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The Effect of Renewable Energy Development Policies on Macroeconomic Indicators in Iran

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Abstract:
The aim of this study was to investigate the Impact of Renewable Energy Development Policies on Macroeconomic Indicators in Iran in 2020 through the exploratory mixed exploration model research method. The statistical population in the qualitative sector was professors of higher education centers in the field of energy and economics, and senior, middle managers and senior experts of the country's electricity industry and in the quantitative sector the managers and deputies of Ministry of Energy, Companies of TAVANIR, Regional Electric Company of Tehran, Fars and Mazandaran and SATBA by 180 people. In qualitative part 20 experts were selected by snowball sampling method and in quantitative part 123 people were selected by relative class sampling method with Cochran's formula. Data were analyzed in qualitative part with Delphi technique and in quantitative part with 105-item questionnaire with SPSS and Smart PLS software. To determine the validity and reliability in the qualitative part, the necessary tests including acceptability and capability have been used and in a quantitative part, the validity of the questionnaires was confirmed in terms of form, content (CVR and CVI range for each item between 0.6 to 0.1 and 0.85 to 0.1, respectively) and structure. The reliability and combined reliability of the components were estimated and confirmed between 0.847 to 0.951 and 0.759 to 0.931, respectively. Findings showed that the model of the Impact of Renewable Energy Development Policies on Macroeconomic Indicators in Iran has nine dimensions (objective evaluation, legal framework, compliance, management requirements, policy environment management, process evaluation, policy evaluators, auditing and the characteristics of the optimal method of evaluation) and 25 components.

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1. Introduction

The use of renewable resource consumption has increseaed recently (Chen, pinar and Stengos, 2021) and corporates' demand for fossil fuels rose from about 5% of total in the United States in 2010 to about 13% in 2019 and may exceed 20% by 2030 (O'Shaughnessy et al, 2021). In Euroup, the revision of the RED II- (Renewable Energy Directive) provides rules for "Renewable Energy Communities" set by the 27 EU Member States by June 2021. The Renewable Energy Directive belongs to local members or shareholders who are allowed to share energy in the community by removing barriers to private investment and funding for renewable energy and securing social benefits (Hoicka et al., 2021). Rising global economic costs to control environmental pollution have doubled the importance of paying attention to renewable energy sources (Shahbaz et al., 2021). Over the past decade, the US annual electricity generation deficit for renewable energy has doubled from 10% to 20%. This growth has been driven by a number of factors, including reducing technology costs and policy support and the share of renewable production is expected to increase over time (Cole, Gates and Mai, 2021). Each country's energy policies influence each other through different economic and political channels (Sattich et al., 2021). Consumption of renewable energy reduces the amount of greenhouse gases in nature compared to the consumption of fossil energy. Therefore, to achieve the goals of sustainable development, governments must implement tax incentives and policies to increase corporate demand for renewable energy sources (Shahbaz et al., 2021).

In second half of twentieth century, global economies has faced unprecedented restructuring for production due to the rapid technological developments which was a result of computer intrusion and globalization. In addition to shifts in the economic sector, further concerns about climate change and emissions are leading to a simultaneous rebuilding of energy consumption patterns. Most of developed countries start using renewable energies instead of fossil fuels (Rafiq et al., 2018). The results show that the development of renewable energy has created more than 8.1 million jobs in the world and during 2015, the share of Asian countries is more than 60% (Emami Meybodi et al., 2017). The existence of three main advantages of creating special capacity for economic development, improving energy supply and security, preserving the environment and reducing air pollution in the use of renewable energy sources such as energy from the sun and wind with the aim of achieving sustainable development in various countries including developed and developing has raised increasing attention to renewable energy (IEA, 2011). one of the most important proven features of renewable energies is that no greenhouse gases enter the atmosphere (Yazdanpanahdo et al., 2017). Renewable energy development can also reduce domestic consumption of fossil fuels (IRENA, 2016). Energy is a basic need for continued economic development, provision and procurement of welfare and comfort of human life (Ehsanfar, 2016) and Sustainable growth and development is possible despite

renewable resources in an endogenous growth model and the assumption of full competition (Tahami Poor et al., 2016). Choosing the right energy policy depends on the relationship between economic growth and energy consumption (Binh, 2011). In fact energy sector is a basic foundation of economic and social activities (Fitras et al., 2014). Renewable energies have direct relation with sustainable development through effect on human development and economic productivity (Asumadu &Owusu,a, 2016). renewable energy resources provide opportunities for energy security, social and economic development, access to energy, climate change mitigation, and environmental and health impacts (Asumadu &Owusu, b, 2016).

According to the Parliamentary Research Center, the country's energy sector at the policy and legislative level, faced with the challenges of lack of a clear accountant, policymakers in charge, politicization of energy planning, lack of constructive communication between institutions and devices and the lack of accurate and integrated statistics to formulate comprehensive energy policies (Ghasemi et al., 2017). Until our national energy policy is not clear, we cannot expect enough legal support to support new energy. In addition, it seems that insufficient information of policymakers, government officials and legislators of the country about the real advantages and disadvantages of using new energies and the side effects of using any new and fossil energies and lack of proper information at the level of policy makers as well as at the national and community level is the most important threat in this field (Hoshyar, 2017). Until recently, evaluation of policy was not much considered and less used in the policy-making process, and recently, more interest and desire among researchers and policy-makers for this part of the policy-making process is being formed. (Alwani and Sharifzadeh, 2012). Evaluation is one of the most important tools to ensure the efficiency and effectiveness of public policies, which, while important, has received less attention from Iranian policymakers and policy researchers (Shokri et al., 2018).

Iran has a significant capacity to generate renewable electricity compared to other countries in the region. According to the report of the Renewable Energy and Electricity Productivity Organization (SATBA), the share of renewable energy in Iran is 45% wind energy, 35% solar energy, 16% small hydropower, 2% biomass energy and 2% heat recovery energy (Sarlaki et al., 2019). Given the importance of production and economic growth of any society, achieving more production and higher growth rates, has always been the concern of governments and nations. For this reason, one of the goals of macroeconomics, which is emphasized by all governments and economic planners in the world, is continuous and sustainable economic growth (Ostadi, 2016). Although the development of renewable energy cannot be the only way to respond to rising energy demand, but it has a considerable capacity to create economic growth and

diversification. Therefore, the development of renewable energy can play an important role in achieving green economic growth (Renewable Energy Policy Network, 2016). Due to the importance of policy evaluation, renewable energy development, and macroeconomic indicators, the present study seeks to model the evaluation of renewable energy development policies affecting macroeconomic indicators and in the following sections, the research methodology, findings, and discussion and conclusions are discussed. Also, the research question was posed as follows: What is the pattern of the impact of renewable energy development policies on macroeconomic indicators in Iran?What are its dimensions and components and how important are they?

2. Literature review

In a research by Monavariyan et al. entiteled Designing a renewable energy development policy model in Iran, the results show that renewable energy development consulting line was selected as a central category; Development of renewable energy market as the main strategy; Business development and goals set in the upstream documents of the country as the main causal conditions; Predisposing factors for the development of renewable energy as a contextual category; Renewable energy market intervention factors as an intervening category; and the development of renewable energies were chosen as major consequence. Finally, a paradigm model of a renewable energy development policy model was designed. In a study conducted by Mirza Mohammadi, Jabbarzadeh, Salehi Shahrabi (2020) entiteled energy supply planning for greenhouses with a focus on renewable energy in the microgrid mode, the results showed that the effect of different sources of renewable energy in the studied geographical area, along with the amounts of investment and maintenance costs, can lead to lack of technical-economic justification for the simultaneous use of different renewable sources.

Sarlaki and Hassan Beigi (2019) study the production potentials and technical barriers to the development and exploitation of renewable energy in Iran and provided technical information and policy tools to address some of the barriers to the development and use of renewable energy in Iran. According to the results of Emami Meybodi et al. (2017), one of the criteria for determining the success rate of countries in achieving sustainable development is to meet energy demand in terms of standards related to energy production and consumption. Majdzadeh Tabatabai and Hadian (2017) showed that achieving the goal of further reducing pollution and the resulting social costs of it will be achieved at the expense of further reducing the equilibrium GDP of the sectors. Based on the research findings of Ghaemirad and Shahin (2016), the most important indicators that are effective in the lack of development of these technologies are the cheapness of fossil fuels and energy carriers in Iran, the lack of understanding of the need by politicians, the lack of incentive to enter the private sector and the lack of

effective policies and adequate incentives from the government. According to the results of Tahamipour et al. (2016), the coefficients of variables of electricity consumption, renewable energy consumption and energy consumption of fuels and recyclables are negative, which can be based on the strong dependence of Iran's economic growth on (fossil energy) oil revenues.

Sattich et al (2021) in their research entiteled Renewable energy in EU-China relations:The interdependence of policies and their geopolitical implications, showed that renewable energy can determine bilateral relations. Renewable energies of the past have contributed to greater co-ordination between the EU and China, while increasing recourse to political options based on national priorities today creates obstacles to greater co-operation. In a study by Cole, Gates, and May (2021) examining the implications of increasing the cost of renewable energy for the United States power system, the results show that the lowest US electricity cost with renewable energy generation will be between 36-36% of total energy production (renewable and non-renewable) by 2030 and 40-65% of total energy production by 2050. Examining how to change the amount of renewable energy has shown that the lowest cost solution affects the cost of construction and operation of the electrical system.

In a study conducted by Rafiq, Salim and MSgro (2018), the results showed that industrialization, the service sector, government spending and the open economy have an effective role in reducing unemployment while agriculture and renewable energy consumption increase unemployment. The results of Moyo et al.'s (2017) study showed that renewable energy consumption has a significant effect on long-term unemployment, however, in the short run, variables have insignificant relationship. Maji (2015) showed that despite the lack of a significant relationship between clean energy indicators and short-term economic growth, there is a negative relationship between clean energy indicators (electricity and nuclear energy) and long-term economic growth. According to the results of research by Apergis and Salim (2015), the adoption of renewable energy technologies and energy efficiency seem to be different in the study areas. The results of Lin and Mubarak (2014) showed that there is a long-term two-way causal relationship between renewable energy consumption and economic growth.

3. Methodology

The research was applied in terms of purpose and in terms of research method was a qualitative-quantitative mixed method that in the qualitative part, the model is identified and in the quantitative part, the identified model in the real statistical community is quantified and tested. The statistical population of the research, in the qualitative part according to the subject and three topics of renewable energy, macroeconomic indicators and the Fifth Development Plan,

the experts of this research were experts who are familiar with these three issues. Therefore, the professors of higher education centers in the field of energy and economics and the top, middle managers and senior experts of the country's electricity industry formed the statistical community in the quality sector. In order to sample in this section, according to the importance of the research topic, a range of key experts in the field of "The Impact of Renewable Energy Development Policies on Macroeconomic Indicators in Iran" were selected that due to the dominance of the qualitative approach, among the qualitative sampling methods, "snowball" sampling was used until theoretical saturation was achieved. In this section, 20 people were selected. The statistical population of the research, in the quantitative part, included managers and deputies of the Ministry of Energy, TAVANIR companies, Tehran, Fars, Mazandaran and SATBA regional electricity companies with an approximate number of 180 people. The sampling method was relative stratified, so that each of the selected companies played the role of a stratum. The number of samples was determined using Cochran's formula to 123 people and in each category, the questionnaire was distributed randomly.

The main research tools in the qualitative part were surveying experts by semi-structured and structured questionnaires (qualitative part) and using a closed questionnaire in the quantitative part. The questionnaire consisted of 105 items to assess the status of each of the dimensions of the secondary research model, according to the experts' opinion on the primary model. To determine the validity and reliability in the qualitative part, the necessary tests including acceptability and capability were used, and in the quantitative part, the validity of the questionnaires was confirmed in terms of structure, face and content (CVR and CVI range for each item between 0.6 to 0.1 and 0.85 to 0.1, respectively). Reliability and combined reliability were estimated and confirmed between 0.847 to 0.951 and 0.759 to 0.931, respectively.

The research method of this research was combined:

A- Qualitative part; To reach from the proposed primary model to the corrective (secondary) model of research, by surveying experts and using the Delphi technique.

B- Quantitative part; To test and quantify the modify model, by surveying statistical samples and using hardware equations in Smart PLS software environment.

4. Research Findings

4.1. Qualitative part Findings

In this study, the Delphi method was performed in a total of four rounds, in which the findings of the first and fourth rounds are presented separately.

"Objective Evaluation" Dimension: In the first round of Delphi, the most important was related to population with a mean of 3.72 and standard deviation

of 0.79 and the least importance was related to the construction component to problems with a mean of 2.25 and standard deviation of 0.88. In the fourth round, the highest importance was related to globalization with a mean of 3.86 and standard deviation of 0.79 and the lowest importance was related to forecasting with a mean of 3.44 and standard deviation of 0.65. Kendall's coefficient of concordance for the fourth round answers is 0.875 which has increased only 10.2% compared to the third round which was equal to 0.773. Finally, the dimension of "goal evaluation", after performing four rounds of Delphi qualitative technique, had three components: 1. Value and cultural priorities, 2. Comprehensiveness 3. Prediction.

"Legal Framework" Dimension: In the first round of Delphi, the most importance was related to the formal features of the law and the guarantee of implementation with a mean of 3.49 and standard deviation of 0.70 and the least importance was related to the basic issues in the law with a mean of 2.11 and a standard deviation of 0.70. In the fourth round, the most importance was related to the formal features of the law and the guarantee of implementation with a mean of 3.89 and standard deviation of 0.75 and the least importance was related to the substantive issues of the law with a mean of 3.59 and standard deviation of 0.71. Kendall's coefficient of concordance for the fourth round answers is 0.875 which has increased only 9.5% compared to the third round which was equal to 0.780. Finally, the dimension of "legal framework", after performing four rounds of Delphi quality technique, was determined with three components as follows: 1. Formal features of the law and guarantee of implementation, 2. Reflection of policy objectives in the law and 3. Substantive issues of the law.

"Adaptation And Compatibility" Dimension: In the first round of Delphi, the most importance was related to the criterion of Sharia and the constitution with a mean of 3.66 and standard deviation of 0.75 and the least importance was related to compliance with the goals and aspirations of the system with a mean of 2.30 and standard deviation of 0.80. In the fourth round, the most importance was related to the standard of Sharia and the constitution with a mean of 3.66 and standard deviation of 0.95 and the lowest importance was related to adaptation to the ecosystem with a mean of 3.52 and standard deviation of 1.03. Kendall's coefficient of concordance for the fourth round answers is 0.805 which has increased by only 7.3% compared to the third round which was equal to 0.732. Finally, the dimension of "compliance and compatibility", after performing four rounds of Delphi quality technique, has three components as follows: 1. Compliance with the ecology and ecosystem, 2. Compliance with upstream documents and 3. Criteria of Sharia and the Constitution.

"Management Requirements" Dimension: In the first round of Delphi, the most importance is related to the structure and resources component with a mean of 3.85 and standard deviation of 0.75 and the least importance is related to

planning and implementation processes with a mean of 2.15 and standard deviation of 0.82. In the fourth round, the most importance was related to the component of structure and resources with a mean of 3.70 and standard deviation of 0.79 and the least importance was related to the components of human resources and program with a mean of 3.33 and standard deviation of 0.86 and 0.75, respectively. Kendall's coefficient of concordance for the fourth round answers is 0.812 which has increased only 9% compared to the third round which was equal to 0.722. Finally, the "Management Requirements" dimension, after performing four rounds of Delphi quality technique, has three components as: 1. Human resources, 2. Program and 3. Structure and resources.

"Policy Management" Dimension: In the first round of Delphi, the most importance was related to the study of the environment with a mean of 3.53 and a standard deviation of 0.93 and the implementation away from politicization with a mean of 2.33 and standard deviation of 0.93 had the least importance. In the fourth round, the most importance was related to the preparation of the performance platform with a mean of 3.72 and standard deviation of 0.76 and the least importance was related to the study of the environment with a mean of 3.33 and a standard deviation of 0.80. Kendall's coefficient of concordance for the fourth round answers is 0.804, which has increased only 5% compared to the third round, which was equal to 0.754. Finally, the dimension of "policy environment management", after performing four rounds of Delphi qualitative technique, has three components as: 1. Study of the environment, 2. Preparation of implementation context and 3. public will to implement.

"Process Evaluation" Dimension: In the first round of Delphi, the greatest importance was related to determining gaps and deviations with a mean of 3.33 and standard deviation of 0.79 and the least importance was related to program and performance evaluation with a mean of 2.21 and standard deviation of 0.65. In the fourth round, the most importance was related to determining gaps and deviations with a mean of 3.72 and standard deviation of 0.77 and the least importance was related to monitoring and tracking of the executive apparatus with a mean of 3.30 and standard deviation of 0.79. Kendall's coefficient of concordance for the fourth round answers is 0.850 which has increased by only 4.8% compared to the third round which was equal to 0.758. Finally, the dimension of "process evaluation", after performing four rounds of Delphi quality technique, has three components as follows: 1. Evaluation of execution schedule, 2. Monitoring and tracking of the executive apparatus, and 3. Determining gaps and deviations.

"Policy Assessors" Dimension: In the first round of Delphi, the most importance was related to key experts and informants with a mean of 3.49 and a standard deviation of 0.70 and the least importance was related to the interest groups with a mean of 2.45 and a standard deviation of 1.05. In the fourth round, the most importance was related to the component of evaluation expert with a

mean of 3.83 and standard deviation of 0.90 and the least importance was related to the component of people's evaluation with a mean of 3.39 and standard deviation of 0.66. Kendall's coefficient of concordance for the fourth round answers is 0.880 which has increased only 3.7% compared to the third round which was equal to 0.743. Finally, the dimension of "policy Assessors ", after performing four rounds of Delphi quality technique, has three components as: 1. People evaluation, 2. Key experts and informers, and 3. Evaluation expert.

"Audit" Dimension: In the first round of Delphi, the highest importance was related to performance auditing with a mean of 3.55 and standard deviation of 0.80 and the least importance was related to accrual auditing with a mean of 2.55 and standard deviation of 0.75. In the fourth round, the highest importance was related to performance auditing with a mean of 3.94 and standard deviation of 0.95 and the least importance was related to the accounting of social systems with a mean of 3.69 and standard deviation of 0.76. Kendall's coefficient of concordance for the fourth round answers is 0.815 which has increased only 4.9% compared to the third round which was equal to 0.766. Finally, the "audit" dimension, after performing four rounds of Delphi quality technique, has two components as: 1. Performance audit and 2. Accounting of social systems.

"Characteristic of the Optimal Evaluation Method " Dimension: In the first round of Delphi, the most importance was related to ethics and accountability with a mean of 3.33 and standard deviation of 0.66 and the least importance was related to the component of evaluating the causes of results with a mean of 2.33 and a standard deviation of 0.55. In the fourth round, the most importance was related to ethics and accountability with a mean of 3.60 and standard deviation of 0.95 and the least importance was related to the conditions of the society with a mean of 3.49 and a standard deviation of 0.87. Kendall's coefficient of concordance for the fourth round answers is 0.823 which has increased by only 6.4% compared to the third round which was equal to 0.759. Finally, the dimension of "characteristic of the optimal evaluation method", after performing four rounds of Delphi qualitative technique, has two components as follows: 1. Ethics and accountability 2. Attention to the conditions of society. Table (1) shows the results of the fourth Delphi round for the components explaining the impact of renewable energy development policies on macroeconomic indicators in Iran, from the experts' perspective.

Table 1 Statistical description of respondents' views on the components explaining the impact of renewable energy development policies on macroeconomic indicators in Iran - Fourth Delphi Round

Components	Number of responses	Lowest	highest	Mean	SD	importance order
Objective evaluation						
Forecast	20	2.00	5.00	3.44	0.65	3
Holistic	20	2.00	5.00	3.86	0.79	1
Value and cultural priorities	20	2.00	5.00	3.62	0.91	2
Legal framework						
Substantive issues of law	20	2.00	5.00	3.59	0.71	3
Formal attributes of law and guarantee of implementation	20	2.00	5.00	3.89	0.75	1
Reflecting policy objectives in law	20	2.00	5.00	3.63	0.95	2
Adaptation						
Criteria of Sharia and the Constitution	20	2.00	5.00	3/69	0.95	1
Compliance with upstream documents	20	2.00	5.00	3.60	0.80	2
Adaptation to ecosystems and ecosystems	20	2.00	5.00	3.52	1.03	3
Management requirements						
Structure and resources	20	2.00	5.00	3.70	0.79	1
Program	20	2.00	5.00	3.33	0.75	2
human resources	20	2.00	5.00	3.33	0.86	2
Policy environment management						
Public will to execute	20	2.00	5.00	3.55	0.65	2
Environmental study	20	2.00	5.00	3.33	0.80	3
Laying the groundwork	20	2.00	5.00	3.72	0.76	1
Process evaluation						
Determining gaps and deviations	20	2.00	5.00	3.72	0.77	1
Evaluate the execution schedule	20	2.00	5.00	3.45	0.93	2
Monitoring and tracking of the executive apparatus	20	2.00	5.00	3.30	0.79	3
Policy evaluators						
Evaluation specialist	20	2.00	5.00	3.83	0.90	1
Experts and key informants	20	2.00	5.00	3.67	0.84	2
Evaluate people	20	2.00	5.00	3.39	0.66	3
Audit						
Performance audit	20	2.00	5.00	3.94	0.95	1
Social systems accounting	20	2.00	5.00	3.69	0.76	2
Characteristics of the optimal evaluation method						
Orientation ethics and accountability	20	2.00	5.00	3.60	0.95	1
Pay attention to the conditions of society	20	2.00	5.00	3.49	0.87	2

4.2. Quantitative Findings

Descriptive statistics: in this research, 106 were male (86.18%), 17 were female (13.82%), 14 were single (11.38%) and 109 were married (88.62%). In the age groups of the subjects, 8 people were under 30 years old (6.50%), 24 people were between 31 and 40 years old (19.51%), 48 people were 41 to 50 years old (39.02%) and 43 people were more than 50 years old (34.96%). In terms of education, 11 were associates and less (8.94%), 68 were bachelors (55.28%) and 44 (35.77%) were masters and above. In service history, 7 people have less than 5 years (5.69%), 21 people between 6 to 10 years (17.07%), 23 people between 11 to 15 years (18.70%), 39 people 16 to 20 years (31.3%) and 33 people (26.83%) more than 20 years of service.

Inferential Statistics: At this stage, by conducting a qualitative study and according to the relevant explanations in the qualitative part, a researcher-made questionnaire with 105 items was developed that at first, its face validity was confirmed through a survey of several experts and the implementation of their desired corrections and based on the calculation of CVR and CVI for each item, the content validity of the questionnaire was approved by a group of 20 people consisting of academic and organizational experts so that the CVR and CVI ranges for each item were obtained between 0.7 to 0.1, 0.85 and 0.1, respectively. To test the model, the researcher-made questionnaire, after confirming the reliability, was distributed among 123 subjects by stratified sampling method and data were analyzed by exploratory and confirmatory factor analysis with SPSS and Smart PLS software.

Question 1: What are the dimensions and components of the model of the impact of renewable energy development policies on macroeconomic indicators in Iran?

To determine whether the desired number of data (sample size and relationship between variables) are suitable for factor analysis, the Kaiser-Meyer[1] fit index and Bartlett[2] test were used. The Kaiser-Meyer fit test is an indicator of sampling adequacy that examines the small partial correlation between variables. The Kaiser-Meyer fit test is an indicator of sampling adequacy that examines the small partial correlation between variables. The amount of KMO (sampling adequacy) for the nine dimensions 1. Objective evaluation, 2. Legal framework, 3. Conformity, 4. Management requirements, 5. Policy environment management, 6. Process evaluation, 7. Policy evaluators, 8. Audit and 9. Characteristics of optimal evaluation method was 0.814, 0.789, 0.780, 0.813, 0.834, 0.789, 0.815, 0.798 and 0.722, respectively, and the significance level of Bartlett test of sphericity was 0.0009. Therefore, in addition to sampling adequacy, the implementation of factor analysis based on the studied correlation matrix will be justified. According to the results of the extracted factors and the

1. KMO(Kaiser-Meyer-Olkin Measure of sampling Adequacy)
2 Bartlets Test of sphericity

percentage of variance explained by the components of the objective evaluation dimension, the eigenvalues of the three studied factors are greater than 10, which together account for approximately 61% of the total changes and among them, the eigenvalue of the first factor was equal to 40.17, the eigenvalue of the second factor was equal to 20.34.

For the legal framework dimension, eigenvalue of the three under study factors were greater than 10, accounting for approximately 67% of the total change. Among them, the eigenvalue of the first factor was equal to 37.24, the eigenvalue of the second factor was equal to 18.87 and the eigenvalue of the third factor was 10.66. For the dimension of adaptation, the eigenvalues of the three under study factors were greater than 12, which together account for approximately 68% of the total change, among which the eigenvalue of the first factor was equal to 39.49, the eigenvalue of the second factor was equal to With 15.88 and the third factor was 12.49.

For the management requirements dimension, the eigenvalues of the three under study factors were greater than 13, accounting for approximately 69% of the total change. Among them, the eigenvalue of the first factor was equal to 39.41, the eigenvalue of the second factor was equal to 15.95, and the eigenvalue of the third factor was equal to 13.63.

For the policy environment dimension, the eigenvalues of the three under study factors were greater than 12, accounting for approximately 69% of the total change. Among them, the eigenvalue of the first factor was equal to 42.55, the eigenvalue of the second factor was equal to 14.12 and the eigenvalue of the third factor was 12.06.

For the process evaluation dimension, the eigenvalues of the three under study factors were greater than 11, accounting for approximately 66% of the total change. Among them, the eigenvalue of the first factor was equal to 39.94, the eigenvalue of the second factor was equal to 16.94 and the eigenvalue of the third factor was 11.65.

For the policy evaluators, the eigenvalues of the three under study factors were greater than 11, accounting for approximately 67% of the total change. Among them, the eigenvalue of the first factor was equal to 41.11, the eigenvalue of the second factor was equal to 13.79 and the eigenvalue of the third factor was 11.94.

For the audit dimension, the eigenvalues of the two under study factors were greater than 18, accounting for approximately 63% of the total change. Among them, the eigenvalue of the first factor was equal to 43.76 and the eigenvalue of the second factor was equal to 18.85.

For the dimension of the characteristic of the optimal evaluation method, the eigenvalues of the two factors under study were greater than 24, which together account for approximately 63% of the total change. Among them, the eigenvalue of the first factor was equal to 38.10, the eigenvalue of the second factor was

equal to 24.95. To examine the research model, a second-order confirmatory factor analysis was used, the results of which are shown in Table (2).

Table 2 Main path coefficient and significance coefficient of the model of the impact of renewable energy development policies on macroeconomic indicators in Iran

Path between variables	Coefficient path	t-values	p-value	Results
Value and cultural priorities -> Goal evaluation	0/405	10/543	0/0009	Is significant
Comprehensive -> Objective Evaluation	0/476	9/159	0/0009	Is significant
Prediction -> Objective evaluation	0/443	9/304	0/0009	Is significant
Reflecting policy objectives in law -> legal framework	0/479	12/116	0/0009	Is significant
Formal Attributes of Law and Enforcement Guarantee -> Legal Framework	0/433	11/463	0/0009	Is significant
Substantive issues of law -> Legal framework	0/409	6/868	0/0009	Is significant
Compliance with upstream documents -> Management requirements	0/418	12/862	0/0009	Is significant
Ecology and ecosystem compliance -> Management requirements	0/369	9/765	0/0009	Is significant
Criteria of Sharia and Constitution -> Management Requirements	0/503	14/158	0/0009	Is significant
Schedule -> Management Requirements	0/286	6/291	0/0009	Is significant
Structure and resources -> Management requirements	0/396	11/685	0/0009	Is significant
Human Resources -> Management Requirements	0/616	14/144	0/0009	Is significant
Public will to implement -> policy environment management	0/441	16/335	0/0009	Is significant
Implementation context -> Policy environment management	0/350	10/515	0/0009	Is significant
Environmental Study -> Policy Environment Management	0/468	14/684	0/0009	Is significant
Execution Schedule Evaluation -> Process Evaluation	0/428	9/211	0/0009	Is significant
Determining gaps and deviations -> Process evaluation	0/424	10/671	0/0009	Is significant
Executive Monitoring -> Process Evaluation	0/464	11/517	0/0009	Is significant
People Evaluation -> Policy Evaluators	0/367	9/951	0/0009	Is significant
Key Experts and Informers -> Policy Assessors	0/457	13/086	0/0009	Is significant
Evaluation Specialist -> Policy Evaluators	0/433	14/159	0/0009	Is significant
Social systems accounting -> auditing	0/826	16/127	0/0009	Is significant
Performance Audit -> Audit	0/331	5/884	0/0009	Is significant
Ethics and Accountability -> Characteristics of the optimal evaluation method	0/625	9/157	0/0009	Is significant
Attention to community conditions -> Characteristics of optimal evaluation methods	0/654	9/649	0/0009	Is significant

Source: Questionnaire Findings

From the perspective of the samples, the nine dimensions and twenty-five components of the heuristic model are as model constructs in explaining the impact of renewable energy development policies on macroeconomic indicators in Iran.

Question 2: What is the importance of each of the dimensions and components of the model of the impact of renewable energy development policies on macroeconomic indicators in Iran?

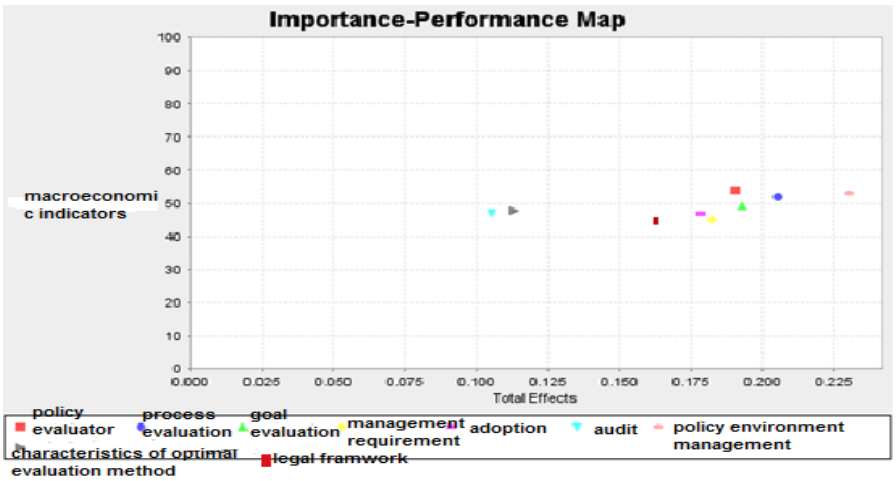
Performance-Significance Map Analysis, also called Performance-Significance Matrix Analysis, is a different way of presenting IMPA output model information focused on the goal of determining the relative importance of structures in the PLS model. Table (3) shows the results of the significance-performance analysis of the components of the model of the impact of renewable energy development policies on macroeconomic indicators in Iran.

Table 3 significance-performance analysis of the components of the model of the impact of renewable energy development policies on macroeconomic indicators in Iran

	Importance and function of the dimensions explaining the evaluation of renewable energy development policies			
	IMPORTANCE	Rank	PERFORMANCE	Rank
Policy evaluator	0/190	4	53/938	1
Process evaluation	0/205	2	52/043	3
Goal evaluation	0/193	3	49/155	4
Management requirement	0/182	5	45/205	8
Adaptation	0/179	6	46/798	7
Audit	0/105	9	47/137	6
Policy environment management	0/230	1	53/064	2
Characteristics of the optimal evaluation method	0/113	8	47/626	5
Legal framework	0/163	7	44/849	9

Source: Questionnaire Findings

According to IPMA analysis, among the dimensions of the evaluation model of the Impact of Renewable Energy Development Policies on Macroeconomic Indicators in Iran, in terms of importance, the highest rank and priority is related to the management dimension of the policy environment with a coefficient of importance of 0.230 and the lowest rank and priority are related to the audit dimension with a significance coefficient of 0.55. In terms of performance, the highest rank and priority are related to the dimension of policy evaluators with a coefficient of 53.938 and the lowest rank and priority are related to the dimension of the legal framework with a coefficient of performance of 44.849.



map1: Significance-performance of dimensions in the final research model
source: survay findings

Question 3: What is the degree of correlation between the dimensions of the evaluation model of the impact of Renewable Energy Development Policies on Macroeconomic Indicators in Iran,? Table (4) shows the results of Spearman correlation coefficient between model dimensions:

Table 4 Correlation coefficients between the dimensions of the evaluation model of the Impact of Renewable Energy Development Policies on Macroeconomic Indicators in Iran

dimentions	Goal evaluation	Legal framwork	adoption	Management requirement	Policy environment management	Process evaluation	Policy evaluation	audit	Characteristics of the optimal evaluation method
Goal evaluation	1								
Legal framwork	0/597**	1							
adoption	0/375**	0/563**	1						
Management requirement	0/379**	0/455**	0/534**	1					
Policy environment management	0/557**	0/590**	0/625**	0/540**	1				
Process evaluation	0/331**	0/416**	0/408**	0/467**	0/416**	1			
Policy evaluation	0/406**	0/392**	0/331**	0/321**	0/299**	0/419**	1		
audit	0/214*	0/217*	0/275**	0/165	0/233**	0/087	0/383**	1	
Characteristics of the optimal evaluation method	0/273**	0/431**	0/422**	0/362**	0/360**	0/474**	0/567**	0/387**	1

* Significant at the level of 0.05 and ** Significant at the level of 0.01

According to Table (3), the highest correlation coefficient is related to the management of the policy environment with compliance and compatibility with the correlation coefficient of 0.625, which is also significant at the level of 0.01 and the lowest correlation coefficient was related to the audit with the process evaluation dimension with a correlation coefficient of 0.087, which is not significant at the level of 0.05.

Question 4: What is the pattern of the impact of renewable energy development policies on macroeconomic indicators in Iran?

Figures (1) and (2) show the research model in the form of standard and significant coefficients.

Figure 1 The main model in the mode of standard coefficients

Figure 2 The main model in the case of significant coefficients

The data obtained from the field study were performed in SMART-PLS software and the following results were obtained.

Table 5 Path coefficient table and significance coefficient of the final pattern

Path between variables	Path coefficient	t-value	p-value	Results
Policy evaluators -> Macroeconomic indicators	0/171	7/829	0/0009	significant
Process evaluation -> Macroeconomic indicators	0/167	6/526	0/0009	significant
Objective evaluation -> Macroeconomic indicators	0/154	5/102	0/0009	significant
Management requirements -> Macroeconomic indicators	0/206	7/974	0/0009	significant
Adaptation -> Macroeconomic indicators	0/158	5/630	0/0009	significant
Audit -> Macroeconomic indicators	0/108	4/679	0/0009	significant
Policy environment management -> Macroeconomic indicators	0/207	8/035	0/0009	significant
Characteristics of optimal evaluation method -> Macroeconomic indicators	0/095	4/105	0/0009	significant
Legal framework -> Macroeconomic indicators	0/140	5/451	0/0009	significant

Source: Questionnaire Findings

5. Conclusion

This study seeks to model the impact of renewable energy development policies on macroeconomic indicators in Iran. Dimensions of objective evaluation (standard coefficient 0.154 and t-values of 102.5), legal framework (0.140 and 5.451), adoption (0.158 and 5.630), management requirements (0.206 and 7.974), policy environment management (0.207 and 0.835), process evaluation (0.167 and 6.526), policy evaluators (0.171 and 7.829), audit (0.108 and 4.679) and the characteristics of the optimal evaluation method (0.095 and 4.105), have explained the model of the impact of renewable energy development policies on macroeconomic indicators in Iran. Components of value and cultural priorities (standard coefficient of 0.405 and t-values of 543), comprehensiveness (0.476 and 9.159), forecasting (0.443 and 9.304), reflection of policy objectives in law (0.479 and 11.116), formal features of law and guarantee of implementation (0.433 and 11.463), substantive issues of law (0.409 and 6.868), compliance with upstream documents (0.418 and 862) / 12), compliance with ecology and ecosystem (0.369 and 9.765), Sharia and constitutional criteria (0.503 and 14.158), program (0.286 and 6.291), structure and resources (0.396 and 11.685), human resources (0.616 and 14.144), public will to implement (0.441 and 16.335), grounding of implementation (0.350 and 10.515), study of the environment (0.468 and 14.684), evaluation of execution schedule (0.428 and 9.211), determination of gaps and deviations (0.424 and 10.671), Monitoring and tracking the executive apparatus (0.646 and 517) 11/), People evaluation (0.367 and 9.951), Key experts and informants (0.457 and 13.866), Evaluation specialist (0.433 and 14.159), Social systems accounting (0.826 and 16,127), performance auditing (0.331 and 5.884), ethics and accountability (0.625 and 9.157) and attention to community conditions (0.654 and 9.649), explains the model of the impact of renewable energy development policies on macroeconomic indicators in Iran**.**

according to the results of Mousavi et. al (2019), researchers point to the implementation of a government policy to support tariffs and guaranteed purchases of electricity as one of the main and most important tools for creating safe investment conditions and attracting investors. This study emphasized the impact of renewable energy development on economic indicators. The final model of the present study is based on 9 dimensions and 25 components and affects economic indicators. The results of the two studies on the economic approach to the development of renewable energy are consistent. Nadimi (2015) in his research concluded that the development of renewable energy is effective on economic components, the results of the two studies are consistent with the economic approach to the development of renewable energy. Emami Meybodi et al. (2017) concluded during their research that attention to renewable energy can be one of the strategies to produce energy sustainability that has a significant impact on the economic, social and environmental sectors. The results pointed to

the economic, distributive and energy system-related effects on the development of renewable energy. The final model of the present study was based on the effect of dimensions and components of renewable energy development policy evaluation on economic indicators. The results of the two studies are consistent in the impact of renewable energy development on economic indicators. The results of Majdzadeh Tabatabai and Hadian (2017) indicate that achieving the goal of further reducing pollution and the resulting social costs will be achieved at the expense of further reducing the equilibrium GDP of the sectors. In the present study, GDP is one of the sub-components explaining macroeconomic indicators, and the results of the two studies on the GDP sub-component are consistent with each other. Based on the findings of Ghaemirad and Shahin (2016), one of the most important indicators that are effective in the lack of development of these technologies, we can mention the cheapness of fossil fuels and energy carriers in Iran, the lack of understanding of the need by policymakers, the lack of incentives for the private sector to enter and the lack of effective policies and adequate incentives from the government. The researchers pointed to the components of the public will to implement and lay the groundwork for implementation. In the research model, the components of public will to implement and lay the groundwork for implementation have explained the dimension of "policy environment management". The results of the two studies on the explanatory components of the public will to implement and lay the groundwork for implementation are consistent. The results of Tahamipour et al. (2016) showed that the coefficients of variables of electrical energy consumption, renewable energy consumption and energy consumption of combustible and recyclable materials are negative which can be justified based on the strong dependence of Iran's economic growth on (fossil energy) oil revenues. The final model of the present study was based on the effect of dimensions and components of renewable energy development policy evaluation on economic indicators. The results of the two studies are consistent in the impact of renewable energy development on economic indicators. Hemmati and Kheshtzar (2015) in researching the role of renewable energy on sustainable development of the country, emphasized the impact of renewable energy on the development of the country and the three dimensions of social, economic and environmental. The model of the present study confirms the effectiveness of policy development evaluation on economic indicators, and the results of the two studies are consistent with the impact of renewable energy development on economic indicators. According to the results of Fitras, Aghazadeh and Jabraili (2014) in the short term there is a one-way causal relationship between renewable energy consumption and economic growth and in Asia-Pacific, in the short term, there is a 10% bilateral causal relationship. And in the long run, there is a one-way causal relationship between economic growth and renewable energy consumption. The

model of the present study confirms the impact of policy development on economic indicators, and the results of the two studies are consistent with the impact of the development of renewable energy on economic indicators. The results of Nezamabadi and Azadi Rad (2014) research showed that in recent years, following the increase in demand for renewable energy, their economic trend has intensified and continued. In the present study, the results showed the effectiveness of the evaluation of the renewable energy development policy on economic indicators. The results of the two studies are consistent in the impact of renewable energy development on economic indicators. Findings of Ebrahimi and Rahimi Mogoei (2011) showed that in regimes with high economic growth, there is a positive relationship between economic growth and the share of renewable energy, and this relationship is negative in countries with low economic growth. The results of the two studies are consistent in the impact of the development of renewable energy on economic indicators. Khobai et al. (2020) showed that renewable energy consumption has a significant effect on long-term unemployment. However, in the short run, variables have little relationship. Therefore, the study supports the increase of production and consumption of renewable energy in order to increase the level of employment. In the present study, employment is one of the sub-components explaining macroeconomic indicators, and the results of the two studies on the GDP sub-component are consistent with each other. Maji (2015) also showed that despite the lack of a significant relationship between clean energy indicators and short-term economic growth, there is a negative relationship between clean energy indicators (electricity and nuclear energy) and long-term economic growth. The results of the two studies are consistent in the impact of renewable energy development on economic indicators. The findings of Apergis and Salim (2015) show a positive effect of renewable energy consumption on unemployment, but disaggregated data in specific regions, including Asia and Latin America, highlight the favorable impact on unemployment which implies that the impact of renewable energy consumption on job creation depends on cost. In the present study, employment is one of the sub-components explaining macroeconomic indicators, and the results of the two studies on the GDP sub-component are consistent with each other. The findings of Lin & Moubarak (2014) indicate a growing economy commensurate with the development of China's renewable energy sector, which in turn boosts economic growth. The results of the two studies are consistent in the impact of renewable energy development on economic indicators. The results of Gkatsou et al. (2014) emphasized the positive and negative impact of green energy (renewable) on employment. In the present study, employment is one of the sub-components explaining macroeconomic indicators and the results of the two researches on the sub-component of GDP are consistent with each other. Menegaki (2011) in a study of the relationship between economic growth and renewable energy showed that in Europe, the

consumption of renewable energy has a minor role in determining GDP. The results of the two studies on the GDP subcomponent are consistent. The results of Research by Apergis and Payne (2010) indicate the existence of a two-way causal relationship between renewable energy consumption and economic growth in the short and long term. The results of the two studies are consistent in the impact of renewable energy development on economic indicators. Menyah and Wolde-Rufael (2010) investigated the relationship between carbon dioxide emissions, nuclear and renewable energy consumption, and real GDP and found the significant relationship. In the present study, GDP is one of the sub-components explaining macroeconomic indicators, and the results of two studies on the GDP sub-component are consistent. The results of Sadorsky (2009) showed that the increase in per capita income has a statistically positive and significant effect on per capita consumption of renewable energy. In the present study, income distribution is one of the sub-components explaining macroeconomic indicators, and the results of the two studies on the GDP sub-component are consistent with each other. The results of China and Hu (2008) research showed that renewable energy has a direct effect on capital formation and indirect effect on GDP and a renewable energy policy dependent on capital formation is more effective than policies dependent on increasing the trade balance. In the present study, GDP is one of the sub-components explaining macroeconomic indicators and the results of the two studies on the GDP sub-component are consistent with each other.

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تاثیر سیاستهای توسعه انرژی های تجدید پذیر بر شاخص‌های اقتصاد کلان در ایران

چکیده:

پژوهش حاضر با هدف تاثیر خط مشی های توسعه انرژی‌های تجدید پذیر بر شاخص‌های اقتصاد کلان در ایران در سال ۱۳۹۹ از طریق روش تحقیق مدل آمیخته اکتشافی انجام شد. جامعهٔ آماری در بخش کیفی، اساتید مراکز آموزش عالی در زمینه انرژی و اقتصاد و مدیران عالی، میانی و کارشناسان ارشد صنعت برق کشور و در بخش کمی مدیران و معاونان وزارت نیرو، شرکت‌های‌توانیر، برق منطقه-ای تهران، فارس، مازندران و ساتبا بتعداد ۱۸۰ نفر بودند. در بخش کیفی با روش نمونه‌گیری گلوله برفی، ۲۰ خبره و در بخش کمی با روش نمونه‌گیری طبقه‌ای نسبی با استفاده از فرمول کوکران، ۱۲۳ نفر انتخاب شدند. داده‌ها در بخش کیفی با تکنیک دلفی و در بخش کمی با پرسشنامه ۱۰۵ گویه‌ای با نرم افزارهای SPSS و Smart PLS تحلیل شد. برای تعیین روایی و پایایی در مرحله کیفی از بررسی‌های لازم شامل مقبولیت و قابلیت، استفاده شده و در مرحله کمی، روایی پرسشنامه‌ها به صورت صوری و محتوایی (محدوده CVR و CVI برای هر یک از گویه‌ها بترتیب بین ۰/۶ تا ۱/۰ و ۰/۸۵ تا ۱/۰) و سازه تأیید شد. پایایی و پایایی ترکیبی مولفه‌ها بترتیب بین ۰/۸۴۷ تا ۰/۹۵۱ و ۰/۷۵۹ تا ۰/۹۳۱ برآورد و تأیید شد. یافته‌ها نشان داد، الگوی تاثیر خط مشی‌های توسعه انرژی‌های تجدیدپذیر بر شاخص‌های اقتصاد کلان در ایران دارای نه بعد (ارزیابی هدف، چارچوب حقوقی، انطباق و سازگاری، الزامات مدیریت، مدیریت محیط خط مشی، ارزیابی فرایند، ارزیابان خط مشی، حسابرسی و ویژگی شیوه مطلوب ارزیابی) و ۲۵ مولفه بوده‌است.

واژه‌های کلیدی: ارزیابی خط مشی، توسعه انرژی‌های تجدیدپذیر، شاخص‌های کلان اقتصادی.