Investigating the Impact of National Innovation System Functions on Attracting Foreign Direct Investment in Iranian Oil Industry

Nima Mokhtarzadeh[1], Hadi Zarei[2]

[1] Assistant professor, Department of Management, University of Tehran
Tehran, Iran
[1] PhD student in Management of Technology, University of Tehran
Tehran, Iran

Abstract

NIS as a network of organizations, public and private institutions and the relationships between them, leads transfering, modifiying and diffusing new technologies in the country. Countries which have been successful to develope their economy on the basis of knowledge and technology development, benefit from strengthing their national innovation system (NIS). One of the mechanism of economic and technological development at national level is using the potential of forighn direct investement. In this context NIS is machnism which has potential to facilate the collaboration among involved organizations and institutes. for the main objective of this study wasdetermining the effects of NIS functions on attracting foreign direct investment and structure equation modeling was employed to answer this research question. The population of this research are upstream oil industry executives who are familiar with the issues of technology transfer and NIS. Findings of the study, indicte that NIS functions have a direct effect on increasing foreign direct investment. Among the functions of the National Innovation System, Technology diffusion with factor loading of 0.78 and Among the functions of the foreign direct investment, ownership advantage with factor loading of 0.69, Has been the most important.

Key words: National innovation system, Foreign direct investment, Structural equation modeling, Upstream of Iraninan oil industry

1. Introduction

Achieving the objectives of Iran'stwenty-year vision plan requires development in the domains of creativity and innovation. Meanwhile, this necessitates adoption of a comprehensive system to integrate scientific and technological elements of Iran and lead to innovation development. Strengthening the innovation capacity of the country paves the way for increasing innovation and, ultimately, economic growth. Accordingly, the concept of national innovation system reflects the fact that paying attention to the existent relationships and interactions among different actors in the development of science and technology in each country is considered as the most important factor in the field of innovation. Nowadays, and due to scientific and technological advances as well as their increasing complexity in the business world, it can be argued that scientific and technological development cannot be done by an individual or a company and, thus, it requires inter-organizational interactions and cooperation. In other words, the realization of innovation in today's world requires the establishment of a kind of collaboration system or network that is referred to as the national innovation system (JomborSadeghi and Mostahsen, 2005). National innovation system is one of the most important systematic systems in macro level that has gained much importance with the advent of knowledge-based economy and increase in the competitive ability of some countries in the field of science and technology. One of the most important topics in the domain of knowledge-based economy is the subject of foreign direct investment[1]. Components and elements of the national innovation system have important roles in attracting FDI [2]. Regarding the aim of achieving a sustainable development, our country should inevitably move towards a knowledge-based economy that has

adopted an export-oriented approach and the transition from a single-product economy that is based on oil. In this way, the acquisition of technology from external sources such as foreign direct investment plays a significant role in this regard.

Nowadays, there are various innovation systems at national, regional and sectorial domainswhose common points are taking heeding of establishing, instead of changing, a system[3]. In recent years, these systems have been widely reviewed in the domain of innovation studies[4]. Hence, the concept of national innovation system is considered as a useful tool for managing the innovation and it can be stated that this element is a useful framework for analyzing future research and analysis processes. Despite the increasing importance of national innovation system in developing countries, studies show that, generally, there are several functions in the domain of management of innovation systems.Nevertheless, little attention has been addressed towards this issue. Besides, it can be said that ignorance of thisissue will be converted into aproblemthatchallenges research management in this field[5]. Therefore, this study firstly attempts to conduct a meta-analysis and presents an appropriate research framework. National innovation system is one of the most important systematic systems in macro level that has gained much importance with the advent of knowledge-based economy and increase in the competitive ability of some countries in the field of science and technology.Regarding the changes in climate and opportunity for innovation in the global arena, it seems that there is a dire need for making change in policy-making approaches in the national arena. Accordingly, some approaches as national innovation system are trying to respond to these needs[6].

Regarding the framework of the national innovation system, innovative performance of countries is not restricted to performance of innovative actors (e.g. firms, research institutions, universities, etc.), but also it depends on the quality of interactions of these factors with each other as constituent elements of an innovative system. Accordingly, the approach of national innovation systemis to identify the present

national institutions as well as their interactions, relationship and functions [7]. The objectives of the national innovation system are related to the overall objective of countries. It is possible that a number of developing countries choose to eliminate the technology gap between themselves and developed countries as their main objective. This can be exerted viamaking use of modern technology and knowledge of the world and implication of such technologies [8]. Thus, it can be said that every national innovation system in any country is closely connected with the outside world. Firms in each country can directly obtain the required technology from abroad. Furthermore, and regarding a higher level of approach, these firms can communicate with research centers, foreign universities and firms in order to exchange information. In this regard, one of the most important actions is to take advantage of foreign investment in line with the national innovation systems in the country [2]. With regard to the mentioned issues, the main research question is as follows:

What are the impacts of national innovation system and its functions on foreign direct investment?

The main site of this research has been located in Tehran city. The population of this study was all top-level managers active in the field of oil industry who were familiar with the notions of national innovation system as well as technology transfer. Regarding the research methodology, this research was of applied type. Furthermore, descriptive method was used to collect the required data. As such, this research was of correlational type of research. The main tool for data collection was questionnaire. Since all items of the questionnaires, which were used to measure the desired constructs,were based on previous studies, a number of academics and oil industry executives initially reviewed the questionnaires. Regarding their feedback and in order to reduce uncertainties, the early questionnaires were modified and finalized. In this article, we reviewed the literature of similar previous studies. Then, the theoretical foundations of the concepts of national innovation system and foreign direct investmentwere fully described. After that, the methodology was presented and the research

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model was proposed. Finally, the model was discussed and the conclusions were summarized.
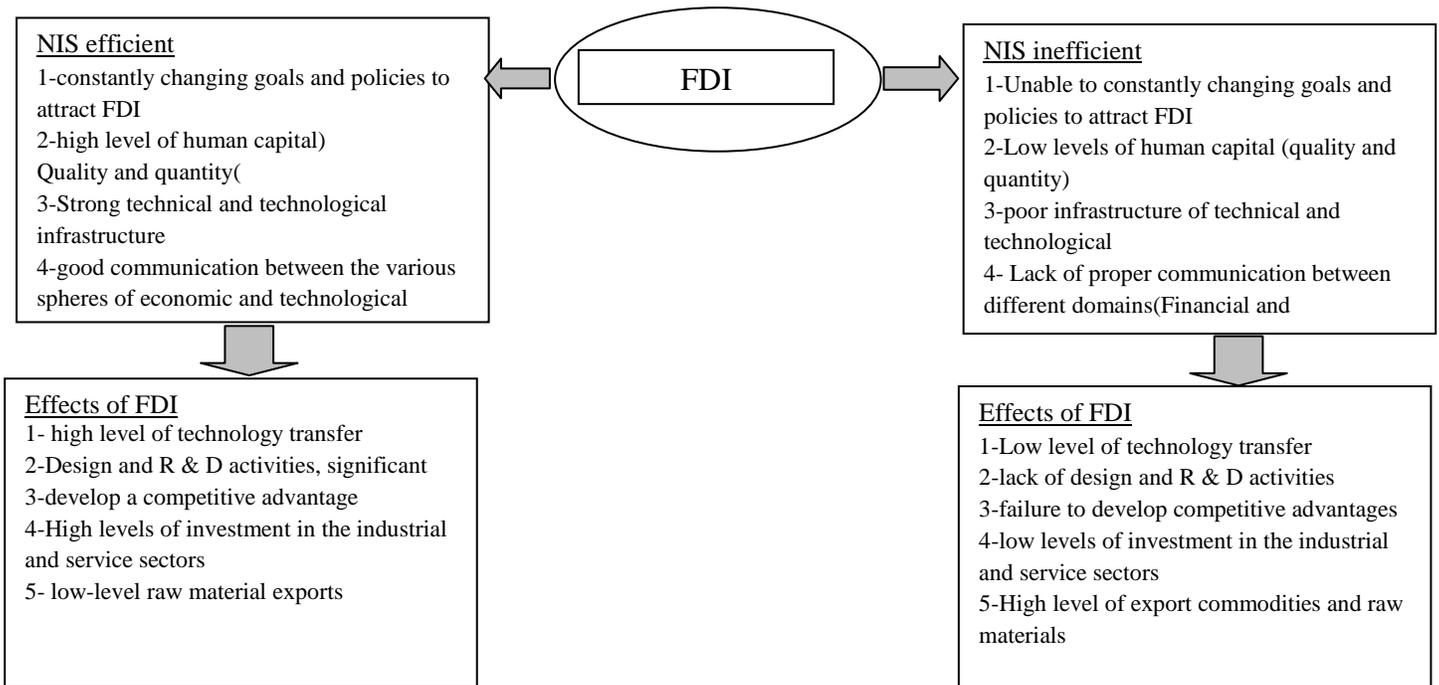
2. Review of literature

The roots of the concept of innovation were based on Neo-Schumpeterian economy that is focused on innovation and entrepreneurship.This idea was firstly formed via introducing a concept of technological-economic paradigms initiated by Freeman in the early 1980s. It should be noted that this idea is now known as national innovation system [9]. In his research, entitled "from Industrial Revolution to innovation planning", he has divided theinnovative policymaking planning into three periods:

1. The initial period that was simultaneous with the early 1970s and the beginning of the Industrial Revolution: In this era of innovation, some helps were directed towards innovation in the field of industry. However, this support was few and was originated from the ability of some numerable individuals.

2. The 1970s and 1980s: During this period, there were more policymaking efforts in the domain of innovation, high technology and basic industries. Basic industries were particularly focused on mining, agriculture and steel production. Furthermore, advanced technologies were based on secret research in the fields of space and weaponry.

3. 1990s onwards: The third period was the era of systematic policymaking formulation. Significant changes in plans as well as significant changes in their implementation were abundant in this period. Among these important changes, one can point to alignment of thoughts and desires of market withthe research conducted at universities and research centers as well as more than ever government's intervention in the financial and spiritual support of macro and long-term plans. [9].

So far, few detailed studies have examined the relationship between the national innovation system and the foreign direct investment [2]. After extensive searches, only one direct article and few indirect articles were found that had addressed the relationship between these two variables.Baskaran and Muchie (2008) presented an article which had directly addressed the relationship between NIS and FDI. This paper has pointed out that the national innovation system is not just a tool to accomplish an industrial-economic objective, but italso can help us to develop and achieve broad social interests. Regarding this paper, which was presented in 2009, the authors tried to present a two-way link between NIS and FDI. They pointed to the model of efficient as well as inefficient national innovation systems. Then, they expressed the manners by which FDI had influenced national innovation system. In this paper, we have demonstrated this relationship in a better format:

NIS efficient
1-constantly changing goals and policies to attract FDI
2-high level of human capital)
Quality and quantity(
3-Strong technical and technological infrastructure
4-good communication between the various spheres of economic and technological

FDI

NIS inefficient
1-Unable to constantly changing goals and policies to attract FDI
2-Low levels of human capital (quality and quantity)
3-poor infrastructure of technical and technological
4- Lack of proper communication between different domains(Financial and

Effects of FDI
1- high level of technology transfer
2-Design and R & D activities, significant
3-develop a competitive advantage
4-High levels of investment in the industrial and service sectors
5- low-level raw material exports

Effects of FDI
1-Low level of technology transfer
2-lack of design and R & D activities
3-failure to develop competitive advantages
4-low levels of investment in the industrial and service sectors
5-High level of export commodities and raw materials

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In another article, Guimon (2009) has examined governmental strategies and policies to attract FDI. Furthermore, different approaches that are effective to attract foreign direct investment have been examined. Finally, it is noted that the national innovation system hasa very constructive and effective role in providing infrastructures and facilitating the exchange of information between different parts of this field. More description that is comprehensivecan be found in the following table:

A summary of the research that has been done in this area is presented in the table below:

Researcher	Year	Title	Results
Baskaran & Muchie[2]	2008	The Impact of the National Innovation Systems on the Flow and Benefits of Foreign Direct Investment to National Economics	Investigating the impact of national innovation system on FDI and its impact on the national economy
Guimon[1]	2009	Government strategies to attract R&D-intensive FDI	In this paper, the approaches and strategies to attract foreign direct investment have been addressed. As such, it is concluded that the national innovation system has an important role in this connection.
Lingela[10]	2007	An Innovation Management Framework to Improve National Competitiveness in Developing Countries	Success factors of national innovation systems in developed countries have been expressed. One of the most important factors in this regard is the transfer of knowledge from outside to inside of the country.
Niosi[11]	2002	National systems of innovations are "x efficient" (and x-effective) Why some are slow learners?	Determination of inefficient factors in innovative systems and their relations with knowledge transfer
Dahlman[12]	1995	NIS & Economic Development in Social Capability& Long Term Economic Growth	Important factors in success and failure of policymaking in NIS
Kim[13]	1993	National System of Industrial Innovation: Dynamics of Capability Building in Korea	Necessary resources and factors for success in NIS as well as establishment of innovation opportunities for adoption of new methods and structures
Nasimi[14]	2008	Using the NIS models for the promotion of innovation	The difference between NIS in developed and developing countries
Mirbalouk et al.,[15]	2008	Review of national innovation system in different countries with Iran	Important factors in success of NIS
Manteghi et al.,[16]	2009	Identifying Policy Challenges in the National Innovation System of Iran	Detection of 48 effective elements in terms of inefficient function of innovative policymaking

As can be seen, Although much research has been done in similar research domains, no comprehensive research has been done to investigate the impact of national innovation system on foreign direct investment. As such, this research attempts to fill in this research blank.

2.1 National innovation system

Innovation and technological development are the results of a complex set of relations existent among active elements of a system called National Innovation System (NIS). Freeman firstly used this term in 1987 when he implemented this term in the

context of Japan as follow: a network of entities-public and private- whose activities and interactions result in development, introduction, modification and broadcasting of new technologies [17]. Lundvall (1992) announces that national innovation system is a set of elements and relations that are active in the domain of economic producing, broadcasting and implementing a new knowledge within the national borders [18]. Nelson asserts that national innovation system is a set of entities whose interactions lead to innovative performance of national firms [19]. National innovation system, as a scientific research resultant from perfectionisteconomy, is the outcome of interaction between scientific theoreticians and policymaking senior experts such as Freeman, Deci, Lundvall, Nelson and ,Landual, Nelson and Edcois within two European and American domain [20].

Choosing the right method and implementing the required steps to develop the innovation system need high intelligence and strong will.Conducting study and research on developed systems in other countries can help us to make good use of their experience. However, the formulation and design of such systems in any given country depend on the circumstances, needs, problems, and environmental features of that country. As such, these systems cannot be copied or imitated by other countries. Countries are different based on the production, deployment and use of the information. Different factors such as technological and industrial context, the level of participation among institutions, investment innovation models, the type of approach towards risk, labor market regulation, the role of private and public sector as well as small and large companies affect the adoption of an innovation system [21]. Structure, function, and completeness of various components of the national innovation system have big impacts on the promotion of national innovation capabilities. National innovation system can be seen as a management system that includes a main body, structural elements and the external environment [22]: The main body consists of economic entities (industries), universities, scientific and technological parks and incubators, research centers, governmental agencies, and financial institutions.Structural elements consist of competitive market, research, innovative infrastructures, participation, collaboration, and

information access.External environment includes management system of the country, the culture of innovation, governmental policies and programs, operational mechanisms (laws, regulations, dissemination of technology, intellectual property, risk-taking capital, education system, etc.). Such a system should be defined at the national level because many of the problems of underdevelopment are limited to political sanctions and geographical boundaries of countries. Secondly, knowledge is the key to innovation and, thus, passes through borders much more difficult than other goods. Thirdly, policies that are directly involved in the production and use of knowledge are those that are designed and implemented at the national level.

National innovation system is not only operating within an extensive set of national laws and policies, but also it is influencing by several national and global factorsthat is callednational or global innovation environment. As such, these environments include multinational corporations and international trade rules as well as intellectualproperty [8]. These environments last deep impacts on the flow of knowledge and technology available to any given country. However, each country has great flexibility to react to such environmental impacts [24].

In a more detailed classification, components of the innovation system are divided into 9 categories as elements of the innovation system: Structural elements, legal and regulatory framework, innovative /entrepreneurial culture, pioneers of innovation, innovation infrastructure, financial resources, information dissemination, mechanisms for technology transfer/distribution, support for commercialization [25]. Rickne believes that supporting the establishment and growth of new technology-based firms can be used as an indicator to determine the limits of tasks [26].

One of the most common classifications that has been founded on the basis of functions of the national innovation system and has been used as the research base for national innovation system in many countries is the classification presented by the Organization for Economic Cooperation and Development (OECD) (Manteqi et al, 2009). Based

on this classification, the main functions of a national innovation system include general policymaking, facilitating, guiding, and providing research and innovation funding, conducting research and innovation, human resource development, promotion of entrepreneurship, technology distribution [20].

Functions (layers)	Activities
Macro Policy	* Formulation of innovation and technology policies * Steering and determining the overall framework * Coordination, monitoring and evaluation
R&D	* Fundamental research * Applied research * Developmental research * Reverse engineering
Facilitating and funding research and innovation	* Supporting investment and financing * Supporting standardization * Supporting intellectual property
Workforce Development	* Training, development and promotion * Facilitating the movement of people
Publishing Technology	* Raising awareness and technology demonstration * Referencing and searching information services * Training, consulting and technical services * Joint research projects and technology * Governmental purchases * Technology transfer * Regional or industrial networking
Promoting technological entrepreneurship	* Providing the required budget for technology-based companies * Providing administrative and managerial support to entrepreneurs and new companies

Table 2. Functions and activities of the national innovation system

Under the framework of the national innovation system proposed by Furman [27] and the application of the conceptual framework proposed by Mei chih Hu and Mathews [28] for the newly industrialized countries of Southeast Asia, the most important factors in the functioning of the national innovation system include expenditure on research and development, the accumulation of knowledge, the degree of openness of the economy, investments in general and higher education, the number of researchers and scholars, industry structure, andinteractionamong public infrastructures.

A simple structure of NIS as well as its main elements is delivered in the following figure. Furthermore, the roles of each element have been briefly described. Firstly, the role of government: governments play important roles in the coordination of all factors and actors in this field so that countries can function more efficient, more dynamic, more competitive in the scientific and technological domains. As such, all activities will be related to economic growth. Finally, governments implement policies to produce and distribute knowledge. Innovation policies of the government are divided into three categories: 1-Policies on presenting innovation are introduced and described by

government's activities so that they should provide and facilitate resources such as human resources and supply of innovation information in order to facilitate firms' activity. 2. Policies on innovation demand which refer to those policies that directly affect a firm and final consumer of knowledge so that the produced knowledge is implemented. 3. Policies on promoting innovation that refer to policies that affect both the supply side and the demand side of innovation. Secondly, the role of technological infrastructures: This is one of the most important factors of NIS so that a country's innovative activities are fully dependent on it."The characteristics of the technological infrastructure are largely enumerated asuntouchableness, solidarity, diversity, and presenting professional services". These infrastructures include telecommunication and communication network, R & D hardware, human resources and institutional structures like the patent system. The concept of technological infrastructurein terms of NIS refers to educational system, academic research, public research institutions, invention and dissemination of information systems. The educational system is considered as a common infrastructure. Information dissemination system and industrial property system are seen as basic infrastructure.Academic research and public research institutes are considered as modern infrastructure. Thirdly, the role of communication system: Bridging system is one of the most important elements of NIS. Understanding the relationship between the main actors involved in innovation at the national level is the key element for improving innovation performance. Innovation performance in the national levelis completely dependent on good relationship among actors such as universities, R & D institutes and private firms as a cooperative system of production and use of knowledge. Fourthly, the role of legal and cultural context: This element is considered as one of the elements of national innovation system.This context includes several elementssuch as financial system, organizational culture, labor relations, religious culture, social customs, and so on. National innovation system of any given country is defined by the institutionalization of the above-mentioned contexts and environments. These contexts, directly and

indirectly, affect the relations between the actors and the manner of circulation of technical information as well as innovative enterprises. Fifthly, the role of private firms: Firm-level characteristics of large firms, their relationships with small and medium-sized firms, their relationships with consumers, the relationship between suppliers and producers of products are among the most important factors in the domain of NIS. All these factors have affected the social and cultural environment of any country. Although these issues exist in all countries, they greatly vary in terms of intensity from country to country. As such, there are some internationally different NISs. Accordingly, the above-mentioned factors lead to different NISs [29].

2.2 Foreign Direct Investment

Technology transfer is a process through which the technology a technology finds its way from its origin and place of creation in another territory in order to produce products and a base for emergence of new technologies. This process consists of different steps of selection, acquisition, adaptation, assimilation, application, dissemination and development of the received technology [30]. Foreign direct investment is one of the methods of technology transfer. According to UNCTAD (2005), FDI is an investment involving a long-term economic relation.Furthermore, it must demonstrate the fix benefits and economic control of resident's units (the parent company)in a company located outside the home country of the investor. FDI brings many benefits including job creation and technology transfer to the host country. Access to foreign markets and financial resources, that are necessary for any country, are among other benefits of this phenomenon. Although global foreign direct investment has grown considerably since the 1980s, many countries, including Iran, have not played remarkable roles in this process [31]. Until 1960s, there was no independent and self-supporting theory on FDI. Besides, the concept of FDI was introduced as part of International capital flow whose main features were neglected thereof.However, and since 1960s onwards,much theoretical literature appeared on FDI because increasing volume of FDI came to scene which attempted to explain the reasons and

incentives for FDI, its location and times. Dunning (2009) points out that two main problems occurred during these years that did not let FDI to be studied as part of the neoclassical theory of capital [33]. Firstly, FDI was more than just capital transferand it included areas such as technology transfer, human skills and management. Secondly, and unlike the capital transfer in which capital flows was taking place between two independent sectors, FDI necessitated the transfer of capital within the firms [33]. Having had special circumstances, developing countries usually take advantage of limitedscale of the technology. Since most of the technologies used in these countries are old, the efficiency of their firms is relatively low. Even if part of the efficiency gap is compensated by lower wages, technical inefficiency can affect the quality of the products and decrease their ability to respond to new demands of the market. This is despite the fact that these countries can have access to modern technology through FDI and increase its efficiency [34]. Regarding the theory proposed by Dunning, FDI has the following parameters: ownership advantage, spatial advantage, and internalization advantage thatis known as OLI Theory [35].

Ownership advantages: this advantage includesa high-technology manufacturing industry or optimized marketing or organizing system, innovation capacity for trademarks, publicity or other ownership. These advantages guarantee the capability of a firm to enter the market of the host country.

Internalization advantages: These advantages explain the reasons why foreign companies prefer to personally control the production process in the host country. These advantages explain the preference for a foreign company to control the production process rather than empowerment of the company's internal assets. Due to high rate of transaction costs as well as cost associated with the contract terms and provisions, such a move is necessary to be done.

Spatial advantage: althoughthese advantages guarantee the entrance of a foreign firm in the host country, they cannot justify reasons why a foreign firm should produce a product in the host country. Local or regional advantages can justify the reasons of the presence of foreign firms in the host country. These advantages include the difference in the quality, the cost of international transport and communication, and the policies of host government. Despite Dunning, none of the above three conditions are available in all countries alike. However, each of them areaffected by particularities of each country. Because of this, he has studied several types and kinds of link established among the above-mentioned advantages I terms of each country [36].

Table 3. Regarding the three conditions of ownership, location and internalization according to national characteristics [35]

Ownership advantages	Characteristics of the country
* The size of the company and firm	* Large markets
* Technology and trademark	* Liberal policies for mergers
* Management and organizational systems	* Government support for innovation
* Product differentiation	* Skilled labor
	* Training facilities
	* Advertising and marketing level
Spatial and local advantages	**Characteristics of the country**
* Labor costs and raw materials	* Developed or developing countries
* Transportation costs	* Distance between countries
* Government interventions and policies	* Orientation of government towards FDI
Internalization advantages	**Characteristics of the country**

* Costs of search, negotiation and management	* High levels of education and larger markets creates a particular kind of knowledge that will lead to more advantages.
* Avoiding the costs resulting from acts	
* Ownership rights	
* Production support	* Linguistic and cultural similarities between countries
* Cultural gap	

Theoretical research framework

Regarding the above-mentioned comments, this conceptual research model is presented in Figure 5. According to this model, the research hypotheses are discussed as follows:

* Functions of the national innovation system have impact on the ownership advantage of foreign direct investment.

* Functions of the national innovation system have impact on the internalization advantage of foreign direct investment.

* Functions of the national innovation system have impact on the spatial advantage of foreign direct investment.
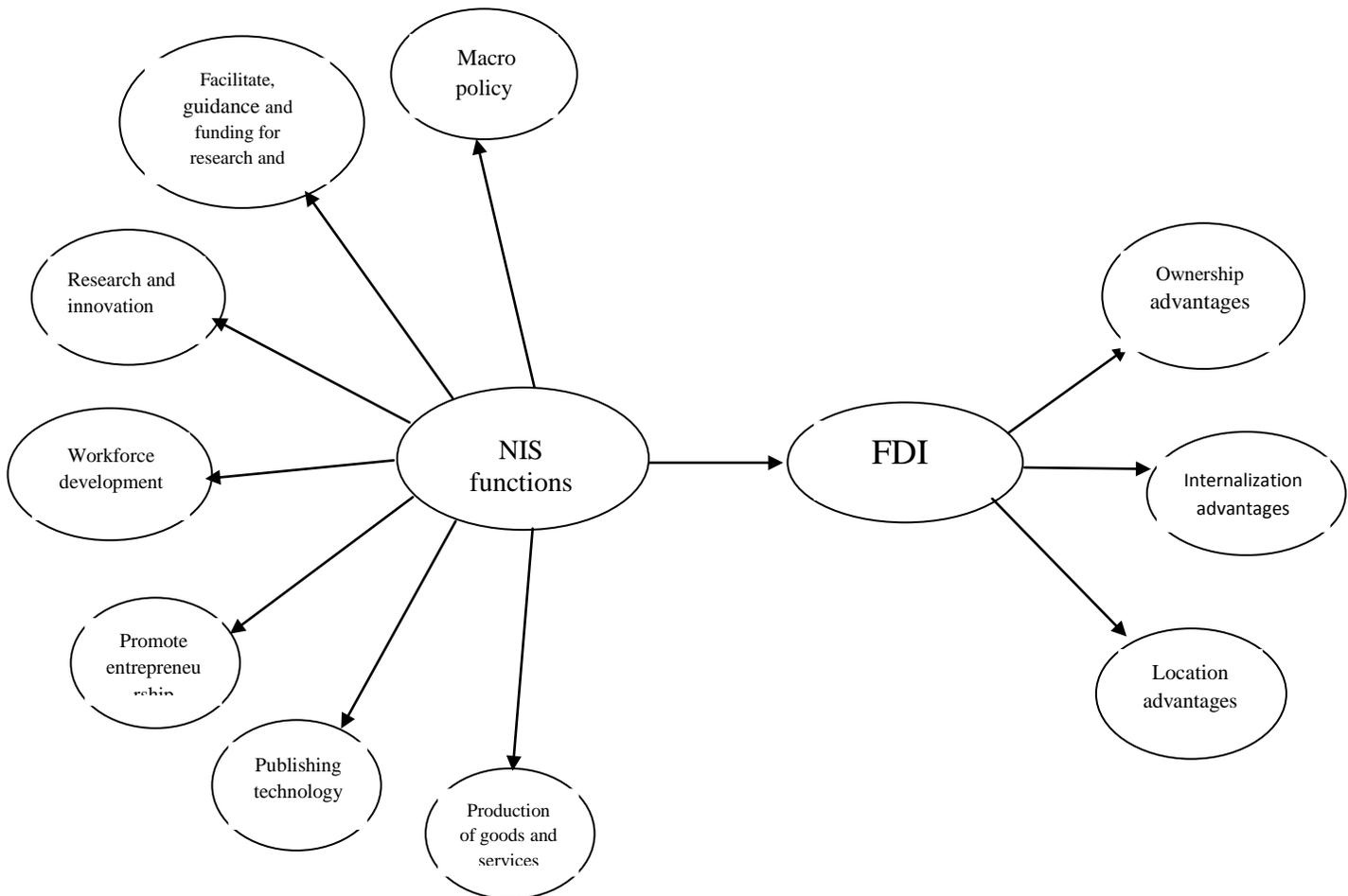

Figure 2-Research Model

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3. Research methodology

Regarding the objective, the present research is of applied type. Besides, this research was of correlational type of research.The population of this study was all top-level managers active in the field of oil industry who were familiar with the notions of national innovation system as well as technology transfer. The main tool for data collection was questionnaire. It consists of 27 questions with a 5-scale Likert in which number 1 represents the lowest agreement and number 5 shows the most agreement.Having designed the questionnaire's questions, it was tried out on 30 members of the target population in order to diagnose the probable ambiguities of certain questions as well as the reliability of the research instrument.The questionnaire data were statistically analyzed. Having assessed the reliability of the questionnaire, the final questionnaire was obtained and used to collect the required data.The results of statistical analysis of pilot test on the thirty members of the target population showed that the value of Cronbach's alpha was calculated as 0.7 for all research constructs. Therefore, the assessment tool benefited from satisfactorily reliability. The number of managers who were active in the top-level sectors of oil industry were about 4000 individuals. Regarding Morgan table and the number of population, questionnaires were distributed among 351 managers and experts who were familiar with technology transfer projects. Finally, 264 questionnaires were answered.Content and construct validity were used to assess the validity of questionnaires.Placing too much reliance on the literature and making use of expertise can be usedto assess the content validity of the questionnaires [37]. Since all of the questionnaire items used to measure the construct have been based on previous studies, a number of university professors and managers of oil industry were firstly reviewed the desired questionnaires. Then, their feedbacks were considered to reduce uncertainties, modify the pilot questionnairesand design the final questionnaires. As such, the content reliability of the questionnaires were confirmed. The construct validity of the questionnaires was confirmed using the confirmatory factor analysis based on LISREL software [38].
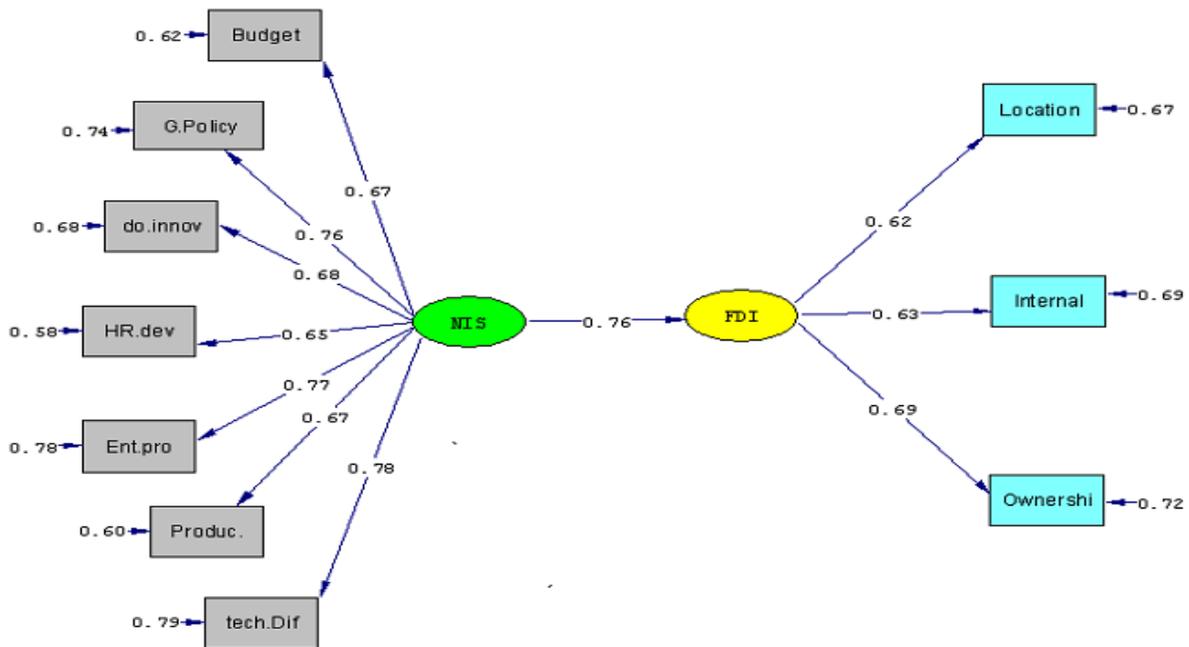
4. Research results

Table 4 and Figure 4 show the results of the factor analysis. Fit indexes are used.The ratio of chi-square to degree of freedom is 1.22 that is less than 3 and, thus, is appropriate. The fit index of RMSEA model is 0.076, which is smaller than 0.08 and, thus, is appropriate. As seen in Table 4, the majority ofcoefficients of standardized factor loads are high and remarkable. Based on the results of structural equation model, the national innovation system directly impact on FDI which is equal to 0.76. The impact of the national innovation system in terms of ownership, internalization and spatial dimensions of FDI on standardized factor loads are 0.69, 0.63 and 0.62 respectively that confirm the three research hypotheses.

Table4. results of confirmatory factor analysis

Model Dimensions	Standardized factor loadings
National Innovation System(NIS)	
Publishing Technology	0.78
Promote entrepreneurship	0.77
Macro Policy	0.76
Research and innovation	0.68
Production of goods and services	0.67
Facilitate, guidance and funding for research and innovation	0.67
Workforce Development	0.65
foreign direct investment(FDI)	
Ownership advantages	0.69
Internalization advantages	0.63
Location advantages	0.62

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Chi-Square=169.37, df= 142, p-value=0.00146, RMSEA= 0.076

Having defined the model, several methods were used to estimate the overall goodness of fit of the model with the observed data. Generally, several indicators are used to measure the fitness of the model. However, three to five indicators are sufficient to verify the model.

A) RMR index: As this index is smaller (i.e., closer to zero), the fitness of the model is indicated better.

B) AGFI and GFI indices: The closer the value of this index to 1, the goodness of fit of the model to the observed data is more.

C) RMSEA index: It is in fact, the test of deviation of each degree of freedom. The value of this index for models that have good fitness is less than 0.05. Higher values up to 0.08 represent reasonable errors of approximation in the population. The values that are less or more than 0.1, are well fitted.

D) CFI and NFI indices: Values higher than 0.9 are acceptable.

So, these tests can answer the question on the quality and fitness of research data.Regarding these tests, the most famous of them are cited as goodness of fit tests.Although these tests are based on chi-square test, they will be listed along them.

Table8. The results of the model fit indices

Index	Value reported
χ^2	169.37
GFI	0.95
AGFI	0.90
NFI	0.93
RMR	0.07
CFI	0.94
RMSEA	0.076

5. Discussion and conclusion

Given the issues raised in the theoretical foundations of this study, it can be said that the objectives of the national innovation system are related to the overall

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objective of countries. The objectives of the national innovation system are related to the overall objective of countries. It is possible that a number of developing countries choose to eliminate the technology gap between themselves and developed countries as their main objective. This can be exerted via making use of modern technology and knowledge of the world and implication of such technologies. It can be argued that the best solution in this regard is to make use of foreign direct investment. This study examined the impact of national innovation system on FDI and the structural equation model was used in this way. Based on structural equation model, the national innovation system directly affectedthe foreign direct investment and its effect was equal to 0.76.Also, given the related model, all the research hypotheses were confirmed. Technology circulation had the greatest weight in the national innovation system. After that, the promotions of entrepreneurship and policies have been placedin the subsequent positions by slight differences. Finally, human resource development has had the lowest weight. This indicates that most attention has been shifted to the circulation of technology and less attention has been paid to the development of human resources in the domains of oil industry and the national innovation system. Meanwhile, development of human resources has a very important status in FDI and must be taken into consideration before addressing the related process. This means that organizations' human resources must be fully trained and qualified because, otherwise there is a risk of failure in the process of FDI. Regarding foreign direct investment, ownership advantages have had the highest weight and lowest weight has been dedicated to the spatial advantages. This implies that even though the location of FDI is important in the process of technology transfer. In other words, although this factor complements the technology transfer process, little attention has been paid to it. The results suggest that more attention is paid to the opinions of experts in the field of technology transfer as well as ownership of FDI to increase foreign direct investment. Obviously, any company, organization, or institution that wants to undertake FDI should be quite sure of its investment ownership. Most experts have emphasized that the best manner for undertaking the process of technology transfer through FDI is to follow a natural way that is based on the needs and without direct compulsion and involvement of senior level powers. In this context, the role of information needs, capabilities, and intermediary institutions can also be effective.

The innovation of this study was that, for the first time, a specialized research was conducted to examine the role of a national innovation system in attracting FDI. In this way, all the functions of a national innovation system were carefully scrutinized and considered. The results of this research can be helpful for managers to understand the importance of a national innovation system and its impact on attracting foreign direct investment.Managers are recommendedto accurately identify the functions and components of the national innovation systems that, in turn,play roles in this process.Formation of a national innovation system can help policymakers and managers to undertake approaches to strengthen the knowledge-based economy that have been emphasized in the Fourth Development Plan of the Islamic Republic.Although there are some hopeful outcomes by utilizing the national innovation system, there are some deficiencies including lack of enough cooperation among the private and public research sectors, existence of several problems in scientific cooperation between Iran and other countries, the lack of labor mobility in the domain of scientific researches, lack of scientific and technological information network in the country, research reworking and lack of appropriate application of these plans, the weak link between university and industry, and, most importantly, the lack of support for the country's national innovation system.There are some recommendations in this regard including identifyinga responsible for successful implementation of the national innovation system, revising the support system for research and development based on Iran's twenty-year vision plan, strengthening R & D centers in the private sector in line with the general policies of Article 44, assessing the executive performance of public research institutesin line with implementation and application of national innovation system in order to attract foreign directinvestment.

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Due to the limitations of this study, this included a focus on top-level managers of oil industry and analyzing the functions of the national innovation system,future studies can investigate specific functions of national innovation systems in attracting FDI, such as the promotion of entrepreneurship and the role of human resource development. In addition, other areas of technology other than the oil industry can be searched and examined. Finally, other models as the model of Almeida and Maras can used in these domains.

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Nima Mokhtarzadeh is PhD in management from University of Tehran in Iran. He is assistant professor of Industrial management at University of Tehran where He teaches courses on strategy, innovation and technology transfer.
E-mail: mokhtarzadeh@ut.ac.ir

Hadi Zarei received his Bachelor of Industrial engineering from Islamic azad Univerity (South Tehran Branch) in Iran, his Master's degree in entrepreneurship management at University of Tehran in Iran and he is now a PhD Student in management of technology at University of Tehran in Iran. He is General Manager of Kavosh Consultants co. in Iran. His research and publications include 25 authored. E-mail: hzarei@ut.ac.ir