807	0.623	0.759	0.644	0.511
2003	0.624	0.867	0.987	0.639	0.83	0.631	0.678	0.639	0.556
2004	0.591	0.793	0.975	0.628	0.76	0.607	0.632	0.621	0.578
2005	0.586	0.825	0.977	0.599	0.754	0.636	0.622	0.610	0.590
<b>Year</b>	0.477	0.759	0.963	0.577	0.828	0.637	0.598	0.474	0.612
2006	0.474	0.701	0.943	0.572	0.846	0.704	0.556	0.503	0.617
2007	0.623	0.641	0.911	0.563	0.822	0.701	0.556	0.652	0.627
2008	0.754	0.685	0.918	0.540	0.642	0.684	0.546	0.790	0.635
2009	0.748	0.726	0.922	0.512	0.981	0.702	0.554	0.758	0.710
2010	0.751	0.804	0.936	0.496	0.964	0.727	0.555	0.759	0.751
2011	0.808	0.920	0.965	0.509	0.968	0.644	0.547	0.775	0.775
2012	0.755	0.891	0.940	0.525	1	0.667	0.549	0.742	0.772
2013	0.775	0.909	0.940	0.506	0.901	0.660	0.539	0.747	0.774
2014	0.793	0.902	0.930	0.530	0.901	0.710	0.532	0.770	0.888
2015	0.793	0.853	0.891	0.508	0.894	0.726	0.524	0.763	0.937
2016	0.755	0.878	0.900	0.494	0.885	0.722	0.517	0.721	0.900
2017	0.726	0.792	0.794	0.503	0.867	0.667	0.510	0.686	0.928
2018	0.699	0.871	0.821	0.502	0.901	0.626	0.503	0.657	0.924
2019	0.597	0.682	0.520	0.483	0.968	0.547	0.496	0.542	1.000
2020	0.588	0.724	0.474	0.474	1	0.474	0.490	0.552	0.992
2021	1.000	0.653	1.000	0.981	0.529	0.888	0.887	1.000	0.767

Source: Research calculations

intensity of the relationship was different depending on the type of variable.

## References

- [1] E.F. Brigham and J.F. Houston, *Fundamentals of Financial Management*, Cengage Learning, 2019.

- [2] T.F. Cojoianu, G.L. Clark, A.G.F. Hoepner, P. Veneri and D. Wójcik, *Entrepreneurs for a low carbon world: How environmental knowledge and policy shape the creation and financing of green start-ups*, Res. Policy **49** (2020), no. 6, 103988.
- [3] C. Criscuolo and C. Menon, *Environmental policies and risk finance in the green Sector: Cross-country evidence*, Energy Policy **83** (2015), 38–56.
- [4] P.M. Falcone, *Environmental regulation and green investments: The role of green finance*, Ijge **14** (2020), no. 2, 159–173.
- [5] S. Hafner, A. Jones, A. Anger-Kraavi and J. Pohl, *Closing the green finance gap- A systems perspective*, Environ Innov. Soc. Transit. **34** (2020), 26–60.
- [6] J.W. LEE, *Green finance and sustainable development goals: The case of China*, J. Asian Finance Econ. Bus. **7** (2020), no. 7, 577–586.
- [7] Z. Li, T.H. Kuo, W. Siao-Yun and L. The Vinh, *Role of green finance, volatility, and risk in promoting the investments in renewable energy resources in the post-COVID-19*, Resour. Policy **76** (2022), 102563.
- [8] X. Xu and J. Li, *Asymmetric impacts of the policy and development of green credit on the debt financing cost and maturity of different types of enterprises in China*, J. Clean. Prod. **264** (2020), 121574.
- [9] Y. Xu, S. Li, X. Zhou, U. Shahzad and X. Zhao, *How environmental regulations affect the development of green finance: Recent evidence from polluting firms in China*, Renew. Energy **189** (2022), 917–926.
- [10] Y. Yang, X. Su and S. Yao, *Nexus between green finance, fintech, and high-quality economic development: Empirical evidence from China*, Resour. Policy **74** (2021), 102445.
- [11] C. Zhang, X. Cheng and Y. Ma, *Research on the impact of green Finance policy on regional green innovation-based on evidence from the pilot zones for green finance reform and innovation*, Front. Envir. Sci. **10** (2022).