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The Impacts of Environmental Policies on Natural Gas Consumption in Iranian Industrial Sector

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ABSTRACT

This study aims to evaluate the effects of environmental policies, including price and non-price policies, on natural gas demand in Iranian industrial sector. To this end, considering the dynamic nature of our panel data, we adopted a generalized method of moments (GMM) model to estimate natural gas consumption for 22 Iranian industries from 2005 to 2015. The results state that the average annual natural gas consumption has been rising, reaching five times higher than the consumption of other fossil fuels. Among the industries, nonmetallic minerals industry with 8% of the total production of industry sector and more than 25% of natural gas consumption was regarded as the most natural gas consumer. The results of our GMM model show that non-price environmental policies are more effective than the price policies on natural gas consumption. Overall, in non-price policies, energy intensity seems more important than CO2 emission reduction. We therefore recommend that governmental energy policies should focus more on energy intensity improvement in Iranian industries through technological enhancement and fuel energy saving regulations.

1.Introduction

With the consumption of more than 225 trillion cubic meters, Iran was the world's fourth largest consumer of natural gas after the United States, Russia, and China in 2018. The share of natural gas in total fuel consumption in Iran increased from 20% in 2007 to 68% in 2018 (BP Statistics, 2019). This upward trend and an inappropriate energy consumption pattern has led to an increase in energy consumption, especially in natural gas. The largest share of natural gas consumption was domestically in the electric power sector (32%), residential and commercial sector (29%), and the industrial sector (27%) in 2016 (Iran Energy Balance, 2016).

Considering the environmental issues and the depletion of world oil reserves, the share of natural gas in the energy portfolio has been on the rise in recent years. Iran is one of the largest gas producing countries in the world, and the production capacity is higher than the demand for injection into oil reservoirs and domestic consumption. Natural gas can also be used as the raw material for the production of petrochemical and refining products in a liquid form. Iran's energy policy is based on promoting gas consumption instead of other liquid fossil fuels due to the abundant gas reserves.

There are several environmental policies, including price and non-price policies, such as improvements in technologies

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to save energy and promote natural gas consumption instead of fossil fuels to reduce greenhouse gas emissions in Iran. However, whether theses environmental policies have played an effective role in natural gas consumption in Iranian industrial sector or not is not clear. Thus, this research aims to identify the effects of environmental policies on natural gas demand in Iranian industrial sector and to provide a model for predicting the amount of this demand in the coming years. Considering the issue raised in this research, the following questions may arise:

- What are the impacts of the environmental policies on the demand for natural gas in the Iran industry section?
- What would be the influences of the non-price policies such as the improvement of technologies, the improvement in energy consumption efficiency, and the reduction of CO^2 emissions on the demand for natural gas in Iran industrial sectors?
- How does the change in pricing policies alter the tendency of Iranian industrial users from other fuels toward natural gas?

Investigating the impacts of environmental policies, including price and non-price policies, on natural gas demand in Iran industries through a model based on generalized method of moments (GMM) is the major contribution of the present paper.

The rest of the paper is structured as follows. In section two, we will introduce an overview of energy consumption and CO_2 emission in Iranian industrial sector. We will review the relevant domestic and international literature in section three. Then, in section four, we will discuss the methodology and design of research, including the data and the econometric model. Section five as the main part of the research is devoted to the estimation of the research model and the analysis of the empirical findings. Eventually, section six presents conclusions and policy implications derived from the research model.

2. An Overview to Energy Consumption and CO_2 Emissions in Iranian Industrial Sector

We provide a general overview of gas consumption in Iranian industrial sector, including the average annual natural gas and fossil fuel consumption and production, energy intensity, and CO_2 emissions from 2005 to 2015 in this section. Table 1 demonstrates that the development of other nonmetallic minerals industries with just 8% of production demands 25% of natural gas and 56% of other fossil fuels consumption and produces 53% of CO_2 emissions. Table 1 tabulates energy consumption and CO_2 emission in Iranian industrial sector.

The average annual total natural gas consumption in Iranian industrial sectors from 2005 to 2015 is equivalent to 151,616,403 barrels of oil, of which 37,963,536 barrels (about one fourth of total) are consumed by other nonmetallic mineral products industry as the largest consumer of natural gas in Iranian industries. The average annual total fossil fuel consumption in Iranian industrial sector from 2005 to 2015 is equivalent to 33,582,554 barrels of oil, of which 18,906,086 barrels (about 56%) is consumed by manufacturers of other nonmetallic mineral products as the largest consumer of fossil fuels in Iran industries. Comparing the natural gas and fossil fuel consumption reveals that Iranian industries consume natural gas about five times more than fossil fuels.

The average annual total production in Iranian industrial sector from 2005 to 2015 is 709,609 billion Rials (based on Rial value in 2011), while coal production industries and oil refineries with a value of about 196,059 billion Rials (based on Rial value in 2011) (about 28%) are the biggest producer of Iranian industries. The average annual total energy intensity in Iranian industrial sector from 2005 to 2015 is equivalent to 4.82 barrels of oil per billion Rials (based on Rial value in 2011), while the energy intensity of the production of other nonmetallic minerals, which is equivalent to about 1.06 barrels of oil per billion Rials (based on Rial value in 2011) (about 22%), is the highest figure in Iranian industries. The average annual total CO_2 emissions in Iranian industrial sector from 2005 to 2015 is 112,242,667.7 tones, of which 59,667,229.1 tones (about 53%) is the CO_2 emissions of other nonmetallic mineral products industry as the largest amount of CO_2 emissions in Iranian industries.

3. Literature Review

In this section, previous studies on industries demand for natural gas is reviewed. This section is divided into two subsections: the first subsection explains general studies on the demand for natural gas, and the next subsection reviews previous reports forecasted the demand for natural gas based on the environmental policies.

Interests in estimating natural gas have led to a remarkable number of researches in the last decade (Aydin, 2014). World energy demand has amplified abruptly as primary energy sources are required for sustainable development (Azadeh et al., 2015). Energy is connected to industrial production, agricultural output, access to healthy water, education, quality of life, cooking, and transportation (Xiong and Wang, 2014). Around one-fifth of the world prime energy is provided by natural gas which is the cleanest burning fossil fuel (BP, 2019; Xiong and Wang, 2014). Many studies have predicted natural gas production, consumption, as well as prices and income elasticity in several diverse areas at a regional level, world level, city level, national level, and individual customer level in industrial and residential sectors(Tonkovic et al., 2009). These studies used numerous data which could be classified into three main groups: meteorological data, historical data, and econom-

ic data. The first experimental study on the prediction of natural gas demand was conducted by Balestra and Nerlove (1966), while the first theoretical study was that of Hubbert (1949).

In 2004, Kaboudan and Liu derived a multi-regression equation system for short-term US demand for genetic planning (GP) and forecasted gas consumption in all four domestic, commercial, industrial, and electrical sectors. They indicated that the demand for each part is considered as a function of gas price, the price of the energy carrier, the economic conditions, and other control variables.

Aras (2004) conducted a study in Turkey and showed the significant motivation behind the demand for natural gas, with private gas consumption accounting for about 18% of the total gas consumption. Investigations into the anticipation of future

Table 1- Energy consumption and CO_2 emission in Iranian industrial sector

ISIC CODE	Industry	Natural Gas Consumption (%)	Fossil Fuel Consumption (%)	Production (%)	Energy Intensity (Amount)	CO_2 Emissions (%)
2732	Production of other nonmetallic minerals	25.04%	56.30%	8.17%	1.06	53.16%
2320	Coal production industries-oil refineries	16.20%	14.04%	27.63%	0.28	13.08%
1548	Food and beverage industries	5.50%	11.35%	8.82%	0.22	12.66%
2700	Basic metals production	23.82%	4.65%	13.90%	0.98	5.21%
2411	Chemical products industry	22.95%	3.57%	16.86%	0.33	4.17%
1721	Production of textiles	1.16%	2.30%	2.28%	0.21	2.78%
3410	Production of motor vehicles, trailers, and semi-trailers	1.07%	1.78%	8.40%	0.05	1.97%
2811	Manufacture of metal products except for machine tools	0.61%	1.20%	2.80%	0.08	1.37%
2899	Manufacture of machinery and equipment unclassified elsewhere	0.82%	1.06%	2.84%	0.10	1.24%
2100	Production of paper and paper products	0.97%	1.04%	0.65%	0.49	1.21%
2413	Production of rubber and plastic products	0.78%	1.00%	2.06%	0.14	1.08%
3110	Machinery and equipment for the generation and transmission of electricity	0.35%	0.47%	2.13%	0.06	0.57%
2022	Production of furniture and artifacts	0.14%	0.36%	0.42%	0.12	0.42%
2022	Production of wood, wood products, and cork	0.23%	0.27%	0.33%	0.22	0.35%
3599	Manufacture of other transport equipment	0.08%	0.21%	0.61%	0.06	0.26%
2926	Tanning and making leather and bags and luggage	0.04%	0.12%	0.18%	0.11	0.16%
2424	The production of medical, optical, and precision instruments and clocks	0.06%	0.12%	0.49%	0.05	0.14%
2221	Publish, print, and reproducing recorded media	0.06%	0.06%	0.31%	0.07	0.06%
3230	Production of radio, television, and communication devices	0.03%	0.04%	0.33%	0.05	0.05%
2422	Fabric manufacturing and coloring of fur skin	0.03%	0.03%	0.18%	0.06	0.04%
3000	Manufacturing of administrative and computing machinery	0.01%	0.02%	0.23%	0.02	0.02%
1600	Production of tobacco products from cigarettes	0.06%	0.00%	0.38%	0.04	0.00%

Source: Current work findings

gas interests have an incredible significance since natural gas is a source of foreign vitality. Aras proposed a method to obtain model fitting for gauging private month to month natural gas utilization. The technique depends on separating a year into two seasons as warming and non-warming periods and evaluating individual autoregressive time arrangement models for each period as opposed to achieving the regular examples in a solitary model.

Huntington (2007) examined the use of natural gas in the United States in order to develop an empirical model for evaluating future trends. This research derived a statistical model for the US consumption of natural gas based on data from 1958 to 2003, focusing on intermediate fuel switching facilities and changes in the industrial economy.

Keshavarz Haddad and Mirbagheri Jam (2007) studied the impacts of natural gas consumption, air temperature, natural gas prices, and consumer income on natural gas demand in Iran during 1995-2004. The coefficients estimated using the maximum likelihood method show that gas consumption per capita has a reverse relation with the price of electricity. Based on structural time series model (STSM) modeling, they found that temperature, the price of natural gas relative to electricity price, and income are the most important factors in predicting natural gas demand in Iran.

Seyyed Javadin et al. (2011) predicted the consumption of natural gas in the horizon of the fifth economic, social, and political development program of the country. Their results show that climatic conditions affect the consumption of natural gas in the domestic and public sectors, and the consumption behavior of the power plants and the domestic sectors complement each other in two different periods.

Abooniori and Ghafouri (2011) evaluated the factors influencing the supply of and the demand for natural gas in Iran using the auto regressive integrated moving average (ARIMA) model during 1976-2007 in a study up to the horizon 2025. They showed that the elasticity of short-term income and the price elasticity of natural gas demand are equal to 0.44 and 0.048 respectively, and long-term income and price elasticity were 8.8 and 1.68 respectively. Short-term and long-term natural gas export elasticity were predicted to be 0.13 and 0.25. Using estimated models in this work, natural gas supply and demand in the country are projected in the horizon 2025 in three optimistic, cynical, and pessimistic scenarios. According to this forecast, the growth of supply of and demand for natural gas in the first scenario are 4.5% and 3.5% respectively; these figures in the second scenario are 3.9% and 3.6% respectively, and they are 1.2% and 51.3% respectively in the third scenario.

Bianco et al. (2014) studied consumption drivers through a single demand model. They developed a model of the long-term forecast of nonresidential gas consumption in Italy based on historical data from 1990 to 2011. They also applied a sce-

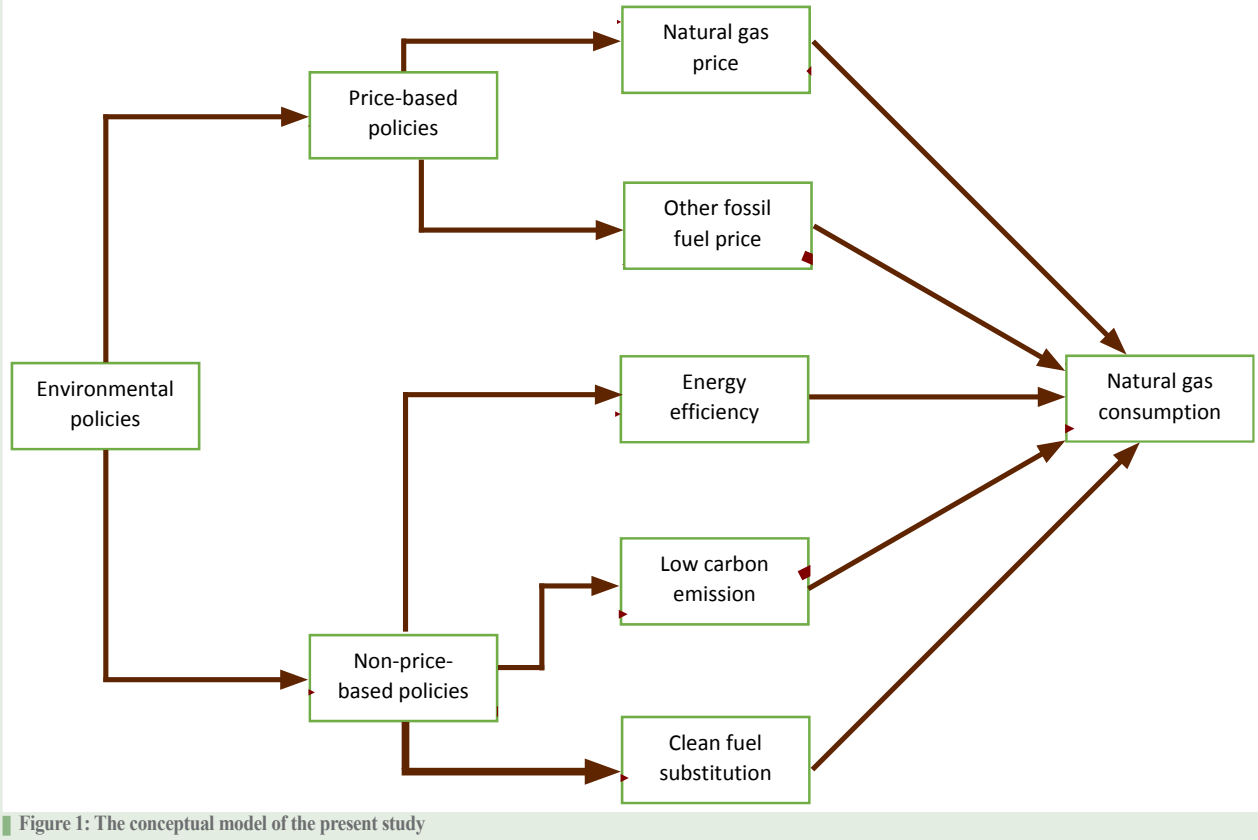

Figure 1: The conceptual model of the present study

nario analysis developed by analyzing twelve different cases.

Arshad Khan (2015) investigated short-term and long-term natural gas demand through econometric models based on the data during 1997-2011and showed that the gross domestic product had a greater impact on natural gas consumption in Pakistan compared to the development of natural gas price and elasticity price.

Zeng (2017) proposed a gray model called TPGM to simulate and forecast the supply of and demand for natural gas in China. They predicted the demand for natural gas in China during 2015-2020 and discovered that 67.61% of the consumption of natural gas will depend on foreign imports in 2020 due to a surge in demand for natural gas in China.

Gautam and Paudel (2018) studied the demand for natural gas in the residential, commercial, and industrial sectors of Northeastern United States using annual state-level panel data over the period 1997-2016. The estimated results showed that own price elasticity of demand for natural gas in residential, commercial, and industrial sectors is -0.14, -0.29, and -0.28 respectively in the long run. The cross-price elasticity of fuel oil for natural gas demand in residential, commercial, and industrial sectors are 0.19, 0.52, and 0.24 respectively. The natural gas demand is not affected by income in all the three sectors in the long run.

The second category of studies focused on natural gas demand and environmental policies.

Li et al. (2011) predicted demand for natural gas based on a dynamic model of the system for China in 2020 and 2030. Since 67% of China's energy supply was based on coal consumption, environmental considerations have led to a shift in energy from coal to natural gas. Thus, the forecasted consumption of 89.5 billion cubic meters of natural gas in 2010 will reach 198.2 billion cubic meters in 2020 and 340.3 billion cubic meters before 2030 in China.

Soldo (2012) examined the prediction model of residential gas consumption based on solar radiation. The results, based on linear models such as the automotive regression model and nonlinear models such as the neural network model, showed that the demand for residential natural gas affected solar energy supplies.

According to the work of Zeng and Li (2016), environmentally conscious manufacturing (ECM) has become an important strategy and proactive approach for the iron and steel sector of India to produce environmentally friendly and to reduce manufacturing costs. There are several environmentally conscious manufacturing indicators to evaluate ECM programs. Among those indicators, energy consumption and greenhouse gas (GHG) emission may be considered critical environmentally conscious manufacturing indicators (CECMI) for Indian iron and steel sector. They focused on forecasting energy consumption and GHG emission for a pig iron manufacturing organization of India. The selection of the correct ARIMA models of these indicators helps with accurate forecasting and achieving better environmental management practice.

According to the work of Xu and Lin (2016), energy saving and a decrease in carbon dioxide outflow in China are increasingly being considered worldwide. China has been on display in a period of rapid urbanization and industrialization, reflected in the rapid development of the use of vitality and carbon dioxide (CO_2) outflows. In addition, urbanization has an enormous impact on CO_2 emissions due to the mass urban foundation and the development of land. Financial development has a greater effect on emission reduction than industrialization due to the monstrous settled resource speculation and modern vitality improvement.

Mirzaei and Bekri (2017) argued that climate changes and a global temperature boost as the key dangers of human social order are essentially linked to the use of vitality and CO2 emissions. In this study, a dynamic framework model was developed to demonstrate the vitality utilization and CO2 emission patterns for Iran during 2000–2025.

Ozman et al. (2018) forecasted natural gas demand for residential consumers on the basis of multivariate adaptive regression splines (MARS) and conic multivariate adaptive regression splines (CMARS). The effect of monthly temperature variations between 2009 and 2012 was investigated based on the temperature degree (degree day). Moreover, the results were compared to neural network models and linear regression.

A review of the above researches related to natural gas consumption and environmental policies revealed that demand for natural gas is affected by price policies, including decreasing natural gas price and increasing other polluting fuels, and non-price policies, including energy efficiency, low carbon emission, and clean fuels substation. Therefore, the conceptual model of our study can be drawn as follows:

4. Methodology

This paper investigates the effect of environmental policies, including price and non-price policies, on natural gas consumption in Iranian industrial sectors during 2005-2015 for 22 Iranian industrial sectors. Price-based environmental policies include decreasing natural gas price and increasing the price of other fossil fuels consumed in Iranian industrial sectors. Although there are no clear non-price environmental policies for reducing pollutants, we used CO2 emission and energy intensity as proxies for these policies. Other factors such as sectoral productions used as a proxy for measuring economic growth over the period of the study.

As seen in the literatures related to economic and dynamic

modeling, many economic relationships are dynamic in nature, and one of the advantages of longitudinal data is that the researcher can better understand the dynamics of adjustments. Dynamic relationships or models are represented by the presence of a lagged dependent variable among the independent variables (regressors), as follows:

$$yit=\delta yi,t-1+\beta x'it+uit \quad i=1,\ldots,N;\ t=1,\ldots,T \quad (1)$$

where, δ is a scalar, and xit is 1×K; β = K×1. thus, uit follows a one-way error model:

$$u_{it}=u_i+v_{it} \quad (2)$$

where $u_i \sim IID(0,\sigma_\mu^2)$ and $v_{it} \sim IID(0,\sigma_v^2)$ are independent of each other. The regression of the dynamic panel data described in Equation (1) is characterized by two sources of persistence over time. There is autocorrelation due to the presence of a lagged dependent variable among the independent variables and the individual effects characterizing the heterogeneity among the individuals.

Thus, in dynamic panel data models, when a dynamic relationship between variables should be estimated, common models used to estimate consistent and efficient coefficients are not applied. In other words, using estimate approaches based on ordinary least squares (OLS) (pooled OLS), fixed effects, random effects (generalized least squares (GLS) estimator) are not recommended in these models. Several ways in the literature are reported to estimate dynamic models; the first model is based on correcting the bias by using instrumental variables (Anderson and Hsiao, 1981) and the second one applies GMM estimation techniques.

4.1. Generalized Method of Moments (GMM) Model

Generalized method of moments (GMM) is preferred to a number of estimators developed by utilizing the sample moment counterparts of population moment conditions of the data generating model (Hansen, 2001). GMM estimators have become popular for the following main reasons:

- GMM estimator has great sample properties which can easily be characterized in a way which facilitates comparison. A number of these estimators can be studied a priori in a way which makes the comparison of asymptotic efficiency easy. The method is also appropriate to construct tests which explain both sampling and estimation errors (Hansen, 2007).
- In practical studies, researchers have recognized that GMM estimators can be constructed without specifying the generating process of all of data. This characteristic has been used to examine partially specified economic models in studying potentially mis-specified dynamic models designed to match target moments and in constructing stochastic discount factor models which link asset pricing to the sources of macroeconomic risk (Hansen, 2007).

4.2. Arellano and Bond (AB) Estimator Based on GMM

The dynamic panel data approach is usually considered the work of Arellano and Bond (AB) estimator. Arellano–Bond estimation starts by transforming all regressors, usually by differencing, and uses the generalized method of moments; it is also called difference GMM (Roodman, 2009).

It is based on the notion that the instrumental variables approach does not exploit all of the information available in the sample. By doing so in a generalized method of moments context, more efficient estimates of the dynamic panel data model may be constructed (Baum, 2013). Arellano and Bond argue that the Anderson–Hsiao estimator, while consistent, fails to take all of the potential orthogonal conditions into account.

To examine autocorrelation, the Arellano–Bond test is applied to the residuals in differences. Because $\Delta\varepsilon_{it}$ is mathematically related to $\Delta\varepsilon_{i,t-1}$ via the shared $\varepsilon_{i,t-1}$ term, a negative first-order serial correlation is expected in differences, and its evidence is uninformative. Thus, to check for the first-order serial correlation at levels, we look for the second-order correlation in differences based on the idea that this will detect the correlation between ε_(i,t-1) in Δε_it and $\varepsilon_{i,t-2}$ in $\Delta\varepsilon_{i,t-2}$. In general, we checked the serial correlation of order at levels by looking for the correlation of order n+1 in differences.

To test the identifying restrictions (the validity of instruments), we would use Sargan test proposed by Sargan in 1958. Sargan test assumes that model parameters are identified via a priori restrictions on the coefficients and tests the validity of over-identifying restrictions (Sargan, 1958). The test statistics can be calculated by residuals from the regression of instrumental variables by making a quadratic form based on the cross-product of the residuals and exogenous variables.

4.3. Econometric Model and Variables

Considering the structure of our data, i.e. several different Iranian industries for 11 years, dynamic panel data analysis seems an appropriate method. Panel data provide us with the majority of data, increasing the degrees of freedom and reducing the collinearity behind explanatory variables, thereby developing the efficiency of econometric estimates.

The success of dynamic panel data patterns in forecasting economic variables in this kind of data has led these models to be used broadly for predicting economic variables, formulating the behavior of variables, and eventually forecasting their future values. However, the question which remains in place is practically "which model, and on what basis, should be chosen from the various panel data?" The answer to this question is important, and in many studies, only one of the aforementioned patterns (without the steps described in the research methodology section), has been selected as a prediction model. The

Table 2-Summary of the variables, measurements, abbreviations, and the sources of data.

	Variable Name	Measurement	Abbreviation	Data Source
1	Natural Gas Consumption	Barrels of oil equivalent (BOE)	NGASC	Statistical Center of Iran
2	Energy Intensity	BOE/Billion Rial production in 2011	ENERIN	Iranian Energy Balance Sheet
3	CO2 emissions	Million tons per year	CO2EM	Reports of Ministry of Energy
4	Production	Billion Rials (based on Rial in 2011)	PRO	National Portal of Statistics
5	Natural Gas Price	Rial per cubic meter (based on Rial in 2011)	NGASP	Ministry of Energy of Iran
6	Average of Fossil Fuel Price	Rial per liter (based on Rial in 2011)	AVPFF	Calculation of Authors

present study seeks to develop a systematic approach to how to determine the principle of an appropriate dynamic panel data model for prediction in applied studies.

Considering conceptual models and theories, the function of demand for natural gas consumption in Iranian industrial sector will be as follows:

$$NGASC_{i.j}=fPRO_{i.j},ENERIN_{i.j},CO2EM_{i.j},AVPFF_{i.j},NGASP_{i.j} \quad (3)$$

(i=2005, 2006… 2015. j=1, 2… 22)

where, $NGASC_{i.j}$ is natural gas consumption in the ith year of the jth industrial sector; $PRO_{i.j}$ represents the industrial production as a measure of the output in the ith year of the jth industrial sector, and $ENERIN_{i.j.h}$ stands for energy intensity in the ith year of the jth industrial sector. $CO_2EM_{i.j.h}$ is CO_2 emissions in the ith year of the jth industrial sector. $AVPFF_{i.j}$ represents the average price of fossil fuels in the ith year of the jth industrial sector, and $NGASP_{i.j.h}$ stands for natural gas price in the ith year of the jth industrial sector.

Based on our data, because many of the data such as the total of fossil fuel consumption, CO2 emissions, and natural gas consumption are large, for more accurate calculation, we transferred the variables onto a logarithmic scale and calculated the elasticity of the variables. Hence, our final model is given by:

$$Ln(NGASC)=\alpha_1 Ln(PRO)+\alpha_2 Ln(NGASP)+\alpha_3 Ln(AVPFF)+\alpha_4 Ln(CO2EM)+\alpha_5 Ln(ENERIN)+b_0 \quad (4)$$

We also defined average of fossil fuel price (AVPFF) based on the below formula:

$$AVPFF=\frac{P_{Gasoil}\times C_{Gasoil}+P_{kerosene}\times C_{Kerosene}+P_{FuelOil}\times C_{Fuel\ Oil}+P_{GasOline}\times C_{GasOline}+P_{Liquid\ Gas}\times C_{Liquid\ Gas}}{C_{Gas\ oil}+C_{Kerosene}+C_{Fuel\ Oil}+C_{GasOline}+C_{Liquid\ Gas}} \quad (5)$$

4.5. Diagnostic Tests of Dynamic Panel Data

Before model estimation, some tests, including Pesaran's cross-sectional dependence test (CD Test), unit root test, cointegration test, F-Limer test, and Hausman test must be performed to examine the incorporated variables.

In econometrics, panel data is generally assumed to have cross-sectional independence. This assumption cannot be similar to other assumptions, so the first step in the econometric analysis of panel data before any test is to test cross-sectional independence in error terms. To this end, this paper applies Pesaran's cross-sectional dependence test (2004). If there is cross-sectional dependency in the model, then using some of the stationary tests such as Levin, Lin, and Chu (LLC) test and Im, Pesaran, and Shin (IPS) test leads to unreal results, and these tests cannot be used to check the stationary of the model variables. In such a case, it is suggested that cross-sectionally augmented Dickey–Fuller (CADF) and cross-sectionally Im, Pesaran, and Shin (CIPS) tests should be used. Nevertheless, if there is cross section independency, using LLC and IPS tests to check the stationary of variables is recommended.

The next step is to examine the evidence of a long-run relationship. The panel cointegration tests were employed to test the hypothesis of the existence of cointegration. To this end, Pedroni residual cointegration is utilized. In addition, to estimate the model using panel data, the regression relationship should be considered either in terms of the homogeneous intercept and the slope or the supposal of the same intercepts and the common gradient between the sections. To investigate such a case, the F-Limer test is used. If F-Limer indicates that panel data regression model is more appropriate than pooled data regression model, before the regression of the model, we use the Hausman test to determine whether to use the fixed effects model or employ the random effects model.

5. Results and Discussion

5.1. Descriptive Statistics

Descriptive statistics show that of 242 observations for the six variables used in our GMM model, natural gas consumption (LnNGASC) has the most variations around the mean (2.4), while natural gas price (LnNGASP) shows the least changes around the mean (0.8). Table 3 lists the descriptive statistics.

Table 3-Descriptive statistics of the variables

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
LnNGASC	242	13.397	2.412	8.8	17.8
LnPRO	242	9.178	1.611	5.9	13.0
LnENERIN	242	-2.146	1.041	-4.5	1.8
LnCO2EM	242	13.223	2.441	5.6	18.3
LnNGASP	242	5.872	0.829	4.9	6.9
LnAVPFF	242	6.732	1.327	4.6	8

Source: Current work findings

5.2. Cross Sectional Dependence (CD) Test

According to the results of CD test presented in Table 4, there is cross section dependency in error terms of the estimated model. This means that we cannot use LLC and IPS tests for performing panel unit root tests.

5.2. Unit Root Test

Since there is cross-section dependency in the panel data model, this paper utilized CIPS stationary tests to improve the reliability and validity of the results. The results of unit root tests of the model variables are presented in Table 5.

As tabulated in Table 5, the null hypothesis (homogeneous non-stationary) is rejected at the 1% or 5% level of significance, which means that, with the exception of the series of production (PRO) which are stationary in order one, I (1), all the other series are stationary in order zero, I(0), revealing that all the variables are integrated. Based on the given results of panel unit root tests, since variables are stationary in different cases, we can implement a panel cointegration test. Panel data cointegration tests proposed by Pedroni (1999, 2004) null hypothesis is joint non-cointegration.

Table 4- Cross section dependence test for profitability model

Test	Test statistics	Probability	Result
Pesaran's CD	6.678	0.000	Cross section dependency

Source: Current work findings

5.3. Pedroni Panel Cointegration Test

According to the panel unit root tests, we found that some variables are I(0) and one variable is I(1). Therefore, the next step is to test the evidence of a long-run relationship. To this end, Pedroni test was employed, and the results are as listed in Table 6.

Table 6 demonstrates that all the variables are cointegrated. Hence, Pedroni panel cointegration tests strongly support the existence of a long-run equilibrium relationships among the model variables. Therefore, the estimated regression is not a spurious regression. In other words, we can develop a significant regression model among the level of the variables. Next, we present the estimation results of the research model and its relevant discussion.

5.4. F-Limer and Hausman Test

The result of F-Limer indicates that the panel data regression model is more appropriate than the pooled data regression

Table 5 - CIPS unit root test results

Variable	Test Statistics	Result	Level
LnNGASC	-1.753**	stationary	I(0), Level
LnPRO	-2.054***	stationary	I(1), First difference
LnENERIN	-2.012***	stationary	I(0), Level
LnCO2EM	-1.946***	stationary	I(0), Level
LnNGASP	4.160***	stationary	I(0), Level
LnAVPFF	-2.203***	stationary	I(0), Level

Critical value of the 10%, 5%, and 1% level of significance is -1.53, -1.65, and -1.87 respectively.
Critical value of the first difference is -1.57, -1.72, and -1.98 at a 10%, 5%, and 1% level of significance respectively.
***, **, * denote the rejection of the null hypothesis at a 1%, 5%, and 10% level of significance respectively.
Source: Current work finding

Table 6 - Pedroni cointegration test

Series	Alternative hypothesis: common autoregresive (AR) coefficients (within-dimension)			
	Statistic	Probability	Weighted Statistic	Probability
Panel V-Statistic	-2.3790	0.991	-3.1602	0.999
Panel rho-Statistic	-5.8372	1.000	5.9248	1.000
Panel PP-Statistic	-2.5932	0.004***	-4.8743	0.000***
Panel ADF-Statistic	-1.5001	0.066*	-2.2737	0.012**
	Alternative hypothesis: individual AR coefficients (between-dimension)			
Group rho-Statistic	7.9629	1.0000		
Group PP-Statistic	-9.0659	0.000***		
Group ADF-Statistic	-2.2242	0.013**		

***, **, * denote the rejection of the null hypothesis at a 1%, 5%, and 10% level of significance respectively.
Source: Current work findings

model. Also, the Hausman test result illustrates that a fixed effect is preferred. The results F-Limer and Hausman tests are presented in Table 7.

5.5. Estimation and Analysis of the Model

This study estimated the dynamic panel data model by applying one-step Arellano-bond estimator based on GMM proposed by Arellano and Bond (1991). As proposed by the GMM two-step results, we should add the lagged dependent variables of natural gas consumption to Eq. (4), which are endogenous variables considering the fixed effects of industrial sectors; then, we can take the endogeneity for the lagged dependent variable of natural gas consumption in Iranian industrial sectors into account using GMM-type instruments. The estimations obtained by Eq. (4), along with the statistics and p-values of serial correlation tests, namely AR(1), AR(2), and Sargan test, are listed in Table 8.

Table 8 shows that the test statistics of the autocorrelation and validity of the instruments are satisfactory. The null hypothesis in the test for the first-order autocorrelation, AR (1), represents the existence of autocorrelation. In addition, the null hypothesis for the second-order autocorrelation, AR (2), shows no autocorrelation in the model. The test statistics of AR (1) and AR (2) are satisfactory, which is crucial to the validity of the instruments. The null hypothesis in the AR (1) test is rejected, it is accepted in AR (2). Moreover, the test statistics for the Sargan test regarding identifying restrictions (the validity of the instruments) is satisfactory; the null hypothesis is not rejected, so the Sargan test is robust.

Table 7- The results of F-Limer and Hausman tests

Test	Value	Probability	Result
F-Limer	43.02	0.000***	Panel Data
Hausman	194.64	0.000***	Fixed Effect

***, **, * denote the rejection of the null hypothesis at a 1%, 5%, and 10% level of significance respectively.
Source: Current work findings

As listed in Table 8, there is a positive relationship between the amount of natural gas consumption in Iranian industrial sectors and its first and second lags. In other words, the decision to use natural gas in Iranian industrial sectors can effect fuel consumption in the last two years because the manufactures were convinced to use more natural gas than the first year's capacity. In addition, the coefficients of the first and the second lagged value of natural gas consumption are significant at a 1% significance level. Accordingly, we estimated that, other things being equal, a 1% increase in natural gas consumption in the current year will on average lead to a 0.3912% rise in natural gas consumption in the next year; consequently, we estimated that, other things being equal, a 1% increase in natural gas consumption in the current year will on average result in a 0.1811% rise in natural gas consumption in next two years.

Another effective variable is Iranian industrial sector production (PRO) since the estimated coefficient of PRO has an important positive impact on NGASC at a 1% significance level. The estimation reveals that a 1% rise in PRO per year on average increases NGASC by 0.6050% in the Iranian industrial sectors during 2005 to 2015. This result is in line with empirical facts in the given sample data. Because more production needs more energy, this high coefficient shows that policymakers' environmental concerns lead industrial decision makers to use natural gas rather than the other sources of energy. To deal with this issue, policymakers adopted aligning policies to move towards a low carbon economy.

The results also reveal that energy intensity (ENERIN) has a positive and significant effect on natural gas consumption in industry section; on average, a 1% increase in energy intensity will approximately lead to a 0.42% increase in natural gas consumption in Iranian industrial sectors over the period studied, which proves the large effect of energy intensity on industrial sectors in the given sample data.

However, CO_2 emissions (CO2EM) has a positive sta-

Table 8 - GMM model results

GMM estimation; One-step Results						
Variable	Coefficient	Standard Error	Z	P > |Z|	[95% Confidence Interval]	
LnNGASC(-1)	0.3912	0.690	5.67	0.000***	0.2559	0.5265
LnNGASC(-2)	0.1811	0.0454	3.98	0.000***	0.0920	0.2702
LnPRO	0.6050	0.0679	8.90	0.000***	0.4717	0.7383
LnNGASP	-0.1453	0.1184	-1.23	0.220	-0.3774	0.0867
LnCO2EM	0.0825	0.0285	2.89	0.004**	0.0265	0.1385
LnAVPFF	0.1488	0.0869	1.71	0.087*	-0.215	0.3193
LnENERIN	0.4240	0.0533	7.95	0.000***	0.3195	0.5285
Number of observations	198					
Number of groups	22					
Number of instruments	58					
Arellano-Bond test for AR (1)	-2.6532 (Z)			0.000*** (Prob)		
Arellano-Bond test for AR (2)	-0.7399 (Z)			0.459 (Prob)		

***, **, * denote the rejection of the null hypothesis at a 1%, 5%, and 10% level of significance respectively.
Source: Current work findings

tistically significant but negligible effect on natural gas consumption. Totally, the estimation result shows that by assuming other conditions intact, a 1% increase in CO_2 emissions has made approximately more than a 0.08% positive impact on natural gas consumption in Iranian industrial sectors. The reason for this relationship is that there is an increasing rise in CO_2 emissions in Iran. Therefore, to reduce the amount of CO_2 emissions, policymakers prioritized restriction policies such as consuming clean fuels instead of polluting fuels.

Further, natural gas price (NGASP) has a negative but statistically insignificant effect on NGASC; it is estimated that, on average, a 1% rise in natural gas price will approximately lead to a 0.14% decrease in natural gas consumption in Iranian industrial sectors during the period studied. In fact, the results are in accordance with the pricing theory which indicates that an increase in the price of goods and services leads to decreased consumption.

Finally, the results demonstrate that the average of other fossil fuel price (AVPFF) has a positive significant effect on NGASC at a 1% significance level. Totally, the estimation result shows that, other things being equal, a 1% increase in the average of other fossil fuel price has approximately more than 0.1488% positive impact on natural gas consumption in Iranian industrial sectors.

6. Conclusions and policy implications

This research contributed to the stream of literature in the field of industrial sectors and sought to investigate and explore merely the influence of two types of environmental policies, namely price and non-price policies, on natural gas consumption and decreasing CO_2 emissions and energy intensity. Shifting from polluting fuels to clean and more reachable fuels such as natural gas has led the industrial sectors to similarly examine all the aspects of their environmental footprint and create strategies to become environmentally responsible and thrive in today's economic climate.

Thus, the implementation of appropriate policies is required in this context. Implementing price policies or non-price policies to manage natural gas consumption is the proposed solution to reducing environmental pollutions in Iranian industrial sectors. To this end, this paper investigated the effect of environmental policies, including price and non-price policies, on natural gas consumption in 22 Iranian industrial sectors during 2005-2015. Price-based environmental policies intended to utilize the prices of natural gas and other fossil fuels to direct Iranian industrial sectors towards using the clean fuel, i.e. natural gas. Since there are no clear non-price environmental policies to reduce pollution emissions, we used CO2 emission and energy intensity as proxies for these policies. We also considered the production of industry sector as a proxy to measure economic growth during the studied period.

Based on the empirical results, we concluded that there is a positive relation between the amount of natural gas consumption in Iranian industrial sectors and its first and second lagged during 2005-2015.

Furthermore, the estimation results indicated that energy intensity has a significant and positive impact on natural gas consumption in Iranian industrial sectors. The variable coefficient of energy intensity (non-price policy) has the greatest impact on the consumption of natural gas.

Another effective variable was Iranian industrial sectors' production (PRO). Since more production requires more energy, this finding confirmed the empirical facts. Nevertheless,

this high coefficient revealed that the policymakers' environmental concerns lead industrial decision makers to use natural gas as a fuel instead of other sources of energy.

Moreover, the results revealed that there is a positive relationship between CO_2 emission and natural gas consumption. Thus, policymakers regulated the limitation policies through consuming natural gas instead of other fossil fuels to reduce the amount of CO_2 emission.

In accordance with the pricing theory, the average price of other fossil fuels had a positive significant effect on natural gas consumption, which indicated that a rise in the price of other fossil fuels increased the natural gas consumption. Further, natural gas price had a negative but statistically insignificant impact on natural gas consumption in Iranian industrial sectors.

Variables such as natural gas price and the weighted average of other fossil fuels represent price-based policies. In this study, the average weights of the price of other fossil fuels were represented as limitation tools to decrease polluting fuels such as gasoline, kerosene, fuel oil, gas oil, and liquid oil which have been used a lot between 2005 and 2015.

Overall, we found that the non-price environmental policies are more effective compared to price-based policies. Thus, we recommend that policymakers in Iranian industrial sectors should focus more on promoting energy efficiency through technological improvements and energy saving regulations.

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Energy Dual Pricing in Iran and its Impact on Accession to the World Trade Organization

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ABSTRACT

Energy has always been one of the most controversial issues in the World Trade Organization (WTO). The significance and sensitivity of energy was doubled when the major energy-producing countries/states sought to join the WTO. To join the WTO, many energy-producing and energy-exporting states inevitably needed to modify and change their own laws. The adoption of a dual pricing policy by the applying countries appears as one of the controversial issues in this regard. The same has led to the emergence of some disputes between the energy-exporting and energy-importing countries. From the perspective of some energy-importing countries, such behaviors are seen as subsidies, which are contrary to the basic principles of the General Agreement on Tariffs and Trade (GATT) implying non-discrimination, the principle of the most favored nations, and the national conduct. On the other hand, the Islamic Republic of Iran, as one of the largest energy-rich states, has been seeking to join the WTO. Iran subsidizes its domestic producers to support its energy sector and infant industries. This work focused on examining the pricing policies, and in particular, the approach to determining the price of energy in Iran. In addition, we studied the impact of the pricing method of the energy sector in Iran on the process of its accession to the WTO by a comparative evaluation of the accession process of the energy-producing countries such as Russia and Saudi Arabia acceding to the WTO. Through studying the laws and regulations of the energy sector of Iran, one can realize that Iran has been distancing itself from dual pricing in recent years, that it is striving to shift the price of its energy to the global price by benefiting from the experiences of the performance of the member countries of the WTO, and that it has aimed at accelerating the process of its accession to the WTO. JEL Classification: K19, K33, K42

1. Introduction

Pricing has turned into a strategic issue in today's economy and trade. Natural and legal persons, including governments, national business enterprises, and some international economic organizations are concerned about the issue of pricing and the need to take into account the process of pricing and any relevant modifications and changes according to their micro and macro goals. The price element and the correct decision-making about it can adjust the flow of liquidity, lead to the satisfaction of customers and the distribution network agents, change the financial variables optimally, and, ultimately, assist the natural and legal persons in implementing their

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international financial obligations more efficiently.

The problem of dual pricing is one of the issues which has led to many controversies in the global markets in recent years. It should be noted that some countries arbitrarily reduce the prices of products and services in their own domestic markets with the aim of increasing the competitiveness of domestic producers, promoting the level of development, and gaining more share in the global markets. Hence, they somehow disturb the process of free trade and healthy and fairly competition by intervening in the pricing process.

Most controversies and disputes on dual-pricing policies arise from the trade of energy and raw materials. Most energy-importing countries believe that the policies adopted by the energy-rich and exporter countries on how to determine the price of energy in general, and on resorting to dual pricing in particular, damage their interests and disrupt the order of the free trade. Thus, the countries in the first group sought to resolve the barriers caused by dual pricing policies through international institutions such as the WTO.

In fact, none of the major energy exporting countries was among the main and initial states which signed the General Agreement on Tariffs and Trade (GATT) (Marhold, 2013:2). Due to the same reason, the energy related topics were not specifically discussed at the time of drafting GATT (Marceau, 2012:385). However, since the beginning of business systems, energy has been covered more or less in multilateral trade agreements. The Havana Charter, as one of the first international commercial documents, has extensively set and concluded agreements on international merchandise trade such as agreements on the control of the production rules, on the quantitative control of export and import of primary commodities, and on setting the prices. In addition, the Havana Charter has always emphasized the role of natural resources in the economic development of societies (Leal-Arcas & Abu Gosh 2014:120). Nonetheless, it should be noted that the mentioned rules have never reflected in the General Agreement on Tariffs and Trade (GAAT).

During the multilateral trade talks in Tokyo and Uruguay rounds the energy-importing countries tried to determine some energy export limiting procedures (Selivanova, 2007:6) Unfortunately, no agreement was concluded on the energy policies among the members. The WTO agreements did not also provide any specific rules for the energy trade (Selivanova, 2010:1). Thus, the overall and general rules on international merchandise trade are still implemented and applied to the energy trade despite of the failed efforts of governments in the last two decades to negotiate for resolving ambiguities in energy issues. However, the debatable point is that the mentioned general rules do not include many of the problems the energy trade faces such as the dual pricing problem.

The issues on energy trade were heavily debated in the WTO simultaneously with the accession of the major energy producing countries to the WTO. Many issues in relation to energy were raised in the negotiations over the largest energy exporting countries such as Saudi Arabia, Russia, Azerbaijan, Kazakhstan, Algeria, etc. joining the WTO (Leal-Arcas & Abu Gosh 2014:130). As estimated, the share of the energy products of these countries in the global trade is about 50% (Farhaan, 2018:18). Most of the energy-rich countries were requested by other members to change and reform their energy sector policies and laws at the time of accession. Some applicants for joining the WTO modified and changed their laws. A group of other applicants also believed that the request of the member states suggesting the modification and amendment of their laws is beyond the standards of the WTO Statute. In other words, these governments insisted that the request from the member states contained some kind of extra-contractual obligations, so they emphasized their position. Mexico, Saudi Arabia, and Russia were among the countries who opposed the reform of their laws at the time of accession to the WTO (Farhaan, 2018:19). According to some members of the WTO, such as the United States, the above mentioned countries used the dual pricing and preferential pricing for natural resources in their own domestic markets to boost their business power and excel their position against other countries deprived of natural resources (Ibid).

Another point to be noted is that, on the one hand, the energy sources are not distributed uniformly throughout the world (FAO, 2000:1); on the other hand, energy is considered to be an essential element in the national economy of all countries)Farhaan, 2018:198). Therefore, the energy policies of the energy-rich countries also affect the importing countries. At present, the high oil prices have caused the network of energy importing countries to fear the unbalanced supply of energy, which is a crucial and vital element in the economic growth. In contrast, the exporting countries see their interests in keeping the energy prices high. These countries prefer to meet the interests of their domestic industries, so they determine the prices of forms of energy much lower than the global level for domestic uses. Such factors could also act as other causes of the dual pricing of energy (Ibid).

These different viewpoints have led the energy importing countries to follow their differences and disagreements through the WTO. In fact, these countries ask the WTO to oblige the energy-rich countries to comply with the rules of healthy competition and eliminate the discriminatory policies based on its fundamental principles such as the principle of the most favored nation, the principle of national conduct, and the principle of free trade.

The Islamic Republic of Iran is also seen as one of the largest energy-rich countries with a great importance in the energy market (EIA, 2018:1). Iran has been waiting for over

twenty years to join the WTO (WTO, 2019). Since Iran also uses a dual pricing policy in some parts of its energy pricing, we wonder how much it will be obliged to modify the rules and regulations of its energy trade upon joining the WTO.

This research sought to answer the following questions:

- How legitimate are the arguments of the exporting countries in the WTO regarding the contradiction of dual pricing policy with the principles and regulations of the World Trade Organization?
- Have been the reform of the energy sector laws of countries such as Russia and Saudi Arabia to join the WTO based on the statutory requirements of the World Trade Organization?
- if Iran joins the WTO, will it also be obliged to modify its domestic laws?

To this end, in the first section, we reviewed the pricing, pricing strategies, and their importance in national and international markets. In the second section, we examined the dual pricing from the perspective of the WTO and discussed the agreements of this organization. In the third part, we scrutinized the dual pricing in the field of energy and its trade. Also, given the state of Iran's accession to the WTO on the one hand, and its strategic position in the global energy market, on the other hand, we described the energy pricing policies in Iran and the impact of such behaviors on it's the membership process of accession to the WTO in detail.

2. Section I: Pricing in Iran

As mentioned above, price is regarded as one of the main factors in creating incentives for economic activities, and the pricing or prices control policies appear to be among the interesting and challenging topics and issues in the economies of developing and developed countries.

Pricing goods and services in Iran, always, and especially after the end of the imposed war and the development of five-year economic, social, and cultural development plans, has been a controversial and challenging issue. The situation of Iran, as a developing country damaged by several events such as the revolution, the war, and the sanctions, requires that the government partly interferes in the financial and economic system and the pricing of goods and services, at least in the necessary and required sectors. In this section, we examined the pricing process in Iran, in general, and the approach to the pricing of energy, in particular.

2.1. Pricing mechanism

The pricing of goods and services by the Organization for Consumers and Producers Protection dates back to 1981. The general assembly of this organization, according to a statute approved by the Revolutionary Council, is the supreme official pricing reference. The representatives of the general assembly work under the title of the Prices Determination and Stabilization Board, which is one of the pillars of the Organization for Consumers and Producers Protection.

In 1981, a list of items subject to pricing was approved by the general assembly of the organization, and the final approval of the prices of essential and necessary commodities was added to the responsibility scope of the Economic Council; however, the approval of the prices of the items not considered essential by the general public was assigned to the Prices Determination and Stabilization Board (Saghafi, 1998:22). During the imposed war, due to the expectation of people from the government and the problems existed in the country, many items of goods and services were included in the pricing process, which continued until 1989. Since 1989, with the beginning of the first economic program, the number of items subject to pricing was gradually diminished, and the gradual elimination process of the pricing of these items started (Saghafi, 1998:22). Hence, by 1994, the number of pricing items was few; nevertheless, with rising inflation in the Iranian market, the government decided to again use pricing mechanism for the essential items. In fact, in a situation where the economy is severely inflated, the government has no choice other than determining the prices of commodities such as bread, local currency, and gold so as to prevent the economy from being trapped in the shocks and severe fluctuations, which ultimately lead to an economic collapse (Dini, 1998:38).

The Iranian government, according to its conditions, inevitably has to distance itself from using the method of determining the price of goods and services based on the natural system of supply and demand and needs to intervene in the pricing process by two direct and indirect methods.

In the first method, the government either determines the price of the goods, defines the prices based on the costs of the production factors, and dictates to the firms to sell the goods at the pre-determined prices, or, in conjunction with the manufacturers and producers, does the pricing, which is known as the guaranteed purchase.

Through guaranteed purchase, the government helps the producers increase their profit margins, and usually the price determined by the government is higher than the price that the manufacturers can sell their product in free terms. In this case, the sellers do not have to sell merely to the government and can sell their goods to any buyers. For example, the use of this method is common in the case of agricultural products. It should be noted that in order to protect the agricultural producers who sell their products to the government at a guaranteed price and to prevent their losses due to the late payment of the purchased products, the amendment to Note (3) of the Law on the Guaranteed Purchase of Agricultural

Products and the addition of two other notes to it were approved and communicated in September 2004.

In Note (1) of the single Article of the Iranian Act of Guaranteed Purchase of Basic Agricultural Products, the Ministry of Agriculture is obliged to determine the guaranteed purchase prices of the basic and essential products by observing the actual production costs in a conventional utilization unit through maintaining the relationship of trade within and outside the agricultural sector every year and propose to the government. Meanwhile, in the same Article, the government is required to declare the minimum guaranteed purchase price and to make purchases through the relevant units (The Iranian Act of Guaranteed Purchase of Basic Agricultural Products, 1989).

In the indirect method, the government inspects the prices through monetary, financial, and income policies (Dini, 1998:39). This method is more appropriate than the first one. The monetary and financial policies related to the budget debate can change the economic structure of a country optimally so that the supply of the goods the government seeks to reduce the prices of which will increase in the long term and vice versa. In this case, the prices of goods will decrease as the supply increases, and the need for subsidies will be eliminated. Further, by reducing the supply and the rise in prices, the goods to which, in the perspective of the government, lower resources should be allocated will be produced to a lesser extent (Dini, 1998:39).

Although the government's policies in recent years, which follow a pattern to transfer the pricing of goods to the market, have aimed at further flourishing the economic system, the economic structure of Iran is such as to make it difficult to achieve such a goal and to allow the market forces to move in this direction easily. For example, in the agricultural sector, in addition to the failure of pricing policies, we also face the contradictions between the monetary and fiscal policies of the state.

Regarding the insufficiency of pricing policies, we must admit that, in the inflationary conditions of Iran's market, when only some of the goods are included in the pricing process and the rest of the goods can adjust their prices in accordance with the inflation rate, the goods in the first class, which are generally in the category of the basic goods, will tolerate pressure by different aspects of supply and demand. From the aspect of supply, as the production of excluded products is more profitable, producers tend to stop the production of the included products or not to sell it to the government as much as possible. Therefore, the tendency towards production will be weakened. In terms of demand, since the prices of the covered products are relatively stable and their consumption is less expensive for people, the consumers facing rising prices will be more likely to consume the covered goods so as to reduce their costs (Mehrabanian, 2009:27).

Regarding the contradiction between the pricing policy of the state and other monetary and financial policies of the country, it should be mentioned that the government has always increased the amount of money in circulation in recent years and in conditions of the absence of or low demand for domestic production. In this context, on the one hand, the government has increased the demand rate with its monetary policy; on the other hand, it has tried to prevent the rise in the price of some commodities, which is rooted in the pressure of the same created demand (Mehrabanian, ibid).

Therefore, in order to boost the economic growth, increase the employment, and control the level of prices, Iran's government needs to establish a balance between pricing policies and some macro-policies such as monetary policies, trade policies, and anti-inflationary methods. The government should also pay attention to the nature of different products and markets in the process of pricing and should predict and consider the guarantee of effective implementation of pricing policies.

2.2. Energy pricing

The energy pricing trend in the price index of the factors in the production of the Iranian economy is not aligned with many industrial countries and even the energy exporter states. Exercising governmental supporting prices in the energy market has led the energy to replace other primary production inputs, namely labor and capital. Applying supportive prices by subsidizing the energy sector has been done with the aim of boosting economic growth, controlling the level of prices, strengthening the development, and creating jobs. However, we should check out whether the mentioned goals have been met by the policies adopted by Iran's government in the energy pricing or not. In this section, we studied the energy pricing policies and the impact of these policies on the realization of Iran's development goals.

Within one year of second world war's end, energy markets underwent various changes in the industrialized and developing countries. Due to benefiting from the modern technologies, the industrialized countries pursued the process of production relying on inexpensive forms of energy, while developing and even oil-rich countries focused on the user technologies due to having competitive work force and labor (Bastannejad and Nili, 2005:202).

After the oil shock in the 1970s, the countries with low-price energy resources turned to the energy-consuming technologies, while the industrialized energy importing countries sought to utilize the capital-needed and energy-reserving technologies. On the other hand, by increasing the opportunity-cost of energy resources in the global markets and the emergence of topics on environmental issues, energy

consumption, and constraints on the fiscal and tariff policies of the states regarding the free trade, the necessity to moderate the relative prices of forms of energy became inevitable in the developing countries as well as energy exporters. Thus, many energy-exporting countries like Saudi Arabia, Nigeria, and the UAE revised the policy of inexpensive energy supply, and only a few countries such as Iran, Libya, and Algeria insisted on implementing their previous policy.

Over the past four decades, the process of support for prices has been intensifying in the energy sector in Iran's economy, and the government has boosted the process of generating competitive advantage and the growth of its intensity by increasing the provision of subsidies to the energy sector. In fact, in the Iranian economy, through imposing the price ceiling in the market of forms of energy, the government has continuously pursued the policy of creating the price advantage. For example, in the case of electricity, the Ministry of Energy has never been able to receive the real cost of electricity from consumers, and even the electricity tariffs are free for some subscribers (users) in accordance with the law. Thus, the electricity provided to customers is the most affordable type of electricity among 200 countries around the world. The price of electricity without taking into account the cost of fuel consumed at a power plant is about 1050 Iranian Rials per kilowatt hour, while the average selling price of electricity is 660 Iranian Rials. It is also worth noting that the price of electricity falls to 170 Iranian Rials in the warm regions of Iran and in the agricultural sector. Given the fact that the Ministry of Energy provides around 240 billion kilowatt hours of electricity for consumers over a year, a figure of about 100 trillion Iranian Rials per year is the difference between the finished price and the obliged sale price of electricity (www.eghtesadonline.com:2018).

The government has been subsidizing production inputs in general and the forms of energy in particular to pursue the goals of strengthening the flow of economic growth, increasing employment, controlling the general level of prices, and, ultimately, establishing social justice (Bastannejad and Nili, 2005:208). In this regard, the policymaker expects that the increased paid subsidies will improve the indices of employment rate, long-term economic growth, and the inflation rates. However, based on economic models in Iran, reducing the relative prices of forms of energy has had a reverse effect and led to an increase in the inflation rate and the intensity of energy consumption. In other words, energy subsidy inversely relates to economic growth, and the increase in the mentioned subsidy has limited the production gap and the GDP growth through fiscal deficits and inflation (Bastannejad and Nili, 2005:215).

Therefore, the Iranian government needs to change a majority of the major variables related to energy pricing so that the impact of subsidies paid to the energy sector can be evaluated separately to study and examine their positive and negative effects using the economic models.

It is also necessary to modify the energy prices. Usually, the energy-price adjustment policies have focused on general price modification and have proposed global rates. To be effective and efficient, such reforms must be accompanied by social considerations and consider the situation and benefits of the low-income groups.

On the other hand, it should be noted that although the low-price energy as well as the low-wage labor play a significant role in keeping the production costs low, and the manufactured products can compete in the global markets, what the economic policy-makers should consider is the real relative advantage but not the relative advantage created artificially with an unrealistic support of the industries since the great price difference between the domestic energy and energy in the neighboring countries leads to illegal trade and smuggling of energy (Mazraati, 2001:18).

The government should determine the price of energy with regard to the equilibrium exchange rate (free market) and prices in the international markets. In this case, the import and export of energy will be allowed, and the private sector can enter the energy market with confidence. At this stage, the government can also play the role of monitoring and guiding the energy sector through the imposition of taxes and tariffs, and thus eliminate the effects of global market price fluctuations on the national economy. Fortunately, the legislator has required the government to increase and adjust the prices of forms of energy relative to their prime costs by passing various laws such as the subsidy purposefulness law, the law of the fifth and sixth development plans, and the law of protecting the nation's industries. However, we should consider that, due to the fluctuations in oil prices, the government has always faced difficulties in paying for the difference in energy prices.

3. Section II: Energy Dual Pricing and Accession to the WTO

Iran is one of the countries with the richest sources of energy and has always been seen as one of the largest exporters of oil and gas; hence, Iran has a special place in the international markets. However, Iran has not yet succeeded in joining the WTO to use the capacities of this organization for stabilizing and improving its position in the global energy market. One of the obstacles Iran faces to join the WTO is granting subsidies to the energy sector and the government's involvement in pricing and adopting energy dual pricing policies. Despite the fact that the use of dual pricing policy has not been explicitly opposed by the WTO, some energy-rich countries had to stop

this policy to be able to join this organization, yet we should wait to find out whether Iran continues to use this method to determine its energy price or not and to what extent this pricing method will appear to be an obstacle to joining the WTO.

In this section, we explored and studied the status of Iran's accession to the WTO, the energy dual pricing policy, and the challenges the energy sector encounters for accession to the WTO. In addition, we reviewed the laws and rules of energy pricing in Iran and the impact of its joining to the WTO through the study of the procedure for other energy-rich member states.

3.1.The state of Iran's accession to the WTO

Since the establishment of the WTO and its predecessor, GAAT, 164 countries have already joined this entity. We can realize the importance of the role of this organization by considering the fact that now more than 95% of the world's goods and services trade occurs within the framework of its laws and regulations, which has profoundly increased the significance of the issue of Iran's accession to the WTO for this country.

Iran submitted its membership application to the Secretariat of the WTO in 1996 and was accepted as an observer member of the WTO in May 2005. On October 28, 2009, Iran's trade regime was approved by the Council of Ministers to be presented to the WTO and subsequently submitted to the secretariat of this organization for consideration. Initial studies by the WTO led to raising 700 questions about Iran's commercial regime. The Ministry of Commerce prepared the answers to these questions in collaboration with governmental agencies and relevant institutions (around more than 50 institutions) and presented them to the WTO in November 2011 (Jahandideh, 2009:1).

The process of Iran's accession to the WTO has been stopped since 2011 so far. One of the main reasons for the cessation of the process of Iran's accession to the WTO was the simultaneity of the submission of the package of Iran's commercial responses with sanctions by the United States and its allies (www.eghtesadnews.com:2018). Hence, it did not seem reasonable that the countries working together to impose all-around trade sanctions against Iran would meet and negotiate with Iran in the WTO on the trade facilitation.

In fact, if we examine the history of Iran's accession to the WTO, we will conclude that of the 23-year history of Iran's membership request, we have been responsible for about 3 years of delay in submitting the trade regime report to the WTO. In the next years, when Iran had a strong determination to join the World Trade Organization, the accession of Iran has not been realized due to the lack of consensus on the subject in the WTO, which is rooted in political issues. Thus, despite the agreements made with the Head of the Working Group on the Accession of Iran, the United States prevents the appointment of the Chairman of the Working Group in the agenda of the General Council of the WTO while this process takes only a few months for other countries. For example, Afghanistan requested membership in the WTO in 2003, and the working group for the membership process of this country was formed in 2004. It is also worth noting that Afghanistan became a full member of the WTO on July 29, 2016, and hence was the last country which joined this institution (www.wto.org:2019).

With all the difficulties Iran faces in joining the WTO, we should not forget that joining the WTO is indispensable since almost all the global trade is in the hands of the members of the WTO and subject to its rules and regulations, and the members of this organization are not willing to have commercial relationships with the non-member countries at a level lower than these rules and regulations. The free trade between countries has led to increased competition, and such an increase in competition will be associated with innovation and better use of production factors. The competition atmosphere leads the businesses and trade into innovation, improvement of processes, creation of new technologies, and, in general, the advancement of science (Jahandideh, 2009:3).

With Iran accession to the WTO and complying with its rules and regulations, the producers and exporters of Iran will gain a better position for export; however, they will have to promote and improve the quality and quantity of their products to achieve a higher share in the markets of other countries(Jahandideh, 2009:5). The efforts to more extensively enter the global markets can lead to the promotion of technology, improvement of processes, and possible discovery of new relative advantages. As much as our share of the markets in other countries increases, it will become easier for us to fairly achieve the economic growth and development of our country.

3.2. The Legal effects of Iran's accession to the WTO in the energy sector

Given that Iran is on the path to accession to the WTO, some of Iran's laws and regulations on subsidies and pricing in the energy sector are likely to change. Hence, in this section, we explored the laws and rules of the five-year plan of economic, social, and cultural development, the prior budget laws, the law of targeted subsidy plan, and other energy related laws to assess their compliance with the WTO laws and regulations.

3.2.1. The laws on the five-year economic, cultural, and social development plan

The economic, social, cultural, and social development plans of the Islamic Republic of Iran refer to the "Five-year Plans" which are drafted by the government in power and passed by the parliament. Since 1989, six development plans

have been approved, ratified, and implemented. In this section, the energy pricing sections were discussed considering the above laws.

The law on the first five-year economic, cultural, and social development plan of Iran dates back to 1989. The main objectives of the first plan include, but are not limited to, the following:

- Creating economic growth in order to increase per capita production, generating productive employment, and reducing economic dependency by emphasizing the self-sufficiency of agricultural strategic products and curbing the inflation;
- roviding the basic needs of the people;
- Determining and modifying the consumption patterns to specify the needs of humans and society in the course of material and spiritual growth and evolution by preserving human dignity and liberty;
- Organizing the spatial and geographic distribution of population and activities tailored to the relative advantages of each region with the exception of political and military considerations.

The topic of energy has been sporadically mentioned in the first plan of economic development. For example, in determining the overall country's policy, in paragraphs 2-4, the growth of capital and intermediary goods of the economy particularly agricultural inputs, water and soil, mineral and heavy industries, goods needed by the society community, energy provision, communication, development, research and technology aiming at replacing the imports are emphasized while giving priority to the maximum use of the available capacities.

Paragraphs 43, 44, and 45, respectively, have also referred to the following:

- Prioritizing the provision of gas for gas injection projects in order to prevent the crude oil loss and strongly avoid the recovery of gas cap of the oil reservoirs;
- Exploring and extracting gas from the reservoirs shared with neighboring countries, replacing the most amount of petroleum products and other energy-producing fuels with natural gas, and distributing gas respectively for the uses of power plants, industries, commercial and household purposes with the priority given to the country's high-consumption regions, cold regions, and nearby areas.

In addition, Sections 48 and 49 of Part 4 have also addressed the improvement in the utilization of the country's power industry facilities through the following measures:

- By increasing the utilization factor, load factor, and thermal efficiency of power plants and reducing energy losses in transmission and distribution networks;
- Policy making in the field of efficient use of energy and savings in fuel and energy by Ministries of Energy and Petroleum;
- Strictly observing the priorities of the energy sector (electricity, oil, and gas) by the Ministry of Industry and Commerce regarding the means and equipment of the energy consumers.

Regarding energy pricing, the main goal of the first development plan of Iran was to achieve the real prices by considering the livelihood conditions of low-income classes and observing the fair and justice. In order to support production and export, Paragraph 42 of Part 4 states that the pricing method of manufactured, imported, and exported products should be revised.

Also, Paragraph 5 of the general policies has referred to making changes in the policy of pricing commodity and services to gradually create equilibrium prices for the economic resources. According to Clause 5-1, the general principle in the case of public goods and services such as water, electricity, gas, liquid gas, kerosene, gasoline, gas oil, fuel oil, motor oil, telecommunications, and post is to move towards gradually providing the acceptable costs of the new and current capitals of the companies which manufacture/provide these goods and/or services.

Despite the fact that the first development plan was set to reform the energy price structure, the post-war critical situation, the incidence of inflation, and the necessity to provide the minimum conditions for people's lives did not allow the realization of the first development plan objectives.

The second development plan covering a 4-year period between 1995 and 1999 has also addressed the issues of saving in energy consumption, improving the production and consumption policies, and increasing the utilization of energy resources in several notes. A single article of the development plan in Paragraph (b), Note 16, refers to the price of energy. According to the aforementioned note, in order to save on the consumption of oil products and to insure social justice, the prices of oil products should increase during the second plan, and the resulting effects have to be adequately offset. Paragraph (c) of the same note states that the increase in the price of water, gas, and electricity is subject to the increased consumption, so the rate of payment remains constant for the low-consumption customers, while it rises exponentially for the high-consumption subscribers.

In Note 21 of the single article of the second plan, in order to organize the pricing to allow monitoring and control, clarify the subsidies, and improve the competitiveness of domestic products compared with imported products, it was decided to cut all discounts, preferences, exemptions of customs duties, and commercial profits of companies such as National Iranian Gas Company, National Iranian Oil Company and affiliated companies, and National Iranian Petrochemical Company and its subsidiaries.

The third part of the single article of the second plan,

which describes the government revenue policies, indicates that the tax exemptions granted to different sectors, field-activities, and institutions through price modifications, budget allocations, and reviewing the tax system based on the definition of income base should gradually be eliminated with the exception of the agricultural sector and its complementary industries.

In the eighth part, dedicated to pricing, although the correction of prices has been targeted, Paragraph 9 has addressed the coordination in support of producers, consumers, and exporters. The tasks of setting, coordinating, and controlling the prices are assigned to the Council of Economics. It is not clear, however, that how the support and protection of the producers, exporters, and consumers will be realized in the process of pricing.

The law on the third development plan was approved in April 2000 and was in force until 2004. Chapters 5, 7, and 15 of the law on this plan have covered the issues of subsidies, tax system and budget, and the energy respectively.

Article 33 of the third plan states that the policy-making and planning in the field of exploration, extraction, and production of crude oil and the refining of petroleum products and its main and minor products are in the state monopoly, and the government has the authority and is allowed to, within the framework of this law as well as the regulations which are prepared and issued by the Ministry of Oil within six months and will be approved by the Cabinet of Ministers, assign the implementation of activities related to the operations of refining, distribution, and transportation of petroleum products and its main and secondary products to the natural and legal persons in such a way that does not create monopoly in the nongovernmental sector and will not deprive the government authority of the sovereign affairs guarantee and the continuity of the provision of services. However, Paragraph (d) of Article 120 states that the government is obliged to set a bill and submit it to the Islamic Consultative Assembly for approval in order to modify and improve the structure of state-owned companies affiliated with the Ministries of Oil and Power in line with the implementation of the policy of reducing the state ownership and tenure and increasing the economic-technical efficiency of these companies by considering the royalty interest of oil and gas consumed domestically as the national capital during the first year of the third plan.

The list of the essential goods eligible for the subsidy provided in Paragraph (a), Article 46, of the third plan does not include energy. Nevertheless, Article 47 provides subsidies for agricultural inputs such as fertilizers and poisons; perhaps, this type of subsidy can be justified in the form of latent subsidy of the energy sector.

Article 52 also aims to support the production sector by proportioning the costs of electricity and gas and providing preferential rates.

Although one of the objectives of the third plan is to reduce the involvement and tenure of the government, Paragraph (d) of Article 121 has explicitly addressed the pricing of oil, gas, and electricity by the government, and Paragraph (c) of Article 122, determines the guaranteed price of power and electricity sector, which is considered to be a kind of subsidy.

The Law on the fourth five-year economic, cultural, and social development plan, approved for 2005 to 2009, approximately coincide with the regulating and formulating the targeted subsidy plan. According to Article 3 of the law of the fourth plan, the pricing of fuel oil, oil gas, and gasoline should be made based on the wholesale prices of the Persian Gulf. Furthermore, the price of natural gas was supposed to be set based on its lowest level price in the neighboring countries, and the kerosene and liquid gas would be supplied based on the subsidy-free prices for commercial and industrial uses. Under Article 22 of the aforementioned law, the price of compressed natural gas is set at a maximum of 40% of the price of gasoline. Article 26 also specifies the pricing of electricity, gas, water, and some commodities. Moreover, Paragraph (c) of Article 39 of the law restricts the pricing to the public and exclusive goods and services and essential goods.

However, in 2004, an amendment was added to Article 3 of the law, according to which the prices for the sales of products such as gasoline, gas oil, kerosene, fuel oil, gas, other oil products, electricity, and water, as well as the prices for services such as sewage service, telephone communications, and post service were fixed for the first year of the plan at the price set at the end of September 2004. It was also decided that, for the next years of the plan, the changes in prices would be proposed to the Parliament in bills along with its socio-economic justification.

It is stated in Paragraph 4 of Article 21 of the fourth plan that, in order to create further value added and use gas resources in industrial and mineral development, the government is allowed to guarantee and provide up to 9 billion dollars to establish energy-consuming industries and industries with comparative advantages for export purposes complying with the ceilings approved by Article 13 of the Plan on the Settlement of Foreign Exchange Obligations of the country. In addition, Article 27 of the law of the fourth plan allows the government to provide preferential loans for the deprived areas for job-creation projects. The mentioned act is entitled to subsidize agricultural inputs such as fertilizers and poisons, allow the guaranteed purchase of agricultural crops, and provide low-cost electricity to the agricultural sector. It seems that the pricing policies of the act of the fourth plan are not in conflict with the WTO rules and are ultimately considered among the yellow-light or traceable subsidies.

The fifth development plan, which was approved for the

years 2011 to 2015, has dedicated separate sections to oil, gas, electricity, and the clean energies.

The sixth plan was also approved for the years 2017 to 2021. This plan has also dealt with energy, industry, and mining in some sections. In the fifth plan, the government is obligated to supply energy at its full price and somehow reduce its subsidy. On the other hand, the government is required to pay the difference in cash to the relevant institutions, like the Ministry of Energy. However, due to the fall in oil prices and the prevailing economic conditions, the government has failed to accomplish this line item in the budget and pay the difference in cash.

In the sixth plan, Paragraph 3 (b) of Article 39 states that in order to insure transparency in exercising the law, the government is required to submit the revenues and payments related to the targeted subsidies plan law in a separate table containing the following items along with the budget of the years to the Islamic Consultative Assembly:

- The total revenues from implementing the targeted subsidies plan;
- The related value added tax;
- The share of energy producing and energy distributing companies;
- The share of the Organization for Targeted Subsidies Plan in order to allocate cash and non-cash subsidies to the households and monetary helping to the health sector and support the production and employment through financing related to the implementation of the Law on the Modification of the Energy Consumption Model approved on 23 February, 2011 and the Law on Transportation Development and Fuel Consumption Management approved on September 12, 2007.

In the fifth and sixth plans, although the government is still involved in energy pricing and giving subsidies to this sector, the legislator emphasizes the finalized and full price of the energy and seeks to eliminate the gap between the domestic price and the global price.

It can be argued that the pricing policies of the law of fourth to sixth plans do not contradict the rules of the WTO and will eventually be regarded as traceable subsidies. However, despite the challenge of Saudi Arabia and Russia in joining the WTO regarding the energy dual prices, which have been considered by some hidden negotiating parties and the members to be removed, it is believed that Iran will face a serious challenge in this context. Nevertheless, it should be noted that Iran's energy sector subsidies are examples of general and permissible subsidies under the WTO regulations since they are paid horizontally to all sectors, and the condition for being specific and exclusive is excluded from it (Zare, 2009:94). However, as based on the provisions of Article 12 of the WTO agreement, the country applying for the accession to the WTO should join the organization in accordance with the terms of the agreement between itself and the organization, and the current trend in energy pricing is unlikely at the time of accession and afterward.

3.2.2. The Targeted Subsidies Law (TSL)

Iran's economy is moving from centralized planning to decentralized planning, and energy subsidies are one of the most fundamental discussions of this transition period. The importance of this point is further highlighted when we realize that the revenues from the sale of various forms of energy constitute more than 90% of the national income; on the other hand, huge amounts of the national budget are allocated and spent annually under the title of subsidies for various forms of energy (Naji and Sotoudeh, 2014:46). Hence, the removal of subsidies is of particular importance.

The Iranian Targeted Subsidies Law (TSL) containing 16 Articles and 16 Notes was passed on January 5, 2010. The law aims to gradually eliminate subsidies and bring the price of energy closer to the finished and global price. According to Paragraph 1 of Article 1 of TSL, the domestic sale prices of gasoline, diesel fuel, fuel oil, kerosene, liquefied petroleum gas, and other oil derivatives in terms of the quality of carriers and costs (including shipping, distribution, tax, and legal fees) should not be less than 90% of free on board (FOB) price in the Persian Gulf by the end of fifth five-year development plan. Furthermore, based on note of this Article the sale price of crude oil and condensate to domestic refineries is determined to be 95% of the price of delivery in the Persian Gulf (FOB price), and the purchase price of the products is determined by the mentioned price. Based on Paragraph 3 of Article 1, the average domestic sale price of electricity should gradually be set to be equivalent to the finished price by the end of Iran's fifth five-year development plan. Nevertheless, according to Note 1 of Article 1, the government is still allowed to apply preferential prices to electricity and natural gas in terms of geographical areas.

Although the main goals of TSL include reforming the economic structure of Iran in low-cost fuel, reducing government interference in pricing, and making the prices transparent, adopting such a policy regarding subsidy does not match the government's interventionist policies in areas such as trade or monopoly conditions in some Iranian industries. For example, pricing or other interventions should be reduced in conditions where government intervention and imposition of high tariffs make people buy a domestic car with an average gasoline consumption rate twice as large as the global level (www.ayaronline.ir:2019).

In the TSL, there is no possibility of price discrimination and step-up pricing for some government goods and services such as electricity, gas, and gasoline given the smart fuel system which can identify each subscriber's consumption rate. In other words,

different prices can be obtained from different groups depending on their consumption. However, this initiative (using different and more efficient policies for energy carriers) is not explicitly stated in the case of energy carriers subject to the TSL, and a common decision has been made for all types of energy carriers. It should, however, be noted that Iran is still one of the largest subsidizing countries for fossil fuel in the world despite its efforts to eliminate energy subsidies in various steps, align the domestic energy prices with the global ones, and eliminate the dual pricing policy (www.old.alef.ir:2019). However, a study into the direct effects of the increased prices of energy carriers in various sectors shows that this increase should occur gradually, more gently, and uniformly, and this policy should be implemented simultaneously with a non-price policy (Naji & Sotoudeh, 2014:52), otherwise it may lead to the bankruptcy of industries or manufacturers' leaving the industry sector.

3.3. A Comparison of Energy Dual Pricing Policies of the WTO's Members

It is well known that the exporting and energy-rich countries were not significantly present in the WTO until a few years ago, which led to the adoption of trade policies which sometimes harmed these countries and deprived them of the economic benefits of their energy resources. Concurrent with the membership request of the largest energy-rich countries such as Saudi Arabia, Oman, and Russia, the energy pricing policies of these countries were strongly opposed by the WTO members.

When Saudi Arabia acceded to the WTO in 2005, its policy on energy dual pricing was criticized by the energy importing countries. Therefore, Saudi Arabia faced intense pressure at the time of its accession to the WTO to undertake specific commitments on dual pricing and was ultimately forced to eliminate the dual price of natural gas liquid (WT/ACC/SAU/61,Para:26) . Some members of the WTO have argued that the low price of natural gas liquid (NGL) causes Saudi producers to benefit from the subsidy, which raises concerns (Mathur, 2014:33). The Saudi Arabia counter-argued that the domestic sale price of NGLs was based on long-term contracts negotiated between producers and consumers and set in accordance with international market prices adjusted downwards for commercial and cost-based considerations. The domestic price of NGLs, while lower than the export price, insured the full recovery of production costs and a reasonable profit even after the downward adjustment. NGL prices for export markets reflected higher export costs on transportation, infrastructure, marketing, etc. The Saudi Arabia also provided assurances that NGLs were available on a non-discriminatory basis to all users in Saudi Arabia, whether Saudis or foreigners (Mathur & Mann, 2014:77). However, in Resolution No. 68 of the Saudi Council of Ministers on November 25, 1995, the representatives of the government acknowledged national industries in Saudi Arabia using liquid gases (butane, propane, and natural gasoline) a 30% discount of the lowest international price obtained by the exporting country in any quarterly period from any overseas consumer (United States International Trade Commission,1999:16). A prototype of such preferential pricing is methyl tert-butyl ether (MTBE), which is produced from methanol. In an anti-dumping petition filed by the US producers of ethanol as a product competing with MTBE, it was claimed that the dual pricing system subsidized MTBE through low-cost provision of the raw material, i.e. natural gas and methanol, to refiners in Saudi Arabia; therefore, the US ethanol industry suffered material injury. The European Union had raised concerns that this practice was indirectly affecting the EU petrochemical industry. For this reason, dual pricing was discussed in the EU-Saudi Arabia bilateral market access negotiations. The negotiations, however, failed in August 2005; the EU surprisingly abandoned its efforts, and the agreement on Saudi Arabia's accession to the WTO was signed (Nedumpara, 2014:33).

Many experts believe that the Saudi Arabia actions do not violate the WTO subsidy agreement and compensatory actions of the WTO. Under the agreement on subsidies and countervailing measures, a measure can be considered a subsidized measure if a) financial assistance is provided by the government or government authorities in the territory of a member; b) it is followed by an advantage for the member; and c) it has a specific aspect. Moreover, in order to cope with the subsidies granted by a government, the subsidies must be among the prohibited or at least actionable subsidies. To this end, Appendix 1 to the agreement on subsidies and countervailing measures has necessitated three conditions in order for government assistance to its domestic customers to be considered specific and prohibited subsidies as follows:

- A government or its affiliated institutions should consider more favorable conditions for domestic goods or imported goods used in the manufacture and export of another product.
- Favorable conditions shall apply only to this product and shall not include goods which can compete with this product or similar products.
- Favorable conditions should create a benefit that results in discrimination provided that both domestic and imported goods are available without any restriction and the only criterion for preferring one over the other is commercial considerations such as lower price.

It should be noted, however, that the terms set out in the agreement and its annex only apply to exported goods and do not include goods produced for domestic use. Nevertheless, in Saudi Arabia, the costs the government receives for raw materials used in petrochemicals are less than those received for domestic consumption. The agreement also considers subsidies

to be prohibited when they are "specific," while raw materials are provided at a lower price to all companies operating in the Saudi petrochemical sector rather than to a specific company or industry. According to Article 2 of the agreement on subsidies and countervailing measures, a subsidy shall not be considered a specific subsidy if it is provided to consumers regardless of their specific criteria and conditions. Another specific condition for subsidy is its allocation to a limited number of companies, the benefit of particular firms, or its unequal allocation to certain companies considering their variety of economic activities. The agreement on the rules of determining specific companies appears to be ambiguous and has created a clear restriction on the use of subsidies for this type of companies, which is because any particular industry uses its own primary resources, and thus granting any kind of subsidy to that industry may be considered "specific." Special conditions such as proof of damage and serious harm to the industries of other countries are also needed for the actionability of Saudi domestic subsidies to domestic manufacturers. Proof of serious injury itself needs meticulous case-by-case evaluations (Mathur,2014:77). Therefore, it is difficult to prove that dual pricing in Saudi Arabia is considered a subsidy and violates the WTO agreement on subsidies and countervailing measures.

However, Saudi Arabia's accession negotiations concerning dual pricing created two precedents for other WTO members. First, governments also have to consider the costs of energy products recycling, and, second, natural raw materials have to be made available to consumers in a non-discriminatory way regardless of their nationality so that it cannot be considered a subsidy.

After Saudi Arabia, the issue of dual energy pricing was raised again when the Russian Federal Government acceded to the WTO. The price of feedstock is determined by Russia at a level that could not be maintained if it was otherwise exposed to market forces. For example, in the case of Russia, the gas and electricity sectors are controlled by the state (WT/ACC/RUS/70) (WT/MIN (11)/20). Although these sectors are privatized, the majority of shares in energy companies such as Gazprom and RAO UES belong to the government. Prices for gas and electricity are set by Federal Tariff Service (FTS) and the Regional Energy Commission (REC). FTS is empowered to regulate the upper bounds for wholesale prices of electricity and gas (Nedumpara,2014:32). Several members of WTO raised concerns on dual pricing since Russia charges lower prices for natural gas devoted to domestic consumption than to export. According to reports, differentiated wholesale prices are set by the Russian Federal Agency, and this differentiation is controlled on the basis of numerous legislative and administrative acts (Ibid). It is further reinforced with a special export tax on gas exports which is implemented alongside. During Russia's accession negotiations, the European Union (EU) maintained its position that the domestic energy prices in Russia were much lower than the world prices, which prejudiced the EU producers. The EU also contended that the Russian government had a monopoly over the energy industries and that it imposed very high export taxes to support a domestic price of gas at a level below the market price. Russia, on the other hand, maintained that (a) this practice was not undertaken to support domestic markets and (b) that it is impossible for Russia to move to world energy prices in a single day (Belyi, 2012). Russia also stated that its energy pricing was not a subsidy as defined in the agreement on subsidies and countervailing measures (SCM) or any other provisions of other covered WTO agreements. Russia also relied upon a World Bank study that enlisted the merits of dual pricing of Russian natural gas. According to the World Bank study, Russia would lose an amount anywhere between 5 and 7 billion dollars per year if it were to eliminate this practice and unify the price of feedstock (Nedumpara, 2014:33). However, Russia undertook to reform its gas pricing laws and develop market pricing principles so that there would be the same price of gas in the domestic and global markets.

Dual pricing was also discussed when Oman acceded to the WTO (WT/ACC/OMN/26, Para: 22-23). Despite being an energy major, the government set maximum prices for petroleum and electricity. Prices for petroleum were set above world market price levels, while electricity was subsidized. Local petroleum prices had been increased for "fiscal reasons" and "to encourage more rational use of petroleum products." Electricity tariffs were differentiated for "social reasons" and "to encourage the development of infant industries" (Mathur & Mann, 2014:78). However, Oman confirmed that it would eliminate the prohibition on importation of petroleum products upon accession (WT/ACC/OMN/26, Para: 52 & 57).

4. Conclusions

Price is one of the key elements in economics and commercial activities, and pricing and price control policies are among the topics of interest in developed and developing countries. In other words, pricing is one of the most important tools of development for any country.

The government's intervention in pricing as a policy to support the domestic market, gain greater share in international trade, and support its producers and consumers had both positive and negative effects. Some economists believe that this intervention is an appropriate policy in most developing countries where domestic manufacturers are unable to compete with foreign ones and cannot gain profit in world markets. In addition, the domestic economy of such countries generally suffers from inflationary conditions, and ordinary

people do not have the purchasing power. Therefore, the government needs to support the low-income groups through its intervention in pricing. Some others argue that government intervention in the pricing of goods and services disturbs the market and leads to unfair competition.

One of the most contested aspects of pricing in recent years has been the issue of dual pricing by governments. To present it more clearly, governments create more favorable situations for their manufacturers and consumers by providing prices lower than the world price for them. What has caused conflicts in international trade is the dual pricing for important commodities such as energy because all countries depend on energy for their national and international development. This has caused complete dependency of global and domestic productions on energy in a such way that countries will cease to operate without access to energy.

Developed countries, which are also importers of energy, regularly object to the dual pricing policies of developing countries. For countries like the USA and the European Union, setting lower prices for energy and raw materials are considered a kind of subsidy, which disturbs market equilibrium. This is why these governments decided to pursue their protests through the most important international trade organization, namely, the WTO.

As a matter of fact, most countries, including energy importers and exporters, are members of the WTO, through which about 95% of the international trade is carried out. However, the WTO has not specifically addressed energy trade and related issues such as dual pricing, which may be owing to the absence or unwillingness of energy-rich countries at the time of the establishment of the WTO and GATT. Therefore, in the event of a dispute over energy trade, we will have to refer to the general rules and current agreements of the WTO. The rules of this organization regarding the mechanism of maximum price control or state-owned companies are inadequate to counter the dual pricing policy. Other agreements of this organization, such as Paragraph 9 of Article 3 of the Agreement on Subsidies and Countervailing Measures, do not merely include obligations to limit governments in setting dual pricing. Therefore, the current rules of the WTO do not oppose dual pricing.

Claiming that determining prices lower than the world price for energy has an impact such as subsidies for energy, energy importing countries rely on the WTO Agreement on Subsidies and Countervailing Measures in order to countervail their own damages. The important point is that considering a price below the actual price of energy and granting subsidies to manufacturers is not consistent with the concept of subsidy mentioned in the agreement. In other words, in order to cope with government subsidies, these subsidies must be specific and be among the prohibited or at least actionable subsidies. However, a study of the accession negotiations of the energy-rich countries shows that the subsidies granted by these governments are distributed equally across all manufacturing units. For example, Russia or Saudi Arabia subsidize all manufacturers, regardless of their activity type and nationality. However, they had to abandon their pricing policy in order to accede to the WTO. These measures appear to be rooted in political issues rather than commercial considerations because, despite the WTO disagreement with dual pricing, its members relied on extra-organizational obligations to make the energy-rich countries gradually or suddenly eliminate dual energy pricing.

Iran, as one of the largest energy-rich countries, has been acceding to the WTO for more than 20 years, and is now one of its observer members. Iran is also one of the largest subsidy providers. By intervening energy pricing, this country supports its manufacturers and indirectly enhances their competitive power in global markets. Therefore, one of the most important commitments of Iran for the accession to the WTO is to reform its energy pricing policy and eliminate the considerable subsidies it pays for its petrochemical products (Jensen & Tarr, 2002:3-8).

An investigation into the patterns of energy-rich countries in the WTO demonstrates that if Iran joins this organization, it will have to reform its laws and regulations. It is important to note, however, that Iran has adopted laws such as the five-year development plans and the TSL to reduce its intervention in price setting and subsidy granting, and these actions show the efforts of Iran to align its trade laws with the WTO standards (Kojima, 2009: 43-44). Nonetheless, the price of energy carriers in Iran is still far from the actual price of energy in the world.

Despite the legal vacuum and the silence of the WTO agreements on dual pricing, governments are required to turn the prices of energy carriers into actual prices and to avoid granting subsidies to this sector because although subsidies enhance the competitive power of manufacturers and their share in world markets in the short run, this artificial price reduction will have numerous adverse effects on the trade and economy of governments.

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Analysis of Gas Sales Receivables in the National Iranian Gas Company: An Emphasis on the Optimization of Receivables Liquidation Methods

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ABSTRACT

Designing incentive mechanisms for increasing the speed of liquidity of receivables is one of the leading options for streamlining domestic resources in the field of oil and gas financing. The main objective of this research is to investigate and optimize the liquidity methods for gas sales receivables in line with the requirements of the National Iranian Gas Company (NIGC). After a deep review of literature, we extract methods and legal platforms for receivables liquidation methods. The current research is an applied and descriptive-analytical research respectively in terms of its purpose and methodology. The data analysis is a combination of quantitative and qualitative methods and the data required for this study, including the amounts and duration of deferred receivables by different categories of the subscribers of NIGC during 2012 to 2018. Subsequently, in order to visualize the data in the form of heat tables, Microsoft's Business Intelligence software is utilized to understand the process of the creation and settlement of receivables, to cluster receivables by the different categories of subscription, and, finally, to reveal the subscriber behavior patterns in disbursements. Finally, using theoretical foundations and experts' opinions, a set of optimal methods has been recommended to accelerate the process of collecting current receivables, depending on the behavior of different groups of subscribers. Based on the results of the interviews, NIGC should apply information technology (IT)-based methods, incentive policies, and deterrent (punitive) strategies to accelerate the liquidation of receivables in household and commercial subscription. The empirical findings of the research on the behavior of industrial and power plant subscribers are different, and the main methods used in this section are receivable-based financing arrangements such as debt discounting, factoring, as well as offset contracting. We provide some policy implications in this context.

1. Introduction

After income generation, collection of receivables is one of the most important functions of a business unit. Providing methods for managing the liquidity of accounts receivable is an essential tool for reducing the liquidity risk in each company. The risk of collecting receivables cannot be completely eliminated, nor can it be reduced to a large extent; however, it can be decreased to a reasonable extent without jeopardizing the commercial success and long-term business economic objectives(Ljubic & Mance, 2019). The management of accounts receivable includes all the actions, procedures, and policies that provide the tools to balance the attraction of customers through interesting credit policies and minimize the risk of delayed disbarments by untrustworthy buyers (Michalski, 2012). Optimizing the receivables liquidity methods while

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mitigating corporate credit risk, helps corporate executives make money by investing in appropriate growth opportunities and value-adding projects, and it is also a fundamental method of financing (asset-backed financing).

Financing is the most important problem which NIGC faces. Considering the significant contribution of NIGC from the sale of natural gas to the economy of the country, it is necessary to determine the mechanisms for facilitating and accelerating the financing of projects in this area. The intensification of economic sanctions in recent years has doubled the importance of using internal and domestic financial resources. In this context, a set of financing methods for the collection of receivables is one of the options for the management of NIGC to stream the domestic resources in the field of financing. The collection of receivables can provide a significant amount of funds for NIGC. This issue in the field of the current receivables may be solved through the design of incentive mechanisms to increase the speed of liquidity and, consequently, raise the cash flow. In the area of dishonored (long-term) receivables, this threat should be turned into an opportunity to use asset-backed financing methods; both of these categories require analyzing the position of receivables. Therefore, the analysis of the status of receivables, the examination and localization of the appropriate methods for the requirements of NIGC in order to liquidate the claims, and studying the feasibility of implementation according to their legal nature will be the main objectives of this study. Considering the importance of the role of NIGC and corresponding subsidiaries in the development and prosperity of Iranian gas reserves, the present study can provide useful and effective methods for the liquidity of receivables; identify liquidity deviations, sediments, and gaps; and address one of the most important challenges NIGC faces, namely the lack of financial resources for capital expenditures and day-to-day operations.

Nowadays, after several years of operation, the figures regarding NIGC receivables from subscribers indicate that, over the past few years, part of the company's claims (due to the lack of timely payment by subscribers) have interrupted and caused many operating and capital allocation problems in the field. There are several methods available for finance, each of which is used in a specific circumstance. Therefore, it is necessary to identify the methods used to manage the collection of receivables for liquidity and financing. Then, among the considered solutions, those which are appropriate for the business environment and the requirements of NIGC are supposed to be used. The main objectives of this research are as follows:

• Analyzing the status of natural gas sales receivables in NIGC;
• Investigating the subscribers' gas consumption and payment patterns;
• Determining incentive (punitive) mechanisms and financing strategies for the collection of receivables in accordance with the requirements of NIGC.

Achieving these objectives involves calculating the lost profits resulting from the increase in volume and the period of the uncollected claims as a result of applying the current receipt methods, which study the legal obstacles and bottlenecks to increasing the speed of cash collection through the receivables. Liquidation of receivables from household, industrial, commercial, and power plant subscribers is a prerequisite for the implementation of gas projects in cities and villages and even for the payment of the current monthly operation by provincial gas companies, and it has been emphasized many times at the annual meeting of NIGC by the managers. It also accounts for the most important indicator of the increase or decrease in the approved budget headings in the current, developmental, educational, and research levels of provincial gas companies. As the receivables of the distribution gas companies are increasing in terms of the period of collection and cumulative amounts, it will become a crisis for NIGC in the not too distant future. Failure to follow up and collect delayed receivables could cause NIGC operation and its affiliated companies to encounter financial distress, thereby disrupting gas supplied by the distribution gas companies. This paper is organized as follows. The second and third parts are devoted to the review of literature and methodology respectively. The fourth section of the paper discusses the empirical findings on receivables analysis. Finally, conclusions and policy implications are presented in the fifth section.

2. Literature Review and Theoretical Foundations

The lack of liquidity (collection) of claims arising from the provision of goods and services is not limited to NIGC, and other companies active in providing utility services (such as electricity, water, and telephone) also suffer from such a problem. In this regard, to accelerate the liquidity of deferred claims, the Telecommunication Company of Iran put an incentive-punitive program on the agenda in 2017. In this program, subscribers which paid their most recent bills by the end of December 2017 could receive gifts from one week to one month free of charge within the network. One of the punitive policies of this plan is the denial of subscribers' rights and the legal prosecution of receivables. Among other main deterrent methods used by Telecommunication Company, we can refer to the sending of formal notifications via short message service (SMS). In this way, the company informs customers by sending an email in a friendly tune so that they pay their debts. One of the other ways Telecommunication company is currently applying to the process of collecting subscribers' down payments is the outsourcing of the process of collecting

current receivables through bidding. Moreover, given that the company does not have enough power to impose a punishment for the disbursement of some governmental agencies, it uses "offsetting" methods in these cases.

One of the ways to track and collect claims in regional electricity companies is the introduction of online payment systems and mobile power apps. By installing and activating the app, the distribution company may not send a bill for the subscribers. Using this method, many savings have been made in printing and distributing bills. Further, by automatically sending the bill to the subscribers' mobile or system, immediately after issuing a bill, they can pay it through the system. Using this method, problems such as the loss of bills will be solved. In addition to innovation in payment methods, according to the Electricity Sales Act approved by the Ministry of Energy, the subscribers are required to pay their bills by the deadline specified in the electricity bill, and, in the case of dishonoring the bill, if the amount of the deferred debt exceeds a certain amount, the subscribers will be subject to a warning and eventually a power outage (as a punitive policy).

Regarding the legal platforms and barriers to the use of incentive-punitive methods for the liquidation of receivables, it should be noted that the majority of the current laws and regulations and upstream documents such as the fifth development plan (Chapter 15, Article 121, Paragraph C), the Subsidies Act, consumer protection law, etc. have contributed to subscribers' encouragement or punishment for energy saving in the public services, i.e. water, electricity, telephony, and gas. Considering that the use of incentive-punitive methods relates to the relationship between the debtor and the creditor, using civil law articles, such as Article 277 of the Civil Code, it is possible to interpret that the use of incentive and punitive methods is allowed under this circumstance if a due date or deadline has been predetermined for the receivables. Nevertheless, the Ministry of Energy and the Ministry of Communications have developed regulations, procedures, and instructions which focus on defining and enforcing the rules governing corporate relationships with split applicants and electricity subscribers. The laws and regulations of electricity sales (approved by the Ministry of Energy), Supplementary Electricity Tariffs (approved by the Ministry of Energy), and the like developed by the Ministry of Energy, Investment and Regulatory Office of Energy, Water, and Electricity Market are among the legal grounds for encouraging and deterrent policies which can be used to liquidate receivables; meanwhile, applying these regulations has been approved by the Energy Commission of the Parliament. Since these regulations are not in contrast to the provisions of customary laws and regulations, they are enforceable and legally valid. As mentioned above, it can be concluded that using incentive and punitive methods for the liquidation of receivables from the sales of public services such as gas, electricity, water, and telephony is not legally prohibited.

2.1. Receivables-based Financing Methods

Investment strategy, which is evaluating and investing in projects or assets in order to maximize returns and firm value, is one of the important issues of strategic financial managers. In this way, companies can use internal or external sources of finance; therefore, financing is the art and science of the provision and management of cash, with the aim of investing, profitability, reducing risk, and meeting the economic and social needs (Jahankhani & Kanani, 2005). Corporate financing provides innovative financing solutions through the re-engineering of custom tools and securities tailored to customers' needs. In this type of financing, the company's financial liabilities are reflected in the balance sheet, and the assets of the company will be the source of repayment. This type of financing is mainly based on both debt financing and asset-backed financing (Ross et al., 2002). Factoring is one of the dominant methods for asset financing and is an important source of external financing for small- and medium-sized business enterprises (Bakhtiari and Darzi, 2014). The International Factors Chain (2014) defines factoring contract as a continuous contract between the factor and the seller of goods and credit services, whereby the factor must purchase accounts receivable for cash payments and more accurately record sales, track administrative affairs regarding accounts receivable, and eventually collect receivables. Unlike other types of financing and lending based on assets, in the factoring, only accounts receivable are used to finance, and funds are provided through the sale, that is, the ownership of accounts receivable is transferred. However, in collateral financing, the collateral is not limited to accounts receivable, but the inventory of completed goods and fixed assets of the firm can also be used as collateral for financing (Ernest & Young, 2009). Firms that use factoring services in fact outsource the tasks associated with crediting and collecting their claims, and this can help facilitate faster growth. In developed financial markets, major factoring transactions are conducted on the basis of non-reference to the seller (without guarantee) although the accounts they are pledged to be prudent are eligible for referrals. In emerging markets, where the information and credit status of firms is not transparent, major factoring deals are made with seller's guarantee (Ernest & Young, 2009). In factoring, unlike other methods, the asset is traded, that is, its ownership is transferred, and this is especially important in relation to the economies that have no clear business rules (Klapper, 2005).

In addition to factoring, debt-discounting is one of the tools used in the Islamic banking system to finance the needs of manufacturing, commercial, and service units. Debt-discounting is a contract by which a third party buys an account receivable for less than a nominal (par) value in cash from the

seller. In Iran, in order to use the maximum capacity of Islamic banking and on the basis of the duties set forth in Article 98 of the law of the fifth development plan, the contract for the mortgage of debt (common in the banking system) was added to the third chapter of the Islamic banking law without any fluctuations, and the Council of Money and Credit approved and then communicated its executive version No. 1128 on August 25, 2010. Banks can mortgage (discount) debts under the issue of long-term bonds and documents for the purpose of creating facilities for all sectors of the economy. In addition to bank-based debt discounting, there is another type of market-based discounting instrument in Iran called "Debt Discounting Sukuk." In accordance with the guideline on the issuance of Debt Discounting, these securities are denominated and bearer bonds for the purchase of long-term receivables by legal institutional . These securities are tradable on stock exchanges or in over-the-counter markets.

Main & Smith (1992) investigated the optimal methods for receivables liquidation. They believe that structured financing based on receivables and factoring are the most important methods for the liquidation of receivables in American companies. Using cross-sectional data, they have shown that the size, range, and level of focus and the credit status of debtors are the most important factors which should be considered in structured financing or factoring. Samer & Wilson (2000) investigated the relationship between credit management and decision making in factoring using a group of 655 British firms. Their results indicated that the use of factoring and receivable-backed financing depends on the structure of the company's products, market characteristics and conditions, and the priorities and preferences of the factor. They also showed that, in recent decades, the use of receivable-backed financing has been growing among British firms. The results of this study were confirmed by Punk and Chen (2001). Klapper (2005) concluded that, in the area of receivable-based financing, factoring is a dominant source of asset-backed financing and an important source of organizational financing. In fact, organizations which use factoring services, outsource the responsibilities associated with crediting and collecting their claims, and this can facilitate processes as well as a faster growth. In this context, Ernest & Young (2009) also focused on legal considerations in the use of factoring and showed that, in the developed financial markets, major factoring transactions come without guarantee.

In Iran, Soroush et al. (2003) studied the collection of electricity receivables from the viewpoint of management organization in forms of the current method of meter readings of subscribers, how the bank functions in collecting charges, the size of the province, the distribution of the population, and the problems associated with governmental and military organs and heavy industrial complexes. Their results indicate that the method of meter readings of subscribers, the size of the provinces, and the distribution of the population are among the factors which increase the time required for collecting receivables, while the bank's performance does not cause many problems. Nafchi (2010) has conducted a study to investigate the reasons for dishonoring the account receivables of electricity distribution subscribers in Isfahan electricity company and indicated that individual, environmental, and organizational factors have a significant effect on the time required for collecting the receivables of the electricity distribution company in Isfahan province. Shamsdalini et al. (2012) investigated the relationship between the reduction of the billing period (as the independent variable) and the time needed for collecting receivables (as the dependent variable) in Qom province gas company as one of the subsidiaries of NIGC. After collecting the required data, household and commercial customers were selected as the test groups and the industrial customers who did not change the course was chosen as the control groups. In their research, data analysis was carried out in the stages before and after the change of the billing period. Their results indicated the inefficiency of the policy of reducing the billing period and the absence of a relationship between the reduction of the subscribers' billing period and a decline in the time required to collect receivables. Nabavi et al. (2014) aimed to describe the relationship between the collections of claims and the behavior of the researched subscribers in the Ilam Gas Company. They indicated that there is a positive and significant relationship among the economic and social situation of the people, the company's actions regarding the collection of receivables, and the satisfaction of the people about the work of the departments with the timely collection of receivables . Dianty & Barzegar (2015) conducted a research on managing the risk of accounts receivable. They believed that any risk management model cannot be replaced with an appropriate economic and legal system for collecting receivables, and the implementation of reforms in the law of the economic systems is a prerequisite for solving the problems of receivables collection. In the current work, a native model is developed to predict the credibility of the claims of some selected Iranian companies, which can reduce the risk of collecting their receivables and knowingly take a calculated risk in certain specific circumstances.

3. Methodology and Design

According to the order of NIGC and providing the necessary support in this regard, the present research is applied in terms of the purpose, and its results should be used to accelerate the liquidity of gas sales receivables. In terms of the nature and methodology, this research can also be categorized as a descriptive-analytical study, which has been surveyed in the light of using expert opinions in the formulation of questions and suggestions. The strategy of this research is a case study,

and the method of data analysis is a mixture of quantitative and qualitative techniques, so the quantitative methods are used in the section of receivables analysis. The multi methods are also applicable to the identification of the subscriber's behavior pattern and to the proposed methods of receivables liquidation and asset-backed financing. In terms of reasoning, the current work can also be regarded as an inductive research. The statistical population includes all the gas distribution companies as the subsidiaries of NIGC, and the sample is selected using an enumeration method. All the information and financial reports related to the time and amounts of gas sales receivables are extracted from the financial statements of the provincial gas companies from 2012 to 2018. The reason for choosing this period is that the major receivables have been deferred during this time. Secondary information relating to literature is collected using archival methods and resources such as books, journals, dissertations, online databases, etc. The primary data required for this study, including the time required to collect receivables and the amounts of deferred receivables from different categories of users (subscribers) for each of the provincial gas companies during the research period consist of more than two billion records and are extracted from the subscribers and financial systems of NIGC. We need such information to discover the payment patterns of different subscribers and to calculate profit loss arising from the deferring payments.

After collecting data and information on the time and amounts of gas sales receivables in NIGC, the data model is formed in Microsoft Excel software. Subsequently, in order to visualize the data in the form of heat tables, Microsoft Business Intelligence software is utilized to understand the process of creating and settlement of receivables. Moreover, we conducted a semi-structured interview with NIGC managers and industry experts. The reason for choosing this type of structure for interview is the wide range of proposed receivables liquidation methods and differences in respondents' views and approaches. Using theoretical foundations and experts' opinions, a set of optimal methods has been proposed to accelerate the process of collecting current receivables and the use of receivable-backed financing methods, depending on the behavior of different groups of users in relation to sales receivables to provide a basis for designing financing methods based on the collection of receivables in line with the requirements of the business environment of NIGC.

Table 1- General position of NIGC receivables across groups of subscribers by the end of 2018.

Subscribers	Accumulated receivables (Million Iranian Rials)	Percentage
Commercial Sectors	10,811,758	18.6
Households	15,750,629	27.0
Large Industrial Sectors	20,873,406	38.8
Small- and Medium-sized Industrial Sectors	5,644,653	9.7
Power Plants	5,158,772	8.9
Grand Total	58,239,218	100

4. Empirical Findings

According to the classification of the subscribers of NIGC, the nature of the subscription (privilege), and the type of consumption (as the basis of grouping), four groups of subscribers, including commercial, household, industrial, and power plants sectors can be distinguished. The field of education, the public sector (public trade), private business, municipalities, sports facilities, etc. can be classified as the commercial subscribers. Households and religious sites can be considered as one of the most important household subscribers. Among the most important subscribers of the industrial group are refineries, petrochemicals, cement factories, aluminum and copper manufacturers, steel manufacturers, ceramic tiles manufacturers, etc., which are divided into large industrial sectors and small- and medium-sized industrial sectors for ease of analysis. Regarding the power plants, we mainly deal with two groups of subscribers, namely public and private, which use gas to generate electricity. Since receivables (claims) are considered as permanent (balance sheet) accounts, the balance of this account at any given date represents the total accumulated receivables since the creation of this account. Table 1 presents the general status of NIGC receivables based on the groups of natural gas subscribers on March 30, 2018 (the latest system

Table 2 -Heat table of general position of NIGC receivables across various clusters by the end of 2018.

Cluster	Commercial Sectors	House-holds	Large Indus-trial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Four	1.17%	1.88%	0.69%	0.35%	0.16%	4.25%
One	7.19%	7.32%	27.27%	3.87%	3.65%	49.31%
Three	3.90%	5.81%	2.07%	1.55%	1.27%	14.60%
Two	6.30%	12.03%	5.82%	3.92%	3.77%	31.84%
Grand Total	18.56%	27.04%	35.84%	9.69%	8.86%	100.00%

log file).

As can be seen in Table 1, the total receivables for the gas sold on March 30, 2018 was 58,239,218 million Iranian Rials, the bulk of which, 35.8% of the total, is related to industrial customers in major industries, namely petrochemicals, steel manufacturers, refineries, cement factories, aluminum and copper manufacturers. Following the industrial subscribers, households (27%), commercial sectors (18.6%), small and medium enterprises (9.7%), and power plants (8.9%) are devoted to NIGC accounts receivable respectively. Most of the receivables from the industrial subscribers is allocated to petrochemicals, steel manufacturers, and then refineries. The above pattern in how to calculate the share of each subscriber group from the deferred receivables does not apply to the receivables of all provincial gas companies. For example, in Tehran Gas Company, due to the high density of population and a small plant space, the shares of household, commercial, and industrial subscribers are almost equal, while power plant subscribers are left with lower receivables (calculated by the authors). These differences should also be considered in planning for the liquidation of deferred receivables; therefore, in order to provide a more realistic picture, the amount of receivables should be provided separately by each provincial gas company.

Given the multiplicity of gas companies, it is difficult to analyze receivables individually, so to overcome this problem, clustering of provincial gas companies is beneficial. In this work, provincial gas companies were firstly classified in four groups according to the average gas sales (in Iranian Rials) from 2012 to 2018. Clustering of provincial gas companies is very helpful in analyzing the receivables based on the average gas sales. Generally, the first, second, third, and fourth clusters, which are different in the number of companies, have contributed the highest total gas sales during the study respectively. Table 2 tabulates the general status of NIGC receivables at the end of 2018, classified into the above clusters. In preparing this table and tables related to clustering, a template for the preparation of heat tables has been used to indicate the focus points and help manage the collection based on management by exception. As it is seen in Table 2, the main aggregation of receivables lies in the first cluster and in the group of major industrial subscribers. Household, commercial, small- and medium-sized industrial subscribers, and then the power plants constitute the following ranks. There is a reasonable link between the sales volume of natural gas and the deferred receivables, and the overall ranking of clusters is the same based on sales and receivables. In the second cluster, which accounts for 31.84% of receivables, the major part of the accumulation lies in the households, commercial sectors, major industries, small and medium enterprises, and finally power plants respectively. This fact is also true for the third and fourth clusters. Subsequently, receivables in each of the clusters are presented separately for the provincial gas companies and subscribers.

Table 3 lists the balance of receivables of provincial gas companies in terms of consumption groups (subscribers) in the first cluster. In the first cluster, the aggregation point is located in the major industrial subscribers of Bushehr province, the majority of which are refineries and petrochemicals, followed by power plants, commercial sectors, households, and small and medium enterprises. After Bushehr provincial gas company, gas distribution companies in Tehran and Isfahan provinces have the highest focus points with 27.51% and 22.03% of receivables in the first cluster (not the total NIGC receivables) respectively. In Tehran province, the pattern of receivables is very different from that of the other provinces of this cluster, and the commercial and household subscribers account for a significant part of Tehran Gas Company receivables.

Table 4 represents the balances of receivables in provincial gas companies by consumer groups (subscribers) in the second cluster. In general, the major points in the accumulation of receivables in 2018 for the provincial gas companies located in the second cluster are households, commercial sectors, and then major industries. Nonetheless, the major part of receivables in the second cluster in 2018 is allocated to the large industrial subscribers of Markazi province and then to the household sector of the East Azarbaijan, Mazandaran, Khorasan Razavi, and Guilan provinces. Subsequently, Fars (major industrial subscribers), Mazandaran (household subscribers), Guilan (household subscribers), Khorasan Razavi (household subscribers), and Alborz (household subscribers) have the highest rates of deferred receivables during 2018 respectively.

Table 5 describes the general status of receivables in 2018

Table 3 -Heat table of general position of NIGC receivables across various clusters by the end of 2018.

Cluster	Commercial Sectors	House-holds	Large Indus-trial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Four	0.04%	0.03%	28.86%	0.01%	0.84%	29.78%
One	2.11%	3.30%	11.57%	3.04%	2.01%	22.03%
Three	0.59%	1.50%	14.19%	2.47%	1.93%	20.68%
Two	11.84%	10.03%	0.67%	2.34%	2.64%	27.51%
Grand Total	14.58%	14.85%	55.30%	7.85%	7.41%	100.00%

by the group of subscribers and the provincial gas companies classified in the third cluster. According to Table 5, in the third cluster, the main accumulation of receivables happens in the household sector. The provincial gas companies of Hamedan (household subscribers), Kermanshah (household subscribers), Zanjan (household subscribers), and North Khorasan (major industries) have contributed to the receivables. As it is seen, in the third cluster, similar to the second cluster, most of the accumulation points are in the household and then commercial segments. Major industries, small and medium enterprises, and power plants are ranked next in terms of accumulation rates.

Finally, we can summarize the general status of receivables in the fourth cluster of provincial gas companies in Table 6. Generally, the distribution of gas sales receivables in 2018 among the subscribers of the fourth cluster is the same as that of the second and third clusters. In fact, the main accumulation of the receivables also lies in the household, commercial, large industries, small- and medium-sized industries, and then power plants segments respectively. According to Table 6, the majority of the accumulation points in the fourth cluster lie in the household and then commercial segments in Lorestan province. Kohgiluyeh and Boyer Ahmad provincial gas company, with a share of 21.24% of the receivables, is the second largest contributor after Lorestan province.

By comparing the general status of the receivables across the clusters, it can be seen that the pattern of establishment, settlement, and accumulation of gas sales receivables is the same for provincial gas companies categorized in the second to fourth clusters and follows the same trend in 2018, while this pattern is completely different for the provincial gas companies listed in the first cluster.

In addition to separating the group of subscribers and provincial gas companies, the decomposition of NIGC receivables over the years can also provide more useful

Table 4 -Heat table of general position of NIGC receivables across the second cluster by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Alborz	1.64%	3.99%	0.31%	0.49%	1.29%	7.72%
East Azerbaijan,	2.64%	2.96%	0.17%	0.40%	0.63%	6.79%
West Azerbaijan,	4.31%	6.95%	0.68%	1.26%	0.98%	14.19%
Fars	1.60%	2.50%	4.01%	0.96%	1.21%	10.28%
Guilan	2.16%	4.34%	0.69%	0.92%	1.55%	9.67%
Hormozgan	0.07%	0.02%	2.76%	0.43%	2.32%	5.60%
Kerman	1.27%	2.38%	0.32%	0.78%	0.89%	5.64%
Khorasan, Razavi	2.21%	4.39%	0.68%	0.94%	0.70%	8.93%
Markazi	1.77%	2.47%	8.08%	1.87%	0.90%	15.10%
Mazandaran	1.45%	6.17%	0.33%	1.38%	0.46%	9.79%
Yazd	0.64%	1.61%	0.23%	2.89%	0.91%	6.28%
Grand Total	19.80%	37.77%	18.27%	12.32%	11.84%	100.00%

Table 5 -Heat table of general position of NIGC receivables across the third cluster by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Alborz	3.26%	4.26%	0.10%	0.68%	0.78%	9.08%
East Azerbaijan,	1.79%	1.52%	0.03%	0.56%	1.10%	5.01%
West Azerbaijan,	1.71%	3.58%	0.31%	1.60%	0.32%	7.52%
Fars	5.38%	9.24%	2.36%	1.68%	0.89%	19.55%
Guilan	3.91%	8.98%	4.44%	0.94%	0.82%	19.08%
Hormozgan	1.75%	1.78%	4.59%	0.50%	0.53%	9.15%
Kerman	2.72%	3.23%	0.77%	0.19%	0.44%	7.36%
Khorasan, Razavi	1.85%	2.14%	0.07%	1.97%	3.33%	9.35%
Markazi	1.38%	1.53%	0.31%	0.61%	0.26%	4.09%
Mazandaran	2.96%	3.55%	1.18%	1.87%	0.26%	9.81%
Yazd	26.71%	39.81%	14.16%	10.60%	8.73%	100.00%
Grand Total	19.80%	37.77%	18.27%	12.32%	11.84%	100.00%

information on the trend analysis of each of the payment patterns of subscribers. According to Table 7, during the research years, the receivables from commercial subscribers grew up from 2.54% before 2016 to 8.69% in 2018. The above view is also true for household customers, which shows similarity between the two models; however, a significant leap (about 700%) is seen in the receivables from household subscribers in 2018. The delinquent receivables of large industrial subscribers in 2016 were lower than those of household and commercial subscribers, but the trend has risen sharply from 0.66% to about 30% in 2017 and 2018. The comparison of the receivables of the industrial customers (both large industries and small and medium enterprises) shows that the rising trend has been maintained in 2018. In the power plant sector, the status of receivables is slightly different; in fact, its formation began in 2016, and, after a significant decline in 2017, it experienced a slight increase in 2018.

Differences in the upward trend in receivables across different groups of subscribers can be attributed to factors such as the difference in the pricing mechanisms of gas sold to each group, the price fluctuations in different years, the difference in the manner and timing of billing and recording, and other factors. In order to compare and analyze the behavioral pattern of subscribers in disbursements and receivables accumulation during the research years, it is necessary to redesign and take the previous steps (taken in 2018) in 2017.

Table 8 presents the overall status of NIGC receivables across subscriber groups by the end of 2017. As can be noted, total NIGC receivables on March 30, 2017 amounted to 83,302,248 million Iranian Rials, the bulk of which (about 41% of the total amount) is related to subscribers in major industries (refineries, petrochemicals, cement, steel, and aluminum and copper). Subsequently, household subscribers (29.7%), commercial subscribers (15.2%), small and medium enterprises (9.7%), and power plants (4.4%) are ranked respectively in terms of receivables volume by the end of 2017. The major part of the receivables is assigned to petrochemical industrial customers, followed by steel manufacturer and refineries respectively.

order to provide a more realistic picture of the overall status of the receivables with respect to the subscriber and each provincial gas company, we summarize the results in the four clusters. The model proposed for clustering provincial gas companies in the year 2018 is also applied to this section. Table 9 presents the status of NIGC receivables by the end of 2017, classified according to the above clusters. The most of the accumulation of NIGC receivables in 2017, as in 2018, lies in the first cluster and in the group of large industries, households, commercial sectors, small and medium industries, and then power plants. According to Table 9, there is a reasonable relationship between the amount of gas sold and the deferred receivables, and the ranks of clusters based on sales and receivables are the same. In the second cluster, which accounts for 31% of claims, receivables are mainly due from households, large industries, commercial sectors, small and

Table 6 -Heat table of general position of NIGC receivables across the fourth cluster by the end of 2018.

Cluster	Commercial Sectors	House-holds	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Chahar Mahaal and Bakhtiari	3.69%	6.10%	1.91%	0.46%	0.00%	12.16%
Ilam	1.63%	3.16%	2.86%	0.33%	0.00%	7.99%
Khorasan, South	1.73%	1.32%	0.69%	1.31%	1.59%	6.65%
Kohgiluyeh and Boyer-Ahmad	9.50%	9.76%	0.80%	1.19%	0.00%	21.24%
Lorestan	10.93%	23.79%	9.92%	4.98%	0.20%	49.83%
Sistan and Baluchestan	0.03%	0.15%	0.00%	0.00%	1.94%	2.13%
Grand Total	27.52%	44.30%	16.19%	8.27%	3.73%	100.00%

Table 7 -Time trend of NIGC receivables at the end of 2018 for each subscriber group.

Category	Before 2016	2016	2017	2018	Grand Total
Commercial Sectors	2.54%	2.82%	4.51%	8.69%	18.56%
Households	0.73%	1.26%	3.79%	21.26%	27.04%
Power Plants	0.00%	6.60%	1.01%	1.25%	8.86%
Large Industrial Sectors	0.66%	1.66%	4.12%	29.40%	35.84%
Small and Medium In-dustrial Sectors	0.18%	0.45%	1.11%	7.95%	9.69%
Grand Total	4.11%	12.80%	14.54%	68.56%	100.00%

medium industries, and finally power plants. This pattern is also true in the third cluster, but in the fourth cluster, after household subscribers, the main focus point is in the group of commercial subscribers and then large industries.

As we can see in Table 10, in the first cluster, the focus point of receivables is located in the large industrial subscribers of Bushehr province, mainly in refineries and petrochemicals, followed by power plants, households, commercial sectors, and small- and medium-sized industries respectively. After Bushehr provincial gas company, gas distribution companies in Isfahan, Tehran, and Khuzestan provinces are left with the highest receivables (respectively 26.19, 24.24, and 18.46% of receivables). The pattern of the formation of receivables of Tehran province is greatly different than that of the other provinces of this cluster, and household and commercial subscribers constitute a significant part of the receivables; small and medium enterprises and power plants are ranked next.

consumption groups (subscribers) in the second cluster. On the whole, the major accumulation points of the receivables in the second cluster in 2017 lie in the household segment, major industries, and then commercial subscribers. In this cluster, power plants also constitute the least amount of the receivables in 2017. The major part of gas sales receivables in the second cluster in 2017 is allocated to the household subscribers of the East Azarbaijan province gas company, the major industries in Fars province, the household segments of Alborz and Mazandaran gas companies, and the major industrial subscribers of Markazi province.

According to Table 12, in the third cluster, most of the accumulation of the receivables lie in the household subscribers, major industries, commercial subscribers, small and medium industries, and power plants respectively. In this cluster, 24.41% of the receivables from the third cluster in 2017, most of which are receivables from major industrial subscribers, belongs to Qom province gas company. The provincial gas companies of Kermanshah and Hamedan with 16.64% and 16.18% of the receivables in 2017 are ranked next. In this cluster, with the exception of the provincial gas companies of North Khorasan, Qom, and Qazvin, the receivables of the provincial gas companies are concentrated in the household sector in 2017. In this regard, the provincial gas companies of Hamedan (household subscribers) and Kermanshah (household subscribers) do not perform well in the collecting of receivables from household subscribers.

Table 13 tabulates NIGC receivables in 2017 for the group of subscribers in the fourth cluster. In general, the distribution of the receivables among the subscribers of the fourth cluster in 2017 reveals that the main aggregation of the receivables in 2017 lies in households, commercial sectors, large industries, small and medium enterprises, and power plants respectively. According to Table 13, the majority of the accumulation points in the fourth cluster are related to the household and

Table 8- General position of NIGC receivables across subscriber groups by the end of 2017.

Subscribers	Grand Total (Million Iranian Rials)	Percentage
Commercial Sectors	12,678,525	15.2
Households	24,716,187	29.7
Large Industrial Sectors	34,101,639	40.9
Small and Medium Industrial Sectors	8,115,093	9.7
Power Plants	3,690,804	4.4
Grand Total	83,302,248	100

Table 9 -Heat table of general position of NIGC receivables across the clusters by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Four	0.91%	1.88%	0.49%	0.29%	0.09%	3.66%
One	5.61%	8.29%	30.03%	3.59%	1.44%	48.95%
Three	3.32%	6.54%	3.78%	1.91%	0.83%	16.39%
Two	5.38%	12.96%	6.64%	3.95%	2.07%	31.00%
Grand Total	15.22%	29.67%	40.94%	9.74%	4.43%	100.00%

Table 10 -Heat table of general position of NIGC receivables across the first cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Bushehr	0.07%	0.10%	30.56%	0.01%	0.36%	31.10%
Isfahan	1.81%	3.71%	16.98%	2.84%	0.85%	26.19%
Khuzestan	0.58%	2.04%	12.87%	2.21%	0.76%	18.46%
Tehran	9.00%	11.09%	0.93%	2.26%	0.96%	24.24%
Grand Total	11.45%	16.94%	61.34%	7.33%	2.93%	100.00%

commercial subscribers of Lorestan province. The commercial and household subscribers of Kohgiluyeh and Boyer Ahmad provincial gas company receives 20.72% of the receivables in the fourth cluster, as the second most significant portion of the receivables. By comparing total NIGC receivables across the four clusters, it can be seen that the pattern of creation, settlement, and accumulation of the receivables among provincial gas companies located in the second and third clusters is the same in 2017, while it is completely different from that of the provincial gas companies located in the first and fourth clusters.

As outlined in Table 14, the receivables from commercial subscribers grew up from about 1.14% before 2015 to 8.73% in 2017. The above trend is also true for household customers, showing the similarity of the two patterns, with the only difference being that in the year 2017 the household receivables have increased around twelvefold. In the case of large industrial subscribers, delinquent receivables in 2016 and previous years are lower than those of commercial and household subscribers, but during 2016 and 2017, the trend was steadily rising to 35.8%, which is worth reflecting. In the aggregate, most of NIGC receivables are due from large industrial subscribers, and this part has grown significantly and dramatically over the years. In the case of household and commercial subscribers, the general trend of growth in receivables is also increasing. In the meantime, the share of industrial subscribers in 2017 faced a very significant increase (shock), while such a shock cannot be found among the other subscriber groups.

Table 15 compares the position of the receivables at the end of the fiscal year of 2017 and 2018 in each group of the receivables classified according to subscriber groups. Accordingly, the gas sales receivables in all the subscriber groups decline in 2018 compared to 2017, with the exception of power plant subscribers. As it is seen, the receivables

Table 11 - Heat table of general position of NIGC receivables across the second cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Alborz	1.46%	6.23%	0.36%	0.56%	0.51%	9.12%
East Azerbaijan,	1.75%	3.11%	0.21%	0.32%	0.36%	5.75%
West Azerbaijan,	3.54%	7.87%	0.89%	1.36%	0.45%	14.12%
Fars	1.36%	3.11%	7.39%	0.98%	1.11%	13.95%
Guilan	2.03%	3.88%	0.67%	0.93%	0.64%	8.15%
Hormozgan	0.05%	0.02%	3.43%	0.66%	0.80%	4.97%
Kerman	1.49%	3.00%	1.61%	1.14%	0.59%	7.82%
Khorasan, Razavi	2.40%	3.60%	0.66%	1.20%	0.77%	8.62%
Markazi	1.64%	2.99%	5.91%	1.88%	0.49%	12.90%
Mazandaran	1.15%	6.20%	0.20%	1.26%	0.48%	9.29%
Yazd	0.47%	1.78%	0.10%	2.46%	0.50%	5.31%
Grand Total	17.36%	41.80%	21.41%	12.75%	6.69%	100.00%

Table 12 - Heat table of general position of NIGC receivables across the third cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Ardabil	2.23%	4.43%	0.28%	0.54%	0.39%	7.87%
Qom	3.10%	5.66%	11.18%	3.55%	0.92%	24.41%
Golestan	1.28%	3.16%	0.30%	1.19%	0.35%	6.29%
Hamadan	3.87%	8.92%	1.71%	1.23%	0.45%	16.18%
Kermanshah	2.84%	8.48%	4.10%	0.76%	0.48%	16.64%
Khorasan, North	1.23%	1.08%	3.77%	0.43%	0.42%	6.93%
Kurdistan	1.66%	2.47%	0.66%	0.20%	0.31%	5.29%
Qazvin	1.38%	1.70%	0.06%	1.81%	1.27%	6.22%
Semnan	0.82%	1.29%	0.14%	0.70%	0.25%	3.20%
Zanjan	1.86%	2.72%	0.87%	1.27%	0.23%	6.96%
Grand Total	20.27%	39.91%	23.07%	11.68%	5.07%	100.00%

from industrial subscribers (the large industries) experience a decrease of 38.79% in 2018 compared to the previous year, and the next highest reduction in the receivables from 2017 to 2018 is assigned to household (36.27%), small- and medium-sized industries (30.44%), and commercial (14.72%) subscribers respectively.

The calculation of the lost profit caused by the dishonor of the receivables is a quantitative statement of effective and efficient decisions regarding the collection of the receivables in NIGC. In addition, given the potential use of corrective methods and compulsory tricks as a part of the program in order to accelerate the liquidity of the receivables, the calculation of lost profits of NIGC can at least help NIGC to quantitatively determine and justify the amount of penalties (for instance, the penalty should be at least equal to the lost profits), or prevent the loss of profits by applying some incentive policies and granting discounts. Therefore, it is necessary to calculate the lost profits raising from the lack of timely receivables liquidation. To this end, considering the time value of money and the amount of receivables due from the subscribers of provincial gas companies, the lost profit (money opportunity cost) is estimated in accordance with Table 16. Thus, we extracted the corresponding risk-free interest rate from Iran Central Bank website in each year and multiplied it by the reciprocal amount of the differed receivables at the end of financial years. Considering the common banking interest rates, NIGC lost profit caused by the dishonor of the receivables from households, industrial sectors, commercial sectors, and power plants is estimated to be at least 15,713,715 million Iranian Rials from 2015 to 2018. The significance of the profit value shows to what extent accelerating the collection of the receivables is important and necessary for NIGC and how the timely management and settlement of the receivables could be able to solve liquidity problems and provide financial resources required for the development of future plans of the company. This profit amount can also be considered by executives and policy makers because it quantitatively reflects the financial consequences of the dishonors of receivables for managers and policy-makers in financial terms. For example, at least the penalty for the delay in payment should be equal to the amount of the profit lost by such a delay.

In the previous sections, the status of NIGC receivables was analyzed in terms of subscriber groups and provincial gas companies, and the financial results of the increase in volume of the receivables and the delay in collecting receivables were calculated in terms of profit lost. The results indicate that use of appropriate methods to accelerate receivables liquidation have a significant effect on the liquidity needed by NIGC to develop upstream and downstream projects. Furthermore, the review of literature and theoretical concepts revealed that the use of incentive and punitive policies and methods to increase the speed of receivables collection as well as receivable-based financing methods have been allowed by the governing laws and regulations approved by the Energy Commission of the Parliament. Following the investigation of receivables management techniques, including incentive mechanisms and receivables financing mechanisms, a semi-structured interview was arranged with several managers (financial management

Table 13 - Heat table of general position of NIGC receivables across the fourth cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Chahar Mahaal and Bakhtiari	3.22%	6.01%	1.26%	0.87%	0.00%	11.34%
Ilam	1.66%	3.64%	3.50%	0.23%	0.00%	9.03%
Khorasan, South	1.66%	1.80%	0.54%	1.51%	1.40%	6.90%
Kohgiluyeh and Boyer-Ahmad	10.30%	8.90%	0.45%	1.07%	0.00%	20.72%
Lorestan	7.96%	30.87%	7.69%	4.26%	0.07%	50.86%
Sistan and Baluchestan	0.05%	0.12%	0.00%	0.00%	0.97%	1.15%
Grand Total	24.85%	51.34%	13.44%	7.93%	2.44%	100.00%

Table 14 -Time trend of NIGC receivables at the end of 2017 for each subscriber group.

Category	Before 2015	2015	2016	2017	Grand Total
Commercial Sectors	1.14%	2.12%	3.23%	8.73%	15.22%
Households	0.58%	1.25%	2.84%	25.01%	29.67%
Power Plants	0.00%	0.00%	3.25%	1.18%	4.43%
Large Industrial Sectors	0.71%	1.23%	3.21%	35.80%	40.94%
Small and Medium Industrial Sectors	0.17%	0.29%	0.76%	8.52%	9.74%
Grand Total	2.59%	4.88%	13.29%	79.23%	100.00%

department, department of management and consolidation planning, and the coordination management of gas supply affairs) of NIGC to customize the identified methods in accordance with the contingents of NIGC.

The energy sales system and tariffs are of particular complexity and are one of the most sophisticated models in Iran. Moreover, the sensitivity to subscribers is not the same in the income system of NIGC, and different classes of subscribers have different roles. Obviously, any proposed methods for the liquidation of receivables or receivable-based financing should also be different in proportion to the type of subscriber, patterns of consumption, and patterns of methods. In cases where there is a legal ban on the use of any of the proposed methods, the relevant directors at NIGC must inform energy policymakers (such as the company board of directors, the Ministry of Oil, and the Energy Commission of the Parliament) of the lost profits incurred due to the increased delay in collecting gas sales receivables in order to make necessary amendments to the laws and regulations. On the contrary, if the use of any of the proposed methods is not legally prohibited, the acceleration of the receivables collection process involves in-house policies made by the managing body, i.e. board of directors, of NIGC regarding the climatic pattern in gas pricing.

According to the results of the interviews with the managers of NIGC and with the experts in this field, the managers and planners of NIGC may use one or more of the following methods in order to accelerate the liquidation of current receivables (commercial and household subscribers) in the short and medium term:

1. IT-based methods: such as billing in the shortest possible time; examples are simultaneous billing with the meter readings to get faster access to funds and designing and using web-based systems, including the web or mobile applications for easier and faster access to bill information and ease of payment.
2. Incentive policies: such as granting a creditable reward to subscribers (household and commercial) who receive and pay their bills online through the system, which saves on billing costs in the current methods (the average cost of issuing bills and sending it for each subscriber is about 50,000 Iranian Rials), and giving incentives can be linked to the profit lost by dishonor of receivables. Providing a good discount on payments in line with the rate of liquidity sleeping is another way to accelerate the liquidation of the receivables in household and commercial sectors.
3. Punitive policies: such as financial penalties for the delay in subscribers' payment, especially commercial customers; first, the authorized payout period should be equal to the average NIGC collection period, and, second, the financial penalty is at least equal to the time value of money (lost profits).

Due to the interconnection patterns of consumption and payment methods among the industrial sector and power plant subscribers, it is possible to propose methods to accelerate the liquidation of the receivables as follows. A part of the proposed methods in this area is the incentive and punitive tools provided for the household and commercial sectors. In addition, in power plants and large industries, the exchange agreement on the sale of the product (offsetting agreements) is also applicable. This is recommended for power plant subscribers, the products and goods of which can more easily be sold through NIGC negotiations with other companies at a national or international level. Given that such an operation by NIGC is directly in violation of its article of association, a third party will be liable for the collection of receivables on behalf of NIGC. Using this method involves long-term planning and negotiation with third parties, which should be included in the future programs of NIGC managers and policy-makers.

According to the findings of the interviews, the following are the applicable methods for the collection of the receivables from power plants and industrial sectors:

1. Use of debt discounting and factoring: Fortunately, in recent years, the legal and infrastructural framework for this issue has also been provided broadly, and the banking system is required to grant the necessary facilities for the activities of NIGC as one of the pillars of the country's economic development; in this context, banks can buy receivables from NIGC. The law on the debt discounting in the banking network also stipulates that with the implementation of the terms of this agreement in the national bank network, the liquidity problems of many production, service, and commercial enterprises such as NIGC are hopefully solved. Therefore, a contract to discount debt in

Table 15 - Comparison of NIGC receivables between 2017 and 2018.

Category	Sum of Receivables in 2017 (million Iranian Rials)	Sum of Receivables in 2018 (million Iranian Rials)	Difference	Ranking
Commercial Sectors	12,678,525.37	10,811,757.99	-14.72%	4
Households	24,716,186.50	15,750,628.59	-36.27%	2
Large Industrial Sectors	34,101,639.21	20,873,406.08	-38.79%	1
Small and Medium Industrial Sectors	8,115,093.21	5,644,653.46	-30.44%	3
Power Plants	3,690,803.75	5,158,772.20	39.77%	5
Grand Total	83,302,248.04	58,239,218.33	-30.09%	

the banking sector can be considered as one of the methods for the liquidation of NIGC receivables from power plants and industrial sectors. Debt discounting may also appear in the form of factoring. The factoring is often accompanied by short-term receivables with a maturity less than one year. Factoring is an outsourced financing method by which the seller, i.e. NIGC, contracts out accounts receivable from power plants and industrial subscribers in the form of a contract to an internal or international factor; as a result, the factor manages the collection process with or without NIGC guarantee. Since the factoring institutions have a high level of expertise and accountability in collecting receivables, they will consider the credit risk of debtors. If the underlying accounts receivable, namely, power plants and industrial subscribers, are large and credible companies, it would be useful for NIGC to finance based on the disposition of the receivables of power plants and industrial subscribers.

2. Issuance of debt discounting bonds in the capital market: Another solution proposed in order to provide the working capital and liquidity required by the provincial gas companies is using the capacity of NIGC. In the previous section, provincial gas companies were explained, and it was observed that the amount of receivables is significant in four sectors of power plants, industries, households, and commercial subscribers in provincial gas companies. This amount is itself a potential capacity for a company, which has not been ignored by the Islamic finance instrument designers. Considering the theoretical foundations of determining the level of credit, receivables aging schedules, and the determination of the liquidation of receivables, a part of NIGC receivables during the studied years (especially 2018) can be used as a basis for the issuance of debt discount bonds. Regarding the significant volume of the receivables of the company, if only 10% of the company receivables is of an acceptable credit rate for issuing bonds, as an initial estimate and the first package of bonds, an amount of 7630 billion Iranian Rials will be provided through these bonds, which will be used in both NIGC working capital and banking loan repayments.

Table 16 - Lost profits of NIGC caused by dishonor of the receivables

Year ended at:	Receivables (Million Iranian Rials)	Lost profits until March 2018
March 2015	2,394,316	2,570,538
March 2016	7,452,326	5,425,293
March 2017	8,466,548	3,725,281
March 2018	39,926,028	3,992,603
Grand Total	58,239,218	15,713,715

In order to summarize the methods suggested for accelerating the liquidation of receivables based on the patterns and methods of payment for households, commercial sector, industries, and power plants, we can provide a matrix, as described in Figure 1, in which the optimal methods for the liquidation of NIGC receivables are summarized in terms of time and volume.

As displayed in this matrix, the volume and maturity of receivables can be considered as two appropriate measures for assessing and analyzing receivables and proposing optimal methods for liquidation or using the capacity for financing. In general, the bottom half of the matrix in Figure 1 contains appropriate mechanisms for accelerating the rate

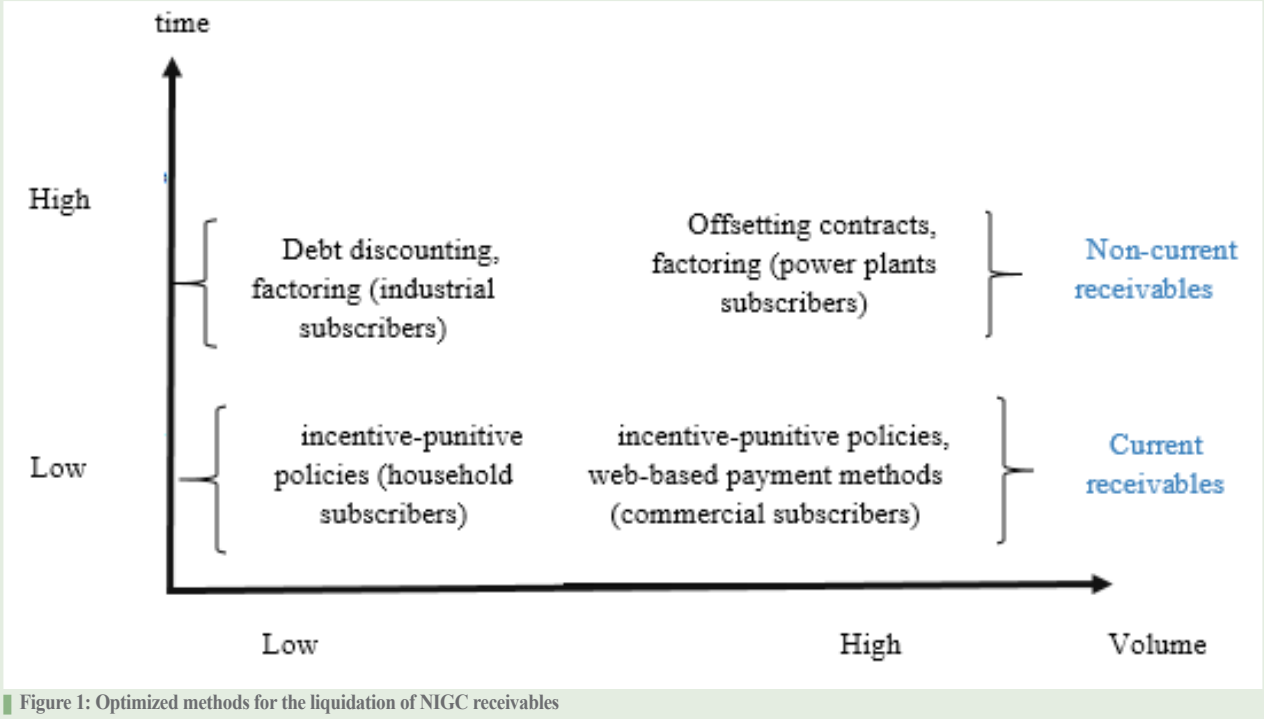

Figure 1: Optimized methods for the liquidation of NIGC receivables

of the liquidation of receivables, which is mainly related to the company's current accounts. More precisely, this section can be linked to the liquidation guidelines for receivables in the commercial and household sectors. The upper half of the matrix also indicates the potential use of NIGC receivables for financing processes. This section can also be related to the results of how to apply receivables as a collateral to financing (provision of working capital) in the industrial sectors and power plants. The common characteristics of the receivables from power plants and industrial subscribers is being overwhelmingly time consuming, which makes the use of financing techniques suitable for this group of receivables. As illustrated, the most expeditious method of accelerating the liquidation of the receivables of groups with low maturity and a small volume (households) is to use incentive-punitive policies as the main focused point of the current study. For long-term and high-volume receivables (such as power plants) factoring and offsetting contracts are recommended the discussion of which is out of the scope of the current paper. Using any of the above methods is not recommended in absolute terms, and it is better to adapt a combination of methods regarding the conditions and requirements of NIGC; for example, considering financial penalties for the delays of power plants will increase the effectiveness of collection process.

5. Conclusions & Remarks

The main objective of this study is to propose incentive mechanisms for the collection of receivables in accordance with the requirements of NIGC to meet a part of its financial needs. To this end, first, NIGC receivables are analyzed in four clusters of provincial gas companies which are classified according to average gas sales during 2012 to 2018. The maximum amount of receivables belongs to the first cluster (the highest ratio of receivables to sales). Also, the analysis of NIGC receivables reveals that a significant portion of the claims belongs to industrial subscribers (mainly refineries and petrochemicals). Following industrial subscribers, household sectors, commercial subscribers, and power plants account for the largest share of receivables; a reasonable relationship between gas sales and deferred receivables is also seen. We clustered provincial gas companies based on average natural gas sales. The analysis of the data show a sharp increase in receivables from commercial, industrial, and household subscribers with some modifications. In the power plant sector, the status of receivables is slightly different, and, after a significant decline in 2017, it experienced a slight increase in 2018. Then, we organized a semi-structured interview with several managers of NIGC to customize the liquidation methods in accordance with the contingents of NIGC. Based on the interview results, NIGC should employ IT-based methods, incentive policies, and deterrent (punitive) strategies to accelerate the liquidation of receivables in household and commercial sectors. According to the empirical findings, the behavior of industrial subscribers and power plants are different from that of household and commercial sectors, and the main methods used for industrial sectors and power plants are receivable-based financing arrangements such as debt discounting, factoring, as well as offset contracting. In the present proceeding of NIGC, the allocation of funds to provincial gas companies is tied to the ability of the companies to collect receivables. It seems that as long as appropriate methods (whether incentive or punitive) are not used for the collection of the receivables, continuing the current procedure will exert double pressure on the management of provincial gas companies. In this regard, given that the financial department of provincial gas companies and NIGC discloses financial information only at the end of the financial period and do not feel obliged to prepare interim reports, this information gap must be filled. Therefore, the following liquidation methods are recommended to NIGC governing bodies:

- Analyzing the receivables patterns and the consumption behavior of subscribers in shorter periods (monthly), using policies such receivables dashboards.
- Designation and development of accounts receivable module in current information systems (use of business intelligence system) to accelerate the planning and formulation of appropriate receivables and to extract the methods and patterns of consumption and payments.
- Setting up a web-based system to integrate current systems, which analyze receivables transactions. Having a specific receiver in the parent company, designing receivables management analysis system, increasing the level of information disclosure in management reports, and quantifying the consequences of each of the motivational approaches are other methods to accelerate the collection of receivables.
- Billing subscribers at the time of the meter reading, using smart meters, employing web-based platforms (such as mobile and web apps), issuing electronic bills, and providing the necessary infrastructure in this area.
- Using incentive methods to encourage well-off subscribers, as well as imposing fines on commercial, household, and industrial subscribers for delays in payments at the time of entering into contracts,

Finally, top managers and executives, consolidation departments, credit department, legal affairs and contract departments, and other bodies responsible at NIGC should accelerate and facilitate the liquidation of receivables through using methods such as factoring, debt discounting, offsetting, etc., should obtain the necessary permissions from relevant authorities in this field, and should negotiate with companies which are involved in factoring operations at the national

or international levels. In the current work, the evaluation and the legal, infrastructural, and cultural feasibility of the implementation of the proposed methods, as well as their effects on the trend of receivables, were not considered and should be studied in the future.

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Investigating the Impact of Sanctions on Expenditures on Development of South Pars Gas Field: Comparing Internal Contractors with Foreign Contractors

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ABSTRACT

Projects are affected by many internal and external factors, which could be initiated domestically or internationally. The South Pars as a mega gas field in Iran requires billions of dollars for development and gas extraction. Its development has taken a rather long time and faced many challenges over the last two decades due to several problems, especially international barriers. In this work, the effects of sanctions on the expenditure on selected activities in developing South Pars field are investigated to compare internal contractors with foreign contractors. The main purpose of this research is to calculate the cost of the selected activities of South Pars phases and compare the performance of the internal contractors under sanctions conditions with that of the foreign contractors under normal (when no sanctions are imposed on Iran) conditions. For this purpose, 18 activities, which were similar in all South Pars contracts, were selected. In three sections, after applying relative indices, global inflation, and technology by using inferential statistics, the total cost of the selected activities done by the internal and foreign contractors was evaluated . Based on the statistical analysis, there was no significant difference between the expenditure on the selected activities performed by the internal contractors and foreign contractors under sanctions.

1. Introduction

Identifying the impact of conditions and different contractors on the selected activities can minimize the implementing costs in these fields and other similar projects. Also, it can prevent the loss of financial funds, human resources, optimization of the consumption, and sale of extracted gas from this field. Due to the existing economic conditions and the need for scarce financial resources in the country, the results of this article have a significant impact on resolving existing currency challenges.

In this paper, initially, South Pars gas field is described. Then, the problem statement, importance, necessity, statistical society, research objectives and questions, data collection, and analysis methods are explained.

In the implementation of South Pars phases and similar projects, the existence of contractors and relevant contracts as well as different international conditions can affect all implementation stages. Due to the sanctions imposed on Iran, and the withdrawal of international contracting companies, the implementation of hydrocarbon field projects has been virtually assigned to internal contractors or consortium companies. The same applies to South Pars gas field and the related projects.

We will examine the effect of different conditions on the expenses of implementing selected South Pars activities in various sectors. To this end, 18 activities which were

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identical to all contracts of South Pars gas field development were chosen. Onshore, offshore, and drilling sections were selected, and the corresponding expenses were analyzed and compared by using relevant indicators. These indicators were selected by using the inventive design and considering the price and technology changes between the 10 internal contractors and the 10 foreign contractors.

2. Literature Review

2.1. South Pars Gas Field

Iran is ranked first in the world by storing 953 trillion cubic feet of gas storages, which are often in the gas fields, oilfields, and gas caps. The country's largest gas field is South Pars gas field, which has a storage area about 507 trillion cubic feet along with the border between Iran and Qatar. About a third of Iran's total gas reserves are accumulated in this vast area. Iran and Qatar have always competed for excellence in the exploitation of hydrocarbon resources from the start of gas production in this area.

2.2. Operating Phases

Operating phases are the phases in which the operation of the three parts, namely onshore, offshore, and drilling, has been completed, and natural gas is being extracted. These phases can have the same standard design and daily gas production of 1,765 million cubic feet per phase.

Phase 1	
Phases 2 and 3	equivalent to two standard phases
Phases 4 and 5	equivalent to two standard phases
Phases 6,7 and 8	equivalent to two standard phases
Phases 9 and 10	equivalent to two standard phases
Phase 12	equivalent to two standard phases
Phases 15 and 16	equivalent to two standard phases
Phases 17 and 18	equivalent to two standard phases
Phase 19	

2.3. Economic Sanctions

Economic sanctions are designed to influence the policies of the target countries by putting economic pressure on and forcing them to accept their demands. (Huffaer & Scott, Hamid Reza Derakhshan, 2014). Economic sanctions are generally considered to be classified into two major types, or they are applied to two areas:

- Imposing a trade sanction in which exports to and imports from the sanctioned country are targeted, limited, or suspended.
- Appling restrictions and terminating financial relations.

2.4. Noneconomic Sanctions

These sanctions are usually imposed before the economic sanctions and are aimed at persuading the target country to change its policy. Noneconomic sanctions depending on the country and circumstances include:

- Cancellation of multilateral meetings;
- Refusal to grant visas;
- Reduction in the level of political representation;
- Prevention of the target country from joining international organizations;
- Opposition to the host country for hosting international meetings;
- Refusal of official aid and assistance in a critical crisis;
- Disconnecting telephone, radio, satellite, sea and land communications.

2.5. Effectiveness of Sanctions

From the standpoint of international trade principles, any sanctions comprise ordered interference with free trade and cause "trade distortion." Business distortion is costly, and both parties often incur costs. Prohibiting imports from or refusing exports to a country will make imports and exports more expensive. It is stated that the goal of the sanctions is to increase trade costs and trade diversion in the target country. However, the cost of sanctions varies according to the countries involved, as well as depending on the involved sector (Emadi, 2012).

Sanctioning the targeted government avoids financial transactions, money transfers, and investment. The sanctioning country uses its influence in international financial institutions to disrupt any financial relationship or technical assistance or even blocks the sanctioned country's assets.

The effectiveness of unilateral sanctions is usually very low unless the sanctioning country has an economic power superior to the target country, and there is a great deal of interdependence between the two countries.

Strategic economic sanctions are different from regular sanctions, which are used for other economic or non-strategic interests, and sanctions for strategic purposes are usually replaced with the war option. Therefore, the cost of economic sanctions is far less than the war, and it can entirely be justified by the country or countries executing economic sanctions.

The transition to economic sanctions for strategic purposes is usually performed in four steps:

- Encouraging the target country privately and through bilateral negotiations;
- Publicly requesting the target country and publicly announcing it;
- Consulting with allies for further action and system action if needed;
- Imposing the sanction at a noneconomic level.

2.6. The International Sanctions Trend on Iran's Oil and Gas Industry

In recent years, Iran's oil and gas sector has become the main focus of competition, like a double-edged sword between Iran and the United States. Although Iran ranks third, second, and fifth in terms of crude oil, natural gas reserves, and crude oil production respectively, it is in the first place in terms of total hydrocarbon reserves (crude oil and natural gas). Therefore, Iran takes an exceptional position in the world energy market, and no country or international corporation can overlook the economic and political benefits of cooperating with Iran and the vital value of making energy contracts with Iran. However, in recent years, due to the sanctions imposed on Iran, especially in the oil and gas industry, the risk of investment and activity in the Iranian oil and gas industry has increased in comparison to the other oil-rich countries in the Middle East region. The US has recently tightened its sanctions against the Islamic Republic of Iran by imposing pressure on foreign companies to choose between Iran and the US markets.

According to the country's statistical reports on oil purchase, Iran has had great difficulty in finding financial institutions to pay for energy-consuming companies and in receiving incomes from selling oil and its products since the beginning of the sanctions imposed on Iran. European and Middle Eastern banks refuse to issue letters of credit (LC) to Iranian financial institutions, which makes it difficult for the customers to pay for the oil purchased from Iran. Shipping companies also prevent transporting their tankers to Iranian oil terminals. Moreover, international insurance companies are reluctant to insure Iran-linked oil shipments. Therefore, Iran will increasingly find fewer financial institutions to deal with, and Chinese banks may be the last source of financing for trade with Iran.

Banks which are still trading with Iran pose many problems for the Iranian side. Reports indicate that some Iranian government officials have complained that Iran's most important oil buyers who purchased oil in the dollar or euro currencies have not been able to pay the price of Iranian crude oil, which has led to a currency shortage, and as a result, the central bank has attempted to strengthen Rial currency power in the Middle East.

2.7. Research Background

Among the similar researches in the field of oil and gas industry from the perspective of economic and financial, we address the following.

Linbrown (2011) explored new investments in the petroleum industry, which indicate that the cost of investing in oil and gas resources, especially in North America, has sharply increased. The primary feature of new oil resources is their high costs accounting for more than a third of the total investment in this industry.

Jaw (2011) also funded projects for hydrocarbon fields and bank capital constraints. The failure of financial markets and the international banking system has shadowed the global economy, which has led to an increase in development and implementation costs for oil and gas projects.

Philip Daniel (2011) reviewed the financial framework as well as the old and new challenges of oil contracts. He reported that it is possible to define new projects in the upstream sector of the oil and gas industry.

Moreover, Akhavan (2014) examined the requirements for South Pars gas field development contracts from three aspects of time, expenses, and repayment during the period.

Khalili Iraqi et al. (2014) used real powers as a technique which is generally very suitable for evaluating economic projects with financial returns under the uncertainty conditions to estimate the South Pars gas field development project. In this context, the weaknesses of traditional financial evaluation methods such as discounted cash flows and present net value were addressed and compared with conventional methods. Further, he determined that it is possible to determine the optimal time for the development of the phases using this approach. It is suggested that this approach, i.e. the economic evaluation of investment projects in various applications, should be used under uncertainty conditions.

In addition, Khazani et al. (2014) explored the exploitation of Iran's oil and gas fields shared with the Persian Gulf countries and outlined the current strengths and weaknesses of the extraction of the shared reservoirs. Based on the research findings, revising the current regime of extraction from the joint oil and gas reservoirs and taking steps towards the implementation of unit management on such reservoirs is an inevitable necessity to increase Iran's economic benefits in the gas extraction of the shared fields.

Javadi et al. (2017) investigated the relationship between some financial variables of the oil and gas companies within the Organization of the Petroleum Exporting Countries (OPEC). Furthermore, Javadi et al. (2018) measured the financial performance of the companies affiliated to the National Iranian Gas Company

(NIGC) which receives its gas from different phases of South Pars gas field. Although these two recent studies were in the field of oil and gas, especially in the context of Iran, they have not considered the cost of the development of South Pars gas field.

With regard to the above review, it can be concluded that the nontechnical aspect of the oil and gas industry in Iran is a rather untouched area, and there are very few studies in this context.

3. Research Methodology

In this part, first, the factors affecting the increase in the expenditure on selected activities in the development of South Pars gas field and the relevant indicators are described. Then, the process of selecting South Pars phases is divided into several components which provide the basis for the present research.

In this study, the two primary states are compared with each other:

- The first phase of implementation by the foreign company under unconventional conditions.
- The second phase of implementation by the internal contractors under sanction conditions.

The 18 selected activities in South Pars gas phases are analyzed and the costs of the 10 internal contractors and the 10 foreign contractors were compared.

3.1. Effectiveness of Factors Influencing the Expenditure on Selected Activities

Factors affecting the expenditures on the chosen activities in the development of South Pars gas field are considered in three general categories.

3.1.1. Factors Affected by Sanctions

This group relates to the factors which lead to international sanctions. These sanctions have imposed three types of restrictions, namely restrictions on imports, restrictions on exports, and difficulty in transferring the currency resources, on the project expenditures. The above limitations ultimately reflect their effect by increasing the presence of intermediaries and segmentation, raising exchange costs, reducing Iran's foreign exchange earnings, and increasing the exchange rate in the costs of the project.

3.1.2. Factors Affected by International Price Changes

Considering the global nature of the oil and gas superstructures implementation, changes in international prices also impact on the implementation of these types of projects. Therefore, worldwide inflation is considered to be an effective factor in raising costs. Foreign investment can change the price of engineering services (design), the price of materials and equipment (procurement), and other external resources necessary to help advance the project. In order to determine the real costs of the project, it is essential to consider the differences caused by changes in external prices in the costs associated with design, procurement, and construction phases.

3.1.3. Factors Influenced by the Implementation of the Economic Development Plan Focusing on the Targeted Subsidy Scheme

Another factor directly and indirectly affecting the costs of implementing development projects is the implementation of a plan for economic transformation which concentrates on a targeted subsidy scheme. The plan, in the form of eliminating subsidies of energy carriers and some of the essential commodities, has led to a rise in prices of many goods and services, construction costs, transportation costs, and prices of mechanical, electrical, and industrial products. Moreover, these developments eventually affect the producer price index.

The factors described above have, directly and indirectly, increased spending on South Pars development projects and raised the actual costs of these projects.

3.2. Index of Measuring the Factors Affecting Expenditure on South Pars Development Projects

3.2.1. Index of Rising Expenditures Due to the Sanctions

- Mediation cost index of foreign purchases;
- Index of the cost of transferring foreign currency.

Table 1 - Sanctions adjustment coefficients

Index	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brokers Fee	100	108	108	108	108	108	114	117	117	117	117
Transfer Fee	100	104	104	104	104	104	104	105	105	105	105
Average	100	106	106	106	106	106	109	111	111	111	111

Table 2 - Adjustment coefficients of international price changes

Index	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Capex and Opex Cost: Upstream Oil & Gas	100	104.3	113.7	115.5	116.4	117.9	109.9	104.8	105.6	106.5	107.3
International Index of Oil & Gas Equipment	100	99.1	101.2	103.9	105.2	106.8	106.8	106.1	106.9	107.9	108.8
International Index of Oil & Gas Pipes	100	102.3	93.8	101.5	103.2	99.8	98.6	99.3	99.3	99.4	99.4
Index of Renting Drilling Rigs	100	91.2	93.6	110.3	142.0	146.0	96.0	72.4	71.2	70.4	69.2
Average	100	99.2	100.6	107.8	116.7	117.6	102.8	95.7	95.8	96.1	96.2

3.2.2. Index of the International Changes in Equipment and Service Price

- Indicator of capital expenditures and operations in the oil and gas upstream activities;
- The international price index of equipment;
- The international index of oil and gas pipelines;
- The cost of renting drilling rigs.

3.2.3. Internal Index

- Indicative price of industrial goods;
- Electricity price index;
- Mechanical equipment prices;
- The freight price index;
- Property price index;
- Service price index.

3.3. Mann-Whitney Test

The Mann-Whitney test is a comparative test to compare the status of two independent groups. When the data of a study are qualitatively sequential or abnormal, it is better to use this test, which is a nonparametric test and equivalent to two independent *t* tests of samples. In this case, we do not use two independent *t* tests of the samples because the average of the variables measured on an orderly scale will not have significant meanings. For example, when we want to compare the height of two groups of women and men, it is better to sort people by height and rank them to compare their mean height. Suppose that we want to compare two traditional and new methods of teaching students of a school. The students are randomly selected, and the subjects are randomly reassigned to each of the two methods (n_1 in the first method and n_2 in the second method, where, $n_1 + n_2 = N$); after the training ends, a single test is performed on all of them. Then, their grades are considered and ranked in order. Next, in the following index, we compute the sum of the ratings of each group and name them R_1 and R_2.

The Mann-Whitney test statistic is now defined by:

$$W = n_1 \times n_2 + \frac{n1(n1+1)}{2} - R_1$$
$$W' = n_1 \times n_2 + \frac{n2(n2+1)}{2} - R_2 \quad (1)$$

If the size of the two groups are not equal, then *n1* is considered to be the smaller group, and *n2* will be the larger group. Calculating either of *W* or *W'* is enough because they are related as given by:

$$W + W' = n_1 \times n_2 \quad (2)$$

In this test, the hypotheses are as follows:

Table 3 - Adjustment coefficients of internal indicators

Index	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Industrial Goods Price Index	100	122.0	188.3	244.0	329.3	362.0	360.5	373.5	402.8	418.5	436.8
Electricity Price Index	100	115.7	135.4	217	257	279	282	295	325	358	366
Mechanical Price Index	100	110.5	129.3	185	228	248	257	268	299	310	329
Freight and Fuel Price Index	100	106	113.5	128	154	200	251	273	309	312	331
Building Price Index	100	113.2	135.5	189.0	226.0	244.4	238.8	251.1	283.8	311.6	320.8
Services Price Index	100	111.8	128.5	157.6	201.5	253.2	288.2	313.1	364.9	390.2	410.3
Average	100	113.2	138.4	187	233	264	279	296	331	350	365

H_0: There is no difference between the two groups.
H_1: There is a difference between the two groups.

If the sample size was less than 20, then the Mann-Whitney table must be used to reject the zero hypothesis. If the sample size was greater than 20, then by using the mean and variance of the following indices, which have a standard normal distribution, we can compare the value at a level of significance of 0.05 with a value of 1.96 in the standard normal table.

$$U = Z = \frac{\left| W - \frac{n1\,n2}{2} \right|}{\sqrt{\frac{n1n2(n1+n2+1)}{12}}} \quad (3)$$

4. Results

4.1. Data Analysis

Table 4 lists the overhead costs of the 18 selected activities in South Pars gas field development calculated using time-driven activity based costing (TDABC). These costs are broken down into the internal contractors and the foreign contractors. One of the main elements of the cost is the overhead costs (expenses) which are not directly involved in the manufacture of goods and products; thus, it is not easy to include these costs in the production of a specific product.

At the beginning of the documentation and reports available to National Iranian Oil Company (NIOC), expenditures paid to the contractors in the selected activities were extracted. Then, taking into account the indicators described in the previous section, the expenditures on the selected field development activities were calculated in million dollars for the foreign contractors and the internal contractors.

4.2. Opportunity Cost

The opportunity cost of a resource is the value of the alternative source use, which is more valuable after its current use. According to the available documents (National Iranian Oil Company), the daily income of South Pars in 2013 (Annually extraction expenditures) was 7 million dollars for each phase. Therefore, considering the 10 phases of the project, these expenditures are expected to reach about 2.5 billion dollars in revenue per year. Specifically, the delays in the extraction from this field every day, every month, and every year will cause extensive economic damages to the country. The selected activities done the internal contractors compared with the foreign contractors in the long-term horizon creates an opportunity cost equivalent to a lower income due to this delay. Table 6 tabulates the opportunity cost of each activity,

Table 4 - Overhead costs of the 18 selected activities c

Part	Activities Description	Internal Contractors		Foreign Contractors	
		Time Consumed (Day)	Allocated Overhead	Time Consumed (Day)	Allocated Overhead
Onshore	Procurement Activities	1750	20.43	900	19.31
	Supply of Equipment	750	8.76	250	5.36
	Supply of Bulk Material	500	5.84	200	4.29
	Supply of Spare Parts	500	5.84	100	2.15
	Site Establishment	750	8.76	200	4.29
	Plant Construction	3000	35.02	1600	34.33
	Pre-Commissioning	500	5.84	150	3.22
	Construction Camp	1250	14.59	600	12.87
	Site Work	500	5.84	200	4.29
Offshore	Mobilization/Demobilization	250	2.92	80	1.72
	Start-up Activities	500	5.84	150	3.22
	Pre-Commissioning test	500	5.84	250	5.36
Drilling	Appraisal Wells	2500	29.19	1300	27.89
	Deviated Wells	4250	49.62	2200	47.20
	Logistic Base Services	750	8.76	325	6.97
	Yard Fabrication	1500	17.51	600	12.87
	Detailed Engineering	500	5.84	275	5.90
	Material Procurement	1250	14.59	175	3.75
	Sum	21500	251	9555	205

Source: calculated using TDABC for the 18 selected activities

Table 5 - Material and equipment costs classified based on

Type of Contractors	Contractors	Onshore									Offshore			Drilling						Sum
		Procurement Activities	Supply of Equipment	Supply of Bulk Material	Supply of Spare Parts	Site Establishment	Plant Contraction	Pre-Commissioning test	Construction Camp	Site Work	Mobilization/ Demobilization	Star-up Activities	Pre-Commissioning test	Appraisal Wells	Deviated Wells	Logistic Base Services	Yard Fabrication	Detailed Engineering	Material Procurement	Sum (Million USD)
Internal Contractors	Aria Naft Shahab	82	1005	967	20	69	638	47	35	166	29	79	14	141	420	38	39	92	198	4080
	Petro Paydar	76	935	899	18	64	593	44	33	154	32	74	13	132	391	36	37	85	185	3799
	Petro Sina	78	965	928	19	66	612	45	34	159	26	76	14	136	404	37	38	88	191	3799
	Petro Pars	68	841	809	17	58	534	39	30	139	25	66	12	118	352	32	33	77	166	3416
	IDRO	90	1106	1064	22	76	702	52	39	182	34	87	16	156	462	42	43	101	218	4490
	OIEC	80	985	948	19	67	625	46	35	162	28	78	14	139	412	38	38	90	194	3998
	MAPNA	73	894	860	18	61	568	42	31	147	29	71	13	126	374	34	35	82	177	3634
	IOEC	98	1206	1160	24	83	765	56	42	199	40	95	17	170	504	46	47	110	238	4901
	NIDC	80	985	948	19	67	625	46	35	162	26	78	14	139	412	38	38	90	194	3996
	ISOICO	86	1055	1015	21	72	670	49	37	174	34	83	15	148	441	40	41	96	208	4287
SUM		809	9977	9598	197	683	6332	465	350	1645	303	788	140	1404	4173	380	390	912	1970	40516
Foreign Contractors	Eni	22	384	238	6	14	269	17	16	113	14	21	8	41	162	16	18	46	88	1493
	State Oil	23	395	245	6	14	277	17	16	117	14	21	8	43	166	17	19	48	91	1537
	Total	22	391	243	7	14	274	17	16	115	12	21	7	42	165	17	19	47	90	1521
	Toyo	22	380	236	7	14	266	17	16	112	10	21	6	41	160	16	18	46	87	1474
	Daelim	23	399	248	8	14	280	17	17	118	13	22	8	43	168	17	19	48	91	1553
	GS	23	403	250	6	14	283	18	17	119	14	22	8	43	170	17	19	49	92	1567
	Hyundai	23	397	247	6	14	278	17	16	117	14	22	5	43	167	17	19	48	91	1542
	Samsung	23	401	249	9	14	281	17	17	118	12	22	8	43	169	17	19	48	92	1561
	Sagadril	22	388	241	6	14	272	17	16	114	11	21	8	42	163	17	18	47	89	1505
	Schlumberger	37	652	405	10	23	457	28	27	192	15	22	9	43	275	28	31	79	149	2484
Sum		241	4191	2601	71	150	2938	183	173	1236	129	214	76	424	1764	180	199	506	960	16236

Table 6 - The opportunity cost of the internal contractors

Activities Description	Delay (Day)	The Portion of each Activity	Daily Revenue of South Pars	Opportunity Cost (Million USD)
Procurement Activities	35	0.10	18	46
Supply of Equipment	21	0.07	18	26
Supply of Bulk Material	13	0.05	18	11
Supply of Spare Parts	17	0.02	18	6
Site Establishment	23	0.04	18	17
Plant Construction	58	0.02	18	21
Pre-Commissioning	15	0.01	18	3
Construction Camp	27	0.02	18	10
Site Work	13	0.04	18	9
Mobilization/Demobilization	7	0.01	18	1
Start-up Activities	15	0.01	18	3
Pre-Commissioning test	10	0.01	18	2
Appraisal Wells	50	0.08	18	72
Deviated Wells	85	0.04	18	62
Logistic Base Services	18	0.08	18	26
Yard Fabrication	38	0.03	18	20
Detailed Engineering	9	0.02	18	3
Material Procurement	45	0.35	18	282
Total	498	1.00	324	637

demonstrates the comparison of the execution time between the internal contractors and foreign contractors, and presents the effect of delays on the gas production in South Pars.

4.3. Cost After Using Indicators

In order to calculate the final coefficients adjustment of each activity, the average relevant indices (as described in the third section) have been considered. Since expenditures on the foreign contractors have been extracted based on the documents issued in 2003 and the foreign contractors were obtained in the same year, 2003 was chosen as the base year. Therefore, in order to equalize and compare the costs, the costs of the internal contractors were divided by the average indicators obtained in the year 2003. Moreover, they were calculated based on the base year (2003) expenditures.

4.4. Inferential analysis

In the inferential statistics section, the normalization of variables is first checked. Then, an appropriate sampling method is selected to compare the contractors. Based on the Shapiro-Wilkes test used herein, two assumptions are considered:

H_0: The associated variable has a normal distribution.

H_1: The associated variable does not have a normal distribution.

The results of the Shapiro-Wilkes test are presented in Table 8:

4.5. Comparing Total Expenditures on the Internal Contractors and the Foreign Contractors

In order to compare the costs of the internal contractors and foreign contractors, three areas of onshore, offshore, and drilling were used. Statistical assumptions are defined as follows:

H_0: There is no significant difference between the total expenditures on the selected activities of the internal and foreign contractor in South Pars field development.

H_1: There is a significant difference between the total expenditures on the selected activities of the internal and foreign contractor in South Pars field development.

The corresponding results of the Mann-Whitney test are presented in Table 9:

The findings in the above table show that after applying international price changes and internal indices, the significance level of the Mann-Whitney statistics is higher than 0.05, and thus the zero hypothesis is accepted. In other words, although the expenditures on the internal contractors are higher than those on the foreign contractors, the internal contractors do not significantly differ from the external contractors at a 95% confidence level.

Table 7 - Total cost (applying to international price changes and the internal indices)

Type of Contractors	Contractors	Onshore									Offshore			Drilling						Sum
		Procurement Activities	Supply of Equipment	Supply of Bulk Material	Supply of Spare Parts	Site Establishment	Plant Contraction	Pre-Commissioning test	Construction Camp	Site Work	Mobilization/ Demobilization	Star-up Activities	Pre-Commissioning test	Appraisal Wells	Deviated Wells	Logistic Base Services	Yard Fabrication	Detailed Engineering	Material Procurement	Sum (Million USD)
Internal Contractors	Aria Naft Shahab	36	435	419	9	30	277	21	16	72	13	35	6	63	184	17	18	40	86	1776
	Petro Paydar	34	405	389	8	28	258	19	15	67	14	32	6	58	172	16	17	37	81	1656
	Petro Sina	35	418	402	8	29	266	20	15	69	11	33	6	60	177	16	17	38	83	1705
	Petro Pars	30	364	350	7	25	232	17	13	60	11	29	5	52	155	14	15	33	72	1487
	IDRO	40	479	461	10	33	306	23	18	79	15	38	7	69	202	19	19	44	95	1957
	OIEC	35	427	410	9	30	272	20	16	71	12	34	6	61	180	17	17	39	85	1741
	MAPNA	32	387	373	8	27	247	18	14	64	13	31	6	55	164	15	16	36	77	1582
	IOEC	43	523	503	11	36	333	25	19	86	17	41	7	75	221	20	21	48	103	2133
	NIDC	36	427	411	9	30	272	20	16	71	11	34	6	62	181	17	17	39	85	1743
	ISOICO	38	457	440	9	32	292	22	17	76	15	36	7	65	193	18	19	42	91	1868
	Opportunity Cost	25	10	4	2	6	8	1	4	4	1	1	1	28	24	10	8	1	111	250
SUM		384	4333	4162	90	306	2765	205	162	719	133	345	64	649	1852	178	184	399	970	17898
Foreign Contractors	Eni	24	384	238	6	14	272	17	17	114	14	21	8		166	17	19	47	88	1508
	State Oil	24	396	246	6	14	280	17	18	117	14	22	8	45	170	18	20	48	91	1553
	Total	24	392	243	8	14	277	17	17	116	12	21	7	44	169	17	19	47	90	1535
	Toyo	24	380	236	7	14	270	17	18	113	10	21	7	44	166	17	20	46	87	1497
	Daelim	26	400	248	8	15	283	18	18	118	13	22	9	46	174	18	20	49	92	1577
	GS	26	404	251	6	15	287	18	18	119	14	22	9	47	175	18	20	50	93	1591
	Hyundai	25	398	247	6	15	283	18	18	118	14	22	6	46	172	18	21	49	91	1565
	Samsung	25	402	249	9	15	284	18	18	119	12	22	9	46	174	18	21	49	92	1582
	Sagadril	24	388	241	6	14	276	17	18	115	11	21	9	45	168	17	20	48	89	1528
	Schlumberger	39	653	405	10	24	460	29	28	193	15	22	10	46	279	29	33	79	150	2504
Sum		260	4196	2605	73	154	2972	186	186	1240	131	217	81	452	1812	187	212	512	964	16440

Table 8 - Shapiro-Wilks test results (after international price changes and internal indices)

Test Type	Condition	Significance Level	Statistics	Research Variables
Nonparametric	Abnormal	0.001	0.747	Onshore
Nonparametric	Abnormal	0.001	0.786	Offshore
Nonparametric	Abnormal	0.001	0.765	Drilling
Nonparametric	Abnormal	0.013	0.753	Total Cost

Table 9 - Results of the Mann-Whitney test

Significance Level	Statistics	Total Cost	Number	Contractor
0.085	-1.72	17898	10	Internal
		16440	10	Foreign
		34338	20	Total

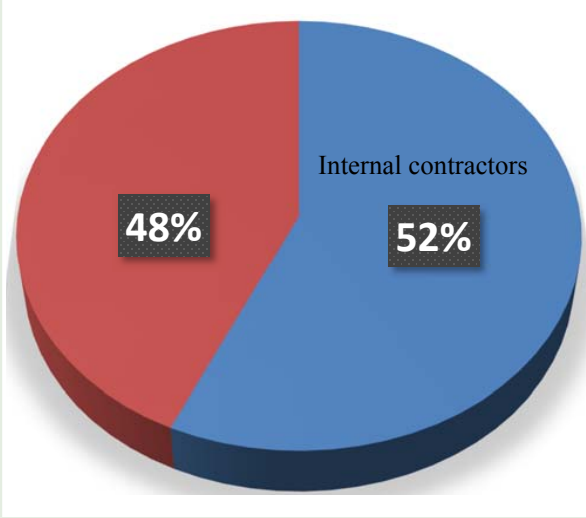

Figure 1: Comparing the total cost of the internal and foreign contractors after applying all indicators

5. Conclusions

According to the results of the statistical data analysis, after excluding the effects of normal-condition indicators, the implementing expenditures on the selected activities of the internal contractors do not significantly differ from that of the foreign contractors. In other words, there is no significant difference in the presence of sanctions.

The obtained results demonstrate that the development costs of this field by the internal contractors under international sanctions are higher than those by the foreign contractors under normal conditions, which means that the sanctions do not have any significant effect on the expenditures on these activities, and the other factors and indicators must also be evaluated.

Taking into account the nature of South Pars gas field and its daily revenue, expediting the development of South Pars phases can add around 10 billion dollars to Iran's profits and prevents current losses due to the slow extraction from this shared zone. Therefore, any delays in the extraction from this field will cause a great deal of unpredictability for the country.

Further, the higher total cost of the internal contractors compared to that of the foreign contractors means that the profit margin of South Pars gas field is lower than that of consuming or exporting gas products, which results in the further loss of rare financial resources of the country.

Since, based on the research findings, the sanctions alone have not had a significant impact on the internal contractors in comparison with the external contractors, it is imperative to meticulously consider other factors, especially internal factors, and take necessary corrective action.

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Recognition of the Effects of Transformational Leadership on Shaping Employee Citizenship Behavior: A Case Study of National Iranian Oil Products Distribution Company, Tehran Region

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ABSTRACT

The transformational leadership is known as one of the most important and effective factors in organizational behaviors of employees. Creating motivation in employees requires a leader with inspirational qualities. On the other hand, the organizational citizenship behavior is a key factor in shaping employees' behavior. The current study aims at investigating the effects of transformational leadership on the employees' organizational citizenship behavior. In addition, some personality traits are revealed in this study to be one of the main factors shaping the behaviors and to be moderating variables. The current study is of applied type in terms of the objective and a descriptive-correlational study in terms of data collection procedures. The data needed for the purpose of the study were collected by using questionnaire distributed among 242 people of a statistical population and were analyzed by structural equations modelling. The results indicated that all the six hypotheses of the study were approved. In other words, the transformational leadership has positive and significant effects on both individual and organizational aspects of the organizational citizenship behavior. Also, the positive moderating role of neuroticism and extroversion in the effects of transformational leadership on the individual and organizational aspects of organizational citizenship behavior was approved. The results showed that the statistical community could utilize its human resources potential to create a competitive advantage and develop the voluntary activities of its employees, provided that it is able to optimally implement a transformational leadership style.

1. Introduction

With the intense competition in the local and global markets, organizations use all their facilities to obtain the competitive advantage and maintain the market share. One of the factors considered as a useful means of the realization of the objectives in the organizations is the leadership. In the intense economic conditions and environmental uncertainty, the promotion of the appropriate leadership behaviors is an important yet difficult task. The requirement of organizations for a quick and proper response to the environmental changes and the controversial expectations of the clients on the one hand, and the necessity of maintaining the competitive advantage on the other hand have made the organizations continuously search for the ways to improve their performance. Numerous researchers have dealt with the effectiveness of the leadership styles and tried to respond to the question "which leadership style and behaviors have the best effects on the organization?".

The studies in this field indicate that the transformational

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leadership can be introduced as an effective way for acting in the uncertainty conditions and obtaining the competitive advantage (Işcan et al., 2014). A great proportion of these studies agree that the transformational leadership style is the most effective style (Van Dierendonck et al., 2013), which either directly or indirectly affects the organization outputs positively.

In the present study, National Iranian Oil Products Distribution Company-Tehran region has been considered as an environment for conducting the study. Therefore, the current study tries to investigate the transformational leadership role in the development of the organizational citizenship behaviors in the industry section in general, and in National Iranian Oil Products Distribution Company-Tehran Region in particular, with the employees having personality traits not so compatible with such behaviors. In today's world changing at an amazing speed, everyone admits that human resources are the most valuable asset of an organization and that no organization can continue to operate without human resources. Therefore, the main question of the study is "how does transformational leadership affect the organization citizenship behaviors of the neurotic and extrovert employees?". In fact, the current study, in addition to investigating the related literature of the transformational leadership and its effects on organizational citizenship behaviors (in individual and behavioral aspects) and studying the role of neuroticism and extroversion personality traits, has tried to provide some ways to promote the organizational citizenship behaviors in organizations based on the transformational leadership style.

2. Theoretical Framework

2.1. Transformational Leadership

The need for management and leadership in all the areas of social activity is tangible and vital (Ehsani Ziari, 2006). Although the terms "leader" and "leadership" are easily used in the literature and language, some believe that the leadership is an important aspect of the management, and an effective leadership ability is one of the conditions of the effective management. It is the process of the social penetration in which the leader asks for the voluntary participation of the employees in the efforts to achieve the organizational goals. The leaders, in order to encourage the voluntary participation of the employees, complete any power and jurisdiction they have through their personality traits and social skills (Rezaeian, 2004). Various ideas and schools have emerged in terms of leadership, among which 1) leadership traits theory, 2) leadership behavioral styles theory, 3) situational and contingency approaches, 4) transformational leadership, and 5) interactive leadership can be noted. The first three theories are traditional leadership theories, while the last two ones are considered as new leadership theories.

Transformational leadership was first used by Danton in 1973. The transformational leaders invite their followers to go beyond their interests for the sake of organization, and they have a great and profound influence on them. These leaders pay attention to the needs and issues of the followers regarding improvement. They can change the followers' awareness of the tasks through guiding them towards considering the traditional issues with a new approach, and

Table 1 - Some aspects of transformational leadership from the viewpoint of past researchers

Row	Defined Aspect	Concept	Reference
1	Articulating a strong vision	They try to motivate and inspire the group members or working team in order to create an attractive and convincing vision for the followers.	Chan et al., 2009; Yukl, 2009; Li, Zhao And Begley, 2014
2	Providing an appropriate model	The role modeling of the followers is done through the provision of a practical model.	Yukl, 2009; Li and Shi, 2005
3	Accepting group goals	Changing the individual goals into group goals, making the employees committed to the collective goals, and drawing a vision for the whole group.	Jalilian et al., 2010; Bass and Riggio, 2006; Brown et al., 2013; Sheikhali Zadeh and Tejari, 2013; Wang and Howell, 2010
4	Having high performance expectations	Expectations beyond what is mentioned in the job description from the followers. Further attempts at the realization of their missions.	Dvir et al., 2002; Bass and Roggio, 2006; Brown et al., 2013; Shamir et al., 1993; Sparks and Schenk, 2001
5	Providing individualized support	Protecting and considering different employees' needs and valuing the employees' growth and improvement	Sosik et al., 1997; Van Derendijk et al., 2013; Bass and Riggio, 2006; Walumbwa et al., 2005; Jalilian et al., 2010
6	Providing intellectual stimulation	Reconsidering the issues and motivating the employees through stimulating their curiosity and encouraging the subordinates to accept new approaches based on the inner motives and making jobs a challenge.	Wang, Tsai and Tsai, 2014; Mumford, Connelly and Gaddis, 2003; Bass and Riggio, 2006; Gumusluoglu and Ilsev, 2009

they can motivate and inspire the followers to attempt harder to achieve the goals. According to the study of Bass and Alivio (1997), transformational leaders have traits such as "proper influence or charisma", "inspirational motivation", "intellectual motive", and "personal considerations". The transformational leadership process is rooted in the leader's personal values and beliefs. Such leaders are inspired by their deepest personal values such as the justice, fairness, honesty, and dignity (Humphreys and Einstein, 2003). A study of Tiki and Donna (1990) showed that the successfulness of such leaders is affected by three measures, namely detection of the need for organization revitalization, creation of a new vision of the organization future, and institutionalizing the change among the employees (Weiss, 2000).

The transformational leadership theory emphasizes that the leaders must behave in a way that improves the innovation of the employees and accelerates the process of innovation. They, through strengthening the innovative thinking in their followers, help improve the individual performance and organization innovation, which consequently leads to the enhancement of organizational performance (Colbert et al., 2008). The transformational leadership subject has been among the favorite concepts in the related literature, and various studies have investigated its different aspects. Some of these aspects are tabulated in Table 1.

Among the studies on transformational leadership, Bernard Bass's model is one of the most comprehensive works. In the current work, the transformational leadership has been studied based on four traits, namely idealized influence, intellectual stimulation, inspirational motivation, and individual considerations (Bass. B. M, 1998).

2.1.1. Idealized influence

This trait explains that the leader acts as a strong model for the followers. If a leader is transformational, he will create a feeling of respect, admiration, and loyalty in the followers and emphasize the importance of a strong commitment to achieving the organizational objectives (Gumusluoglu and Ilsev, 2009). In this state, he has the attributes of a charismatic leader, and is trusted and admired by his subordinates, so they try to follow and imitate him as a model.

2.1.2.Intellectual Stimulation

The transformational leaders use the intellectual stimulation to challenge the followers' thoughts, imaginations, and innovations. It requires that the leaders, while encouraging the followers to provide new and innovative approaches to doing the tasks, direct them towards the reconsideration of the traditional methods of problem solving (Zhu et al., 2009). In such a state, the current situation is challenged and the new methods for realization of the tasks and development of the organization are provided (Bono and Judge, 2004). The leaders intellectually stimulate the employees and encourage their followers to treat the problems with innovation. In fact, they invite the followers to investigate the issues from different angles and implement the innovative problem solving techniques.

2.1.3. Inspirational Motivation

This factor describes the leaders who increase the followers' commitment through allowing them to participate in drawing the vision of future and through motivating them (Chen and Fahr, 2001). The leader encourages the employees to believe in the goals and achieving them through effort. These people are usually optimistic about the future and achievement of the goals.

2.1.4. Individual Considerations

When a leader helps his followers to achieve their desired needs, tries to improve the potential power of the individuals (Horwitz et al., 2008), and meets the sensational needs of them. Such leaders detect the people needs and help them nurture the skills needed for achieving the goals. These leaders may consume a great proportion of time to nurture, educate, and train their followers.

2.2. Organizational Citizenship Behavior

The concept "organizational citizenship behavior" has been developed from the studies of Bernard (1938) (Tabarsa et al., 2010). Batman and Oregan (1983) first used the term "organizational citizenship behavior" (Miri et al., 2014). They defined it as a part of employees' measures taken with the purpose of improving the efficiency, consistency, and solidarity at the workplace. They are regarded as activities which are out of the duties of employees in the organization (Hudson, 2006). The early studies in this field dealt more with the identification of the responsibilities and behaviors of the employees which were usually partially measured for the evaluation of their occupational performance; however, these behaviors influenced the improvement of the organizational effectiveness (Bienstock et al., 2003).

However, after the introduction of this concept by Oregan et al., various scholars have explained this subject through the use of the terms "transcendental behavior" (Van Dign, Comminger & Parks, 1995), "helpful organizational behavior" (Briev and Motovidlo, 1986; George and Beten Hausen, 1990; Oriley and Chatman, 1986), "organizational spontaneity" (George and Briev, 1992; George and Jones, 1997) and "contextual performance" (Borman and Motovidlo, 1993; Borman, White, and Dorsey, 1995; Motovidlo and Van Asater, 1994) during two decades (Podsakoff et al., 2000). A number of the most important basic studies in this context belong to Hasenn, George and Ratten (1990), Podsakoff, McKenzie & Fetter (1993), Snick and Hogan (1995), Podsakoff and McKenzie (1997), Oregan (2006), Livia Markoczy (2009), Fareh et al., (2004; 2011), Netemeyer (2011), and Podsakoff (2009; 2011) (Miri et al., 2012).

Different definitions have been provided for the citizenship behavior. In some definitions, it has been defined as a set of voluntary behaviors, which are not the formal duties of the individuals but lead to the effective improvement in the organizational tasks and

roles (Appelbaum, 2004). The organizational citizenship behavior is the individual and voluntary behaviors which promote the effectiveness and efficiency of the organizational performance but are not directly rewarded by the formal systems of the organization (Hall et al., 2009).

The employees who have this trait show behaviors beyond their role, duties, and formal job description. By these behaviors, they do not aim to obtain organizational rewards, and they attempt to improve and develop the organization (Taghavi, 2010). What is obvious is that the citizenship behavior cannot be directly reinforced. In addition, these behaviors are derived from the excellent efforts of the employees for achieving the success intended by the organization (Korkmaz &Arpaci, 2009). A review of the related literature indicates the vastness of the studies conducted in this field as almost thirty different types of theories have been reported about the citizenship behavior (Yung and Chou, 2011). Although these theories overlap with each other, but the variety of theories suggests that there should be different approaches to this issue.

Overall, it can be admitted that the most important aspects of the organizational citizenship behavior are fairness, altruism, work conscience, social etiquette, and organizational civility (Hadizadeh. M. A, and Tehrani. M, 2011, pp. 9881). Among these aspects of the social etiquette, the work conscience and altruism are introduced as the positive and active helpful components. On the other hand, the fairness and civility are preventive components, avoiding the damage infliction on the organization. These aspects are defined as follows:

- Social etiquette: the behavior which indicates the attention to the participation in the organizational social life;
- Altruism: helping the colleagues in doing their tasks;
- Work conscience: a behavior beyond the formally assigned requirements at the workplace;
- Fairness: the tendency to be patient with the unavoidable interruptions, injustices, and hardships of the workplace without complaining;
- Civility: thinking and paying attention to the effects of the individual behavior (Markoczy and Xin, 2004).

2.3. Personality Traits

Numerous definitions of personality have been presented, and there are different approaches. The personality theorists have not achieved a consensus on a unit definition of personality; however, relying on the common features of these definitions, it can be stated that personality is a relatively stable pattern of the attributes, attitudes, or traits which partially sustain people's behavior. These patterns are different from person to person, so everybody, despite being somewhat similar to others, has a unique personality. Accordingly, it can be stated that a set or the whole attributes and traits of an individual are meant by personality. Personality is a set of traits, including the thought, feelings, and personal perception of one's self, ideas, way of thinking, and many habits (Behzadjazi, 2008).

The personality traits can be known as traits and attributes which emerge in different situations, have a relative stability, are different from person to person, and can be measured (Nazarpoor, 2005). The theory of the factors and traits is among the most applied theories in the recognition of the personality traits. In this theory, the personality traits are divided into five groups, including extraversion, openness to new experiences, responsibility or conscience, socializing or being consistent, emotional stability or neuroticism. This theory, with a little difference, can be seen in the categorization of the five factors of personality by Costa and McCrae. This categorization includes five main aspects of personality as neuroticism, openness, empiricism, agreeableness, and conscientiousness (fidelity). Regarding the affinity of these theories for the aspects of neuroticism and extroversion, the current study focuses on developing a conceptual model based on these personality traits. In the followings, we will define these two aspects.

2.3.1. Neuroticism

Neuroticism is the tendency to experience the feelings such as fear, discomfort, agitation, anger, and impatience. Along with these feelings, the neurotic people also tend to be prone to illogical ideas, and they have less power to control their negative feelings and adapt themselves to stress in a weak manner. The people with low scores of neuroticism are emotionally stable, mild-tempered, and composed. They show less adaptability to the environment and usually reveal negative emotions. The constituent traits of this factor are anxiety, depression, aggression, deviation, impulsive behaviors, vulnerability to mental and physical stress, fear, sorrow, arousal, anger, guilt, and feeling of constant and pervasive loss (McCrae and Costa, 1992; Matthews, Deary, and Whiteman, 2003).

2.3.2. Extroversion

Extrovert people are comfortable while interacting with others. The extrovert people enjoy being with others and large crowds and tend to be bold, active, and talkative. They like simulation and excitement and are usually cheerful. The extroverts are social people, but being social is only one of their traits. In addition, they are resolute, active, conversational, social, and emotional. The extroversion scale is indicative of the people's interest in developing their industry and job (Sheikhali Zade and Tejari, 2013). The most important attribute of this factor is the communication. Most of these people have good social skills, and they are always vibrant. Among the other traits of the extroverts, being affectionate, active, decisive, cheerful, hopeful about the future, and vibrant can be named (McCrae and Costa, 1992; Matthews, Deary, and Whiteman, 2003).

3. Research Framework

Based on the related literature on the research variables, the probable relationships between the variables are predicted and drawn in the framework of the following conceptual model.

4. Methodology

The current study is of applied type and is a descriptive-analytical method in terms of data collection procedures, which uses a questionnaire for data collection. The statistical population of this study included all the employees of National Iranian Oil Products Distribution Company-Tehran region. According to the statistical population (641 managers and employees), 242 individuals were calculated with the help of Korsjie and Morgan table (Krejcie and Morgan, 1970). The main tool for collecting research data was questionnaires distributed among the statistical sample, and the desired data were obtained using simple random sampling (staff list). Then, the data were tested by structural equations method (SEM) based on the research hypotheses. The SPSS and Amos software packages were the analysis bases of the current study. The content validity and content validity ratio (CVR) index were used in order to test the questionnaire validity (Sarmad et al., 2001). In fact, the validity of the questions was evaluated by using ideas and comments of five experts in National Iranian Oil Products Distribution Company-Tehran Region, and based on the minimum acceptable CVR of their response (0.6), the acceptable validity of each variable was determined using Lawshe's ratio calculation. According to the experts' evaluation, the questions had an acceptable validity, and the validity of the questionnaire was approved. The Cronbach's alpha method was used to evaluate the reliability of the questionnaire. Regarding the calculated coefficients which were above 70%, the reliability of the questionnaire was also approved (Sarmad et al., 2001).

Table 2 - Cronbach's alpha values for the main variables

Row	Variable	Cronbach's alpha
1	Transformational leadership	0.949
2	Organizational citizenship behavior (individual aspect)	0.908
3	Organizational citizenship behavior (organizational aspect)	0.880
4	Neuroticism	0.840
5	Extroversion	0.868

5. Data Analysis

After the data were collected by using questionnaires, the data are analyzed with the help of statistical instruments. The results of a statistical sample data analysis are shown in Table 3.

In the inferential statistics, the analysis of the features and parameters related to the statistical population and the quality of the relationships between the concepts and variables are focused in a way that a comparative and causal analysis (causal-correlative) is performed. In order to use the inferential analysis correctly, the data must be firstly analyzed using Kolmogorov–Smirnov normality test. Regarding the significance of the related test (the statistics value being above the standard deviation), it can be concluded that the data are normal and the parametric methods can be used in the current study (Mirzadeh, 2009). In order to use the SEM in this stage, it is necessary to conduct the confirmatory factor analysis for the construct validity and then evaluate the measurement model between the variables; in fact, it is required to determine whether the chosen indices are accurate enough to measure the desired constructs or not. The confirmatory factor analysis (CFA)

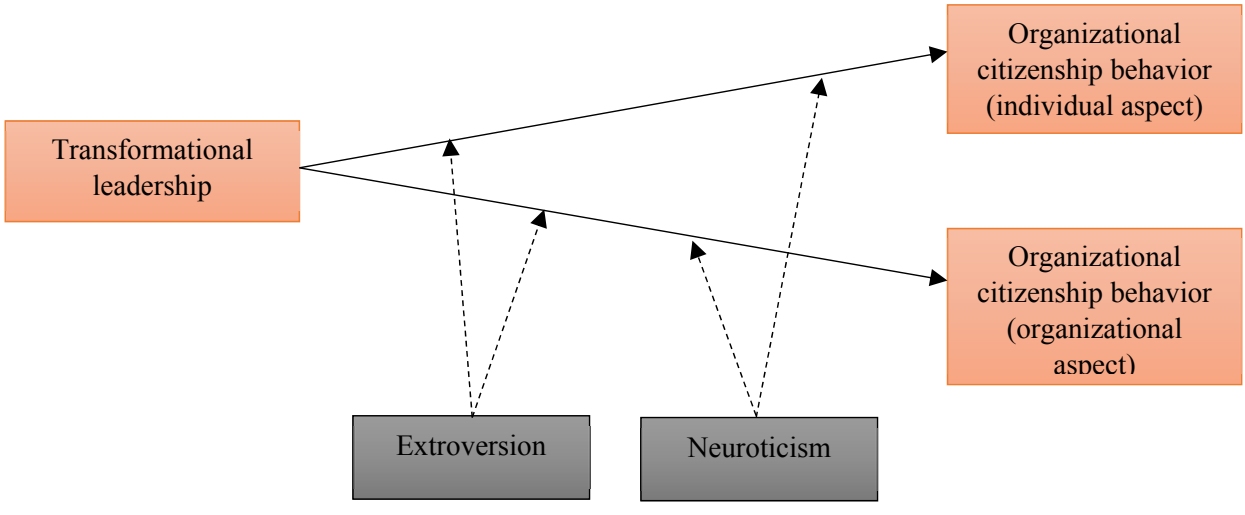

Figure 1: Research conceptual model

Table 3 - Descriptive statistics of the variables

Variables	Mean	Variance	Standard deviation	Skewness	Kurtosis
Transformational leadership	2.877	0.559	0.748	- 0.238	- 0.229
Organizational citizenship behavior (individual aspect)	3.898	0.351	0.593	- 0.066	- 0.266
Organizational citizenship behavior (organizational aspect)	4.070	0.347	0.589	- 0.636	- 0.805
Neuroticism	3.740	0.431	0.657	- 0.135	- 0.207
Extroversion	3.526	0.497	0.705	- 0.160	- 0.656

was calculated as 0.779 based on the Kaiser-Meyer-Olkin (KMO) index, which indicates that they are totally suitable for confirmatory analysis since its value is above 0.7. Also, Bartlett's test significance level is zero which means that the test is significant; the calculated value is lower than 0.05 (Sobhanifard et al., 2016). The model fit data of each of the variables of the study are listed in Table 4, which is indicative of the fitness of indices chosen for the measurement of the constructs.

The measured model fit indices of these variables tabulated in Table 4 indicates their suitable fitness. Moreover, the questions have a factor load of above 0.5, which confirms the validity of the construct. Also, the Cronbach's alpha (reflective) values of the all variables have been calculated to be larger than 0.7, which indicates the reliability of the questions. In addition, the average variance extracted (AVE) of all the variables is higher than 0.5 in the current study, which affirms the validity of the research variables.

In the current study, the transformational leadership was the independent variable, and the organizational citizenship behavior in the individual and organizational aspects were the dependent variables; the neuroticism and extroversion variables were also the moderator variables in the model, as depicted in the structural model (Figure 2).

According to Table 5, which tabulates the structural model fit indices, the model fitting is desirable and approves the main hypotheses of the study. In order to complete the data analysis and respond to the sub-hypotheses, especially the moderating effect of the research variables in relation to the main variables, the path analysis was conducted. The results of the analysis of linear relationships between each two variables and its combination are listed in the form of interactive coefficients in Table 6. These results are indicative of the testing status of the research hypotheses. Regarding the significance of t-statistics, all the hypotheses in the current study are approved.

6. Discussion and Conclusions

Regarding the results obtained from the data analysis, the first and second hypotheses are approved. In fact, the t-statistics of the first hypothesis and the second hypothesis are 2.483 and 3.136 respectively. Therefore, it can be stated with confidence that, in National Iranian Oil and Petroleum Distribution Company-Tehran Region, the transformational leadership has a significant effect on the citizenship behavior of the employees. The calculated coefficient of this hypothesis is 0.180, which indicates that the transformational leadership has a positive effect on the employees' organizational citizenship behavior from both individual and organizational aspects. From the results of this hypothesis testing, it can be inferred that the transformational leadership can form a dynamic and organic organizational structure in the organization, create flexibility in the tasks and freedom of action instead of prewritten job descriptions, grant authority instead of the concentration of decision-makings, and generally provide a desirable environment for the emergence of the citizenship behaviors in the organization. Winnington et al. (2004) also expressed that the employees working with the transformational leaders are usually motivated to work beyond their official tasks in order to benefit the organization.

Generally, the transformational leaders make the employees develop behaviors such as honest advocacy, loyalty, compliance and participation, self-sacrifice, conscientiousness, and civic virtue. Obviously, when the leaders create a mutual motivational relationship with the employees, the employees also behave in a way that generally benefits the organization; for example, they do the tasks which are not obligatory, but improve the organization

Table 4 - Measured model fit indices of research model aspects (Hooman, 2005)

Index	Acceptable value	Independent variable (transformational leadership)	Dependent variable (citizenship behavior)	Moderating variable (neuroticism and extroversion)
Chi-square divided to the degree of freedom	Lower than 3	2.661	2.736	2.988
Normed Fit Index (NFI)	Above 0.9	0.920	0.911	0.904
Increasing Fit Index (IFI)	Above 0.9	0.984	0.934	0.930
Conformation Fit Index (CFI)	Above 0.9	0.984	0.933	0.929
Root Mean Square Error of Approximation (RMSEA)	Close to zero	0.053	0.065	0.071

performance. Mirkamali et al. (2012) also reached the same conclusion in their study. Further, in a study by Baharlou et al. (2014), the mutual relationship of leader-member and the aspects of citizenship behavior were shown.

The hierarchical regression results of the main and interactional effects of the relationship between the transformational leadership and employees' organizational citizenship behavior from both aspects indicate that the main influences of the transformational leadership and neuroticism were significant in every stage. In addition, the interactional effect (0.658 in individual aspect and 0.615 in organizational aspect) between the transformational leadership and neuroticism remarkably influences employees' organizational citizenship behavior from both individual and organizational aspects. Therefore, the investigations reveal that the neuroticism plays a positive and moderating role in the relationship between transformational leadership and organizational citizenship behavior; thus, the third and fourth hypotheses are approved. In fact, the personality trait is a factor which can affect the role of transformational leadership. One of these personality traits is the neuroticism which includes attributes such as anxiety, depression, aggression, deviation, impulsive behaviors, and vulnerability to mental and physical stress. Hence, the lower the score of people in this trait is, the more the effects of transformational leadership will be. In this regard, Rafezi et al. (2012) reported that the consistency has a relationship with the organizational citizenship behavior. The study of Tan & Tan (2008) also indicated that there is a positive and significant relationship between responsibility aspect and the organizational citizenship behavior.

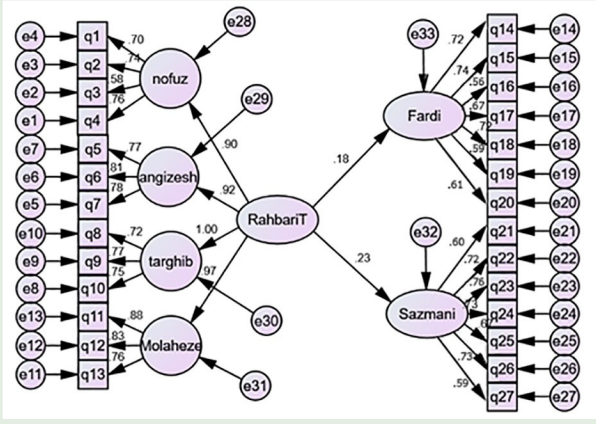

Figure 1: A structural model of hypotheses testing

Table 5 - The structural model fit indices of hypotheses

Index	Acceptable value	Value
Chi-square divided to the degree of freedom	Lower than 3	2.687
Normed Fit Index (NFI)	Above 0.9	0.913
Increasing Fit Index (IFI)	Above 0.9	0.932
Conformation Fit Index (CFI)	Above 0.9	0.931
Root Mean Square Error of Approximation (RMSEA)	Close to zero	0.043

The hierarchical regression results of the main and interactional effects of the relationship between the transformational leadership and employees' organizational citizenship behavior from both aspects indicate that the main effects of the transformational leadership and extroversion were considerable in every stage. Additionally, the interactional effect (0.662 in individual aspect and 0.523 in organizational aspect) between the transformational leadership and extroversion significantly affects the employees' organizational citizenship behavior from both individual and organizational aspects. Therefore, the investigations show that the extroversion plays a positive and moderating role in the relationship between transformational leadership and organizational citizenship behavior; thus, the fifth and sixth hypotheses are also approved. In fact, the extrovert people are usually social, talkative and emotional. As a result, the transformational leaders can better make a mutual relationship with such people; in extrovert people, these traits are a factor for their greater influence, and as a result, their citizenship behaviors show higher outcomes. Hence, the extroversion, as presented in hypothesis testing of the current study, has a significant moderating role in the effects of transformational leadership on employees' organizational citizenship behavior. Chiaburu et al. (2011) also conducted a study in the same field, and their results indicated that the extroversion has a significant relationship with

Table 6 - Testing results of the research hypotheses

Hypothesis				t-statistics	Standard coefficient	Result
1	Transformational leadership	Main hypothesis	Organizational citizenship behavior (individual aspect)	2.483	0.180	Approved
2	Transformational leadership	hypothesis	Organizational citizenship behavior (organizational aspect)	3.136	0.231	Approved
3	Transformational leadership	Moderating neuroticism	Organizational citizenship behavior (individual aspect)	7.943	0.658	Approved
4	Transformational leadership	Moderating neuroticism	Organizational citizenship behavior (organizational aspect)	8.340	0.615	Approved
5	Transformational leadership	Moderating extroversion	Organizational citizenship behavior (individual aspect)	11.225	0.662	Approved
6	Transformational leadership	Moderating extroversion	Organizational citizenship behavior (organizational aspect)	7.334	0.523	Approved

the citizenship behaviors and the contextual performance. In fact, the extroverts, i.e. people with acceptable social skills, can better help the transformational leaders in affecting the emergence of behaviors based on the organizational citizenship since these people, due to having social personality trait, better interact with the leaders who build their management style based on mutual relationship with their employees. They are also affected by these leaders faster since they have a better adaptability to the environment; as a result, they will be employees whose behaviors help with improving the organization performance.

7. Summary and suggestions

Regarding the findings of the current study, which are indicative of a positive and significant effect of transformational leadership on organizational citizenship behavior, the following suggestions are offered to the managers of National Iranian Oil Products Distribution Company-Tehran Region to pay attention to the transformational leadership factors and, consequently, to the improvement of organizational citizenship behavior from both individual and organizational aspects.

The first subject is the precise determination of the goal or specific cause of the organization. The managers must clearly and precisely design the goals for the employees so that they will be able to recognize the current situation, analyze it, and even be motivated and inclined to do some tasks beyond what is mentioned in their formal job description. However, the prerequisite for this is to ignore one's own desires and to sacrifice one's own interests for the benefit of others by integrating the goals of the individual and the organization. On the other hand, it requires flexibility, risk-taking, and acceptance of changes.

In fact, creation of an optimistic and clear image of the organization's future for the employees will lead to higher involvement and participation of employees in the realization of the goals since this optimistic thought to the future causes the employees to be more motivated to do their duties and encourage their subordinates to have a greater performance. Honesty with the employees and showing honesty with the employees in open relationship are the requisite of this task.

Furthermore, the managers and leaders themselves must be the model for organizational citizenship behavior and demonstrate it so that the employees also follow them and develop such behaviors. The managers must use the mental inspiration to challenge the thoughts, imaginations, and behaviors of the employees and to recognize their values and beliefs. It requires that the leaders guide the employees towards retesting of the traditional ways of problem solving. In such a condition, the employees' fault and mistakes, when exhibiting the citizenship behaviors, should not be frowned upon since it would repress such behaviors by them.

Recognition of and paying attention to individual differences and expecting the individuals to show citizenship behavior to the extent of their capability can pave the way for success in this task. Facilitation of the organizational learning for the employees and creation of the possibility to grow will help in the achievement of this goal; in fact, a time should be allocated to educate and train the employees to grow, which will help them to attain the ability to show citizenship behaviors. In this path, the managers are better to acknowledge those employees who show extra-role behaviors. This acknowledgement can be either financial and through the rewards or spiritual through announcing the best employee. It would encourage other employees to show citizenship behaviors. Finally, the organizations and managers must proceed in creation of organizational citizenship behavior step by step since this process, unlike a new technology, cannot instantly enter the organization and is a continuous and time-consuming process.

Moreover, in order to prevent the negative effects of neuroticism moderating variable, the managers had better assign their employees specific missions and prepare them or ask them to get prepared for those missions. However, the recognition of the attributes and personality traits of the employees play an important role in increasing the self-autonomy, variety, and taking new challenges in the neurotic employees. Further, creation of a participatory and effective organizational environment through the formation of working teams prepares these people for integration and connecting with each other. Avoidance of anxiety and depression and creation of a happy and cheerful space will effectively strengthen the performance of the organization and development of organizational citizenship behaviors.

In addition, the results of the analysis of the second moderating variable show that the extroversion personality trait is also effective on the relationship between the transformational leadership and organizational citizenship behavior. In this context, based on the attributes of these people such as the tendency to grow and improve and through the identification of these people and specifying the job direction and organizational development, their sense of loyalty and commitment to the organization can be improved.

The tendency of such people to beginning new tasks can prepare the platform for the initiation of more tasks with new and innovational methods and ideas. On the other hand, their energy can be used to encourage them to do more activities; indeed, these people are able to do several jobs simultaneously. Therefore, it is better to, by not confining them, provide them with this space. Finally, these people tend to change, and the change is exciting for them. In fact, job promotion and job replacement can take place for them every now and then, and other departments can also benefit from their capabilities.

Overall, in order to enjoy the positive effects of the transformational leadership, it is necessary to prepare the platform for the employees to take pride in their jobs, which will be possible through paying attention to the employee's emotions and using them for creation of motivation. The managers must encourage

the employees to learn more and offer new ideas and must take risks in order for the organizational growth to be realized. In this path, paying attention to the legitimate demands and needs of the employees and a common drawing for the achievement of these needs through the realization of the organizational goals must be taken into consideration.

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Designing a Suitable Intellectual Capital Reporting Framework in Iran's Oil Industry

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ABSTRACT

Due to the importance of technology and innovation in the oil industry, it is necessary to look more closely at the intellectual property of this industry. Intellectual capital is a concept which can classify and report the technology capabilities and knowledge spillover in a comparative format. The present research aims to provide an appropriate framework for reporting intellectual capital of companies in the oil industry. To this end, semi-structured interviews with 15 experts and people from petrochemical and petroleum companies with an intellectual and experiential thinking space were conducted. After the interview, the relevant data were analyzed by the thematic analysis method. Finally, the intellectual capital reporting framework was extracted as a qualitative research product. Then, a questionnaire was designed to assess the acceptance of the qualitative model and distributed among the statistical community consisting of the professors, Ph.D. students, and experts of different universities and companies. The results of the distributed questionnaire confirmed that the components of the framework were approved by the respondents.

1. Introduction

In today's world economic system, most of the wealth creation resources are based on non-physical features of organizations and companies such as knowledge and skills. In the past decades, physical assets such as machinery, equipment, and finance were the main resources of capital and profit creation by companies. Nowadays, however, knowledge and skill-based resources and generally the organization's intellectual capital have become more important than the other sources of wealth creation. Peter Drucker (1993), a key figure in management science, points out that in the coming era the more levels of physical capital, natural resources, and labor are not the main resources of the economy, but the main important resource is the knowledge; the current era is the knowledge era.

The identification and evaluation of the organization's intellectual capital is among the most important issues of the current decade, which has appeared in various fields of human sciences, specifically management and accounting. The importance of these kinds of capitals is continually increasing, and nowadays organizations and companies try to estimate the values these capitals and assets and include them in financial statements (for external organizational purposes) and management reports (for internal organizational purposes). Despite the importance of this issue, a considerable effort has not been made to identify and value these resources in our country.

Many attentions have been paid to intellectual capital reporting as a new technique in accounting, which can bring substantial organizational changes,

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especially in improving business performance at the company level. However, intellectual capital reporting as a management tool was criticized for its limited practical impact. Researchers have recently found that this can largely lead to success in developing countries (Yu et al., 2017).

Measuring the intellectual capital includes some criteria such as valuation and growth and some assets like ideas and thoughts, innovations, and creativity in various parts of the knowledge which are not considered as asset according to the traditional tools and standards of accounting. However, new valuation systems indicate and consider the effect of these assets on the market value of a company or organization. This matter also appears when comparing developed and developing countries because growth cannot be justified only based on tangible assets, and in many situations, high investment rates have an information-based and knowledge-based infrastructure.

Defining and identifying the criteria and indicators of intellectual capital and evaluating these capitals are one of the major problems and challenges of the organizations in the world today. Since our country is also moving towards a knowledge-based economy, where various policies such as the Sixth Economic Development Plan and Resistance Economics and the emphasis on internal power have been pointed out, the necessity for more attention to knowledge-based companies and organizations and the dimensions of their intellectual capital and reporting is felt. Hence, this paper aims to play a role in the theoretical and practical development of this area of knowledge by identifying the dimensions and components affecting the intellectual capital reporting of companies in the oil industry.

2. Theoretical foundations

Considering the magnitude of the oil industry in Iran having more than 200,000 people with a high level of expertise in the industry and its linkage to different sectors of the economy, measuring and reporting intellectual capital in this industry is of great importance. Therefore, a model should be designed and presented to identify and report intellectual capital of oil companies, especially the National Iranian Oil Company. Moreover, as stated above, the significant number of human resources in the industry with the education and professional expertise, the specific requirements of this industry from a strategic perspective, and the role of knowledge and technology in its development signifies the issue of intellectual capital in this industry and attaches particular importance to scientific and academic research in order to cover some of the existing gaps in its reporting and, consequently, the proper management of its items.

Intellectual capital as an intangible asset produced within an organization is itself a strategic source enabling the company to create a competitive advantage and superiority in financial performance. However, due to the poor reporting of its items, there is a kind of information asymmetry between management and the shareholders of the company in this area, which may lead to an increase in agency costs.

On the other hand, in a resource-based view, the superior performance of companies can result from the uniqueness and integrity of their resources or their ability to respond to the environment on time. In this context, differences in the performance of companies come from the fact that successful organizations benefit from the strategic (physical, human, and organizational) resources their competitors lack. Therefore, the difference in resources plays a significant role in the company's profitability. Although intellectual capital has a direct impact on the company's performance as one of its resources, it is neglected in the reporting process of the company.

The importance of intangible assets for the value creation process is increasing in all companies. While intangible assets averaged only 5% of the company's total assets in 1978, in the current economy, approximately 50-90% of the value created by the company originates from the intellectual capital management rather than the production of physical products (Chareonsuk and Chansa, 2008).

According to the empirical researches by Amir and Lev (1996), it was estimated that only 10 to 15% of the market value of the 100 American companies under study was nearly accurately recorded by traditional measurement instruments, meaning that it is necessary to incorporate non-financial information in the estimation of the companies' value. They believed that the best definition for stock prices could be derived from a mix of financial and non-financial factors. Most experts and scholars believe that the current financial reporting system cannot explain and report new resources such as intangible assets of the company, including communications and knowledge accumulation. Reporting such information can decrease the company's cost of capital by reducing the

uncertainty about future prospects and providing more accurate basis for valuation.

Generally, to more focus on the destructive effects of the lack of intellectual capital reporting in companies, the following reasons can be noted for the necessity of external reporting of intellectual capital.

- Minor stakeholders may be deprived of some information because they generally do not have access to information about the intangible assets of companies often issued in private meetings with major stakeholders (Shuai and Wang, 2010).
- Managers may abuse internal information generated on intangible items which are unknown to other investors and may engage in inside trading (Aboody and Lev, 2000).
- The liquidity of the stock market and demand for companies' securities are increased by further revealing intangible items (Diamond and Verrecchia, 1991).
- Stock fluctuations and the risk of false valuation growth, which causes investors and banks to consider a higher level of risk for companies.
- Placing higher levels of risk on companies increases the cost of capital.

3. Literature review

The concept of intellectual capital was initially presented by Peter Drucker in the field of management in describing the post-capitalist society. At the end of the 1990s, the concept of intellectual capital and knowledge in the scientific resources of management and business became widespread (Bontis, 2002). Over time, intellectual capital management has become a broad scope and has entered into the areas of financial reporting and accounting of organizations. In an initial research on voluntary intellectual capital disclosure, Guthrie and Petty (2000) investigated the reporting manner of the top 20 Australian companies in six different industries. They measured the extent and range of different levels of intellectual capital published in the annual reports of companies using the content analysis. They examined 24 variables of three components of the intellectual capital of which six variables were related to human capital, nine were related to structural capital, and nine were related to relational capital. The results of their research revealed that 30% of disclosed items were related to structural capital, that about 40% was related to relational capital, and that about 30% was related to human capital.

Capello and Faggian (2005) in a research concluded that, contrary to the past when innovation and creating value-added were considered to occur by large-sized companies, small and knowledge-based companies have more innovative capacity, which is related to the attention to the knowledge spillover in these companies and fortifying their relational capital and collective learning. In other words, the confrontation of these companies with external factors and the positive relationship with the knowledge environment increase the intellectual capital and then the human capital and relational capital of these companies. Therefore, intellectual capital is conceptually beyond human capital and is a combination of human, structural, and relational resources of the company. The components of intellectual capital and their weights show how these components interact with enhancing the knowledge function and its value for the whole organization (Chaminade and Roberts, 2003).

Some studies in the field of intellectual capital reporting have shown that the qualitative, but not quantitative, disclosure of intellectual capital has the greatest benefit to companies in terms of cost-benefit. Quantitative and mathematical models of the intellectual capital disclosure are not positively referenced and are often caught in the trap of balance between reliability and relevance. Moreover, the fear of separated costs may also prevent companies from engaging in quantitative and reliable disclosure of intellectual capital information (Bellora and Guenther, 2015).

Ola et al. (2016) studied the relationship between intellectual capital and productivity in pharmaceutical companies. They investigated a sample of 19 companies and used the intangible value model to measure the value of intellectual capital and the Pulic model to analyze the intellectual capital efficiency. They also calculated productivity using the value-added ratio obtained for each employee. Finally, the results indicated that there is a positive and significant relationship between the value of intellectual capital and productivity.

Kianto et al. (2018) argued that in order to remain relevant in the face of the increasing knowledge intensity of work, organizing, and value creation, the measurements of intellectual capital (IC) should revisit the foundations of what knowledge is. In order to regain this understanding, they proposed four critical themes that should be better recognized in IC measurement: multi-dimensionality, human

agency and action, conceptuality, and temporality and dynamics.

Chia and Chien (2019) in their research concluded that, overall, the human, process, and customer capitals are major dimensions that affect the oil industry in maintaining good operating performance. The findings can serve as a reference to the operating performance evaluation of oil industry firms and to the establishment of a well-planned management system, thereby giving the service quality and operating performance of the accounting firms an advantage.

Adesina (2019) examined the effects of intellectual capital (IC) on technical, allocative, and cost efficiencies for a panel of 339 commercial banks operating in 31 African countries over the 2005–2015 period. His findings, which are based on Tobit and one-step generalized method of moments (GMM) regressions, provide evidence that IC have positive effects on bank technical, allocative, and cost efficiencies.

4. Methodology

This research is an applied research in terms of the purpose. On the other hand, in terms of the nature of data (and analysis methods), it is a qualitative exploratory research and deals with qualitative data. A qualitative research is referred to as any kind of research the findings of which are not derived by statistical operations or numerical methods. A qualitative analysis has a completely different approach to data. In this type of research, the researcher should examine and analyze the documents and information logically and thoughtfully to discover the truth and facts and to judge the hypotheses (Hafeznia, 2006).

4.1. Thematic analysis

In this work, the thematic analysis is applied to analyzing the data. Among the diverse and complex qualitative approaches, the thematic analysis utilizes a suitable and flexible approach to analyzing qualitative data (Brown and Clark, 2006). The thematic analysis is suitable for identifying, analyzing, and reporting patterns (themes) within the data. Each theme contains an important fact about the data related to the research question. The researcher's judgment is necessary to determine the research themes.

4.2 Codes generation

Codes are features of data (semantic or content) which seem to be interesting for analysis. The codes combining with each other form the themes. In this study, English letters and numbers are applied to coding as follows:

The interviewees are coded using English letters. The letters A to O are used here according to the total number of the interviewees, which were 15.

A special number is assigned to indicate the code number related to each important or influential phrase so as to access the main themes and conceptual categories from the researcher's point of view. This code begins at 1 for each text (the interviewee) and is increased naturally.

Each analysis unit (any text or interview) is numbered with one of the letters A to O. The codes in each analysis unit also start at 01, and the number of the code for that unit of analysis is incremented by one unit in the domain of the natural numbers. Therefore, each code consists of two components: the first one is the English letter assigned, and the second specifies the number of the targeted analysis unit.

4.3 Statistical population and the sample

For the semi-structured interviews, the statistical community includes the professors of the accounting discipline with at least a degree of associate professor, as well as the managers and experts of seven companies, including Pars Oil and Gas Company, Iranian Offshore Oil Company, Kalanaft Company, Petroleum Industry Health Organization, National Iranian South Oil Company, Iranian Central Oil Field Company, and Iranian Oil Pipelines and Telecommunication Company. The statistical population of the questionnaire consists of the above-mentioned statistical population plus Ph.D. graduates and students in the fields of accounting and different subfields of management. The sample used for conducting the interviews includes experts who are identified by the researcher based on previous studies as scholars in the area of intellectual capital. Statistical samples are selected based on the snowball method in which new interviewees are introduced by the previous ones. In snowball sampling, participants are selected in connection with the others, and the selected ones guide the researcher to the other people in the population. In this research, 15 interviews were conducted until theoretical saturation was achieved. Since it was not possible to provide a complete population framework for random sampling, a judgmental or accessible sample was used. 76 out of 109 distributed questionnaires were completed and delivered to the researcher.

Table 1 - Thematic analysis along with the codes of each theme.

No. of the main themes	Description of the main theme	No. of the sub-themes	Description of the sub-theme	No. of the concepts	Description of the concept	Code num ber
A	Human capital	A1	Individual dimension of human capital	A1-1	Technical staff	C2-D4-O1-P2-L2
				A1-2	Upstream section	C3-B2-B6-K3-J10-I2
				A1-3	Training and education	C2- E2-F3
				A1-4	Highly skilled engineers	A4-D2-H2-P11
				A1-5	Downstream section	G3-F8
				A1-6	Good English knowledge	C3-C4-E1
				A1-7	Specific job requirements	D4-F2-M2
				A1-7	Specific job requirements	D2-F4-G9-O5
		A2	Occupational (profes-sional) dimension of human capital	A2-1	Work discipline and environment	D2-K2
B	Relational capital		External rela-tional capital	B1-1	Oil customers	J2-K4-G4
				B1-2	Specific customers	C1-E2-B5-D2- H2- I3
				B1-3	Customer long-term relationship	C1-E2-B5- H2
				B1-4	Virtual cooperation	G4
				B1-5	Customers' royalty	B7-K1-I3
				B1-6	Favorable contracts	H11-M4
				B1-7	Limited number of customers' cooperation	I3-D3-E3
			B2	B2-1	Personnel relations	D8-F7-H6
				B2-2	Joint work meetings	D6-H6-J10-O12
				B2-3	Managers' reputation	M4
				B2-4	Managers' dealing mode with each employee	D9-I8-F7
C	Structural capital	C1	Organizational ownerships	C1-1	Integrated laws and rules	P2-B3-O7
				C1-2	Reward system	N2-O5
				C1-3	High disciplined environment	A1-J11
		C2	Organizational structures	C2-1	Special equipment & infrastructure	D13-N3
				C2-2	Hierarchical supervision	C5-B7-D2-F1-G1- I2- L2-N1-P2
				C2-3	Oil resources	D2- G3-J2
				C2-4	Huge infrastructures	H1
D	The importance of intellec-tual capital measurement and reporting	D1	Intellectual capital-related aspects	D1-1	Equal importance of intellectual and physical capital in the oil industry	C1-B1- F2-M1-N1-O1
				D1-2	Importance of evaluating disclosure of IC information	B1-D2- F2-H7- L5- P4
				D1-3	Using as a management tool in the oil industry	B1-D6-M1-N1-O1
				D1-4	The role of knowledge in new discoveries	C1-B1- F2
				D1-5	Distinguishing between the qual-ity of IC in oil and other industries	F2- N1
				D1-6	The large number of skilled per-sonnel in the oil industry	I1-C2- E6- B3
				D1-7	Cost-benefit consideration	G6- C6- E4- H1
				D1-8	Auditing intellectual capital reports	D23-G17-H13-L16-M9-N7-O8
		D2	Infrastructures required at the macroeconomic level of the country	D2-1	More competitive economic environment	B5-D6-F2-J6-O11
				D2-2	Development of knowledge-based companies	C9- K6-L8-N2
				D2-3	Economic structure of the country	B3-F11-M9-K8
				D2-4	Sixth Program of Economic Development	I1-C2- E6-B3-N1-O1
				D2-5	Prerequisites for economic growth	F6-K2-E7
E	Aspects of reporting intel-lectual capital	E1	Aspects of reporting intellectual capital	E1-1	Attention to value judgment	E2- C3- F11- L7
				E1-2	Measurement problems	H6-E2-C3-F4-I9
				E1-3	Unique framework for reporting	M9-E3-D11-O6
				E1-4	Entering value judgments in reporting	D13-F5-N8
				E1-5	Unreliability of some information	E14-G2-I13
				E1-6	Senior management support	B4-N4-L15-N6

4.4 Data collection method

The data were collected in two ways:

4.4.1. Interview

Considering the background of individuals and using the advice of the relevant experts and professors, the interviews were conducted in total with 15 experts in the area of intellectual capital. It should be noted that according to the snowball method, in each interview, new potential interviewees are introduced by the current interviewee at the request of the researcher to be considered in the next stage. It is also worth noting that the conducted interviews were of a semi-structured type.

4.4.2. Questionnaire

A questionnaire consisting of 46 questions was designed based on the components of the model and was delivered to the experts to evaluate the acceptability of the developed model based on the interviews. The questionnaire measured the degree of the agreement of respondents based on the five-point Likert scale from the complete agreement to complete disagreement.

5. Research findings

5.1 Thematic analysis

The qualitative data obtained by reviewing the texts and interviews were coded and categorized to find the themes. Then, the themes in the data were determined and named. Table 1 represents the results of the thematic analysis along with the theme categories and the codes of each one, based on which the qualitative model is drawn in Figure 1.

Figure 1 represents the model obtained from the analysis of the interview texts using the thematic analysis method. As can be seen in this figure, there are generally three aspects of the importance of intellectual capital reporting from the experts' point of view. In the first part of the framework, items that should be considered in intellectual capital reporting are discovered in three branches of human capital, structural capital, and communication capital. These items are based on the expertise and experience of the interviewees and on the questions asked by the researcher. Furthermore, the importance of intellectual capital reporting of companies in the oil industry was also discussed by the interviewees, which can be seen in the form of the final themes in the framework of

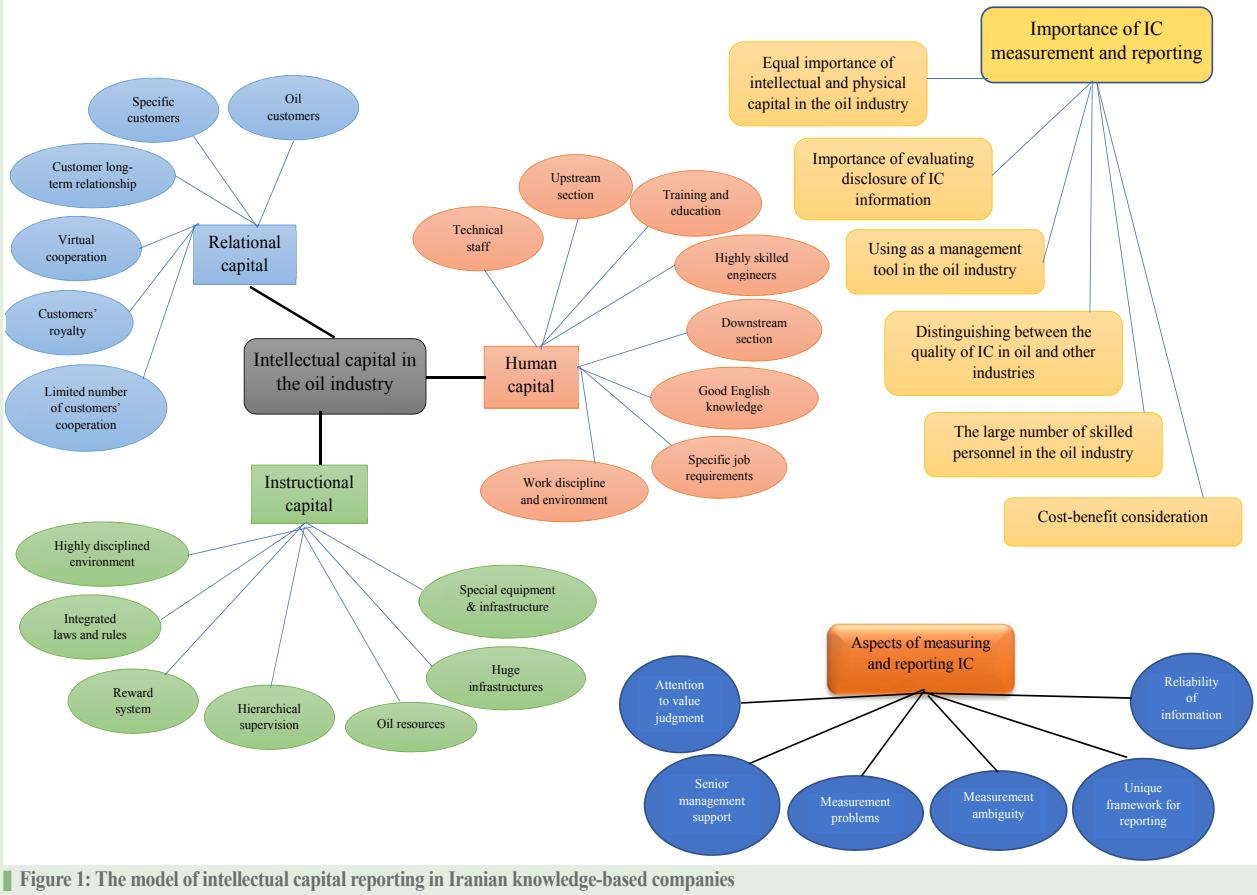

Figure 1: The model of intellectual capital reporting in Iranian knowledge-based companies

Table 2 - Results of the binomial test.

	Question No.	Groups	Groups characteristics	The number of each group	Percentage of each group	Significance	Result
Technical knowledge	1	Group 1	<-3	3	0.04	0.001	✓
		Group 2	>3	73	0.96		
		Total		76	1.00		
Training and education	2	Group 1	<-3	5	0.06	0.000	✓
		Group 2	>3	71	0.94		
		Total		76	1.00		
Job aptitudes	3	Group 1	<-3	11	0.15	0.020	✓
		Group 2	>3	65	0.85		
		Total		76	1.00		
Work-related knowledge	4	Group 1	<-3	31	0.41	0.389	-
		Group 2	>3	45	0.59		
		Total		76	1.00		
Variability	5	Group 1	<-3	14	0.18	0.001	✓
		Group 2	>3	62	0.82		
		Total		76	1.00		
Innovation and on-time response ability	6	Group 1	<-3	10	0.13	0.000	✓
		Group 2	>3	66	0.87		
		Total		76	1.00		
Entrepreneurial characteristics	7	Group 1	<-3	52	0.68	0.803	-
		Group 2	>3	24	0.32		
		Total		76	1.00		
Periodic employee assessment	8	Group 1	<-3	11	0.14	0.041	✓
		Group 2	>3	65	0.86		
		Total		76	1.00		
Professional certificates	9	Group 1	<-3	62	0.81	0.518	-
		Group 2	>3	14	0.19		
		Total		76	1.00		
Business trademarks	10	Group 1	<-3	5	0.07	0.010	✓
		Group 2	>3	71	0.93		
		Total		76	1.00		
The importance of customers	11	Group 1	<-3	70	0.92	0.604	-
		Group 2	>3	6	0.08		
		Total		76	1.00		
Customers' commitment	12	Group 1	<-3	13	0.17	0.003	✓
		Group 2	>3	63	0.83		
		Total		76	1.00		
Returning orders	13	Group 1	<-3	42	0.55	1.000	-
		Group 2	>3	34	0.45		
		Total		76	1.00		
Business cooperation	14	Group 1	<-3	39	0.51	0.614	✓
		Group 2	>3	37	0.49		
		Total		76	1.00		
The number of main customers	15	Group 1	<-3	17	0.22	0.013	✓
		Group 2	>3	59	0.78		
		Total		76	1.00		
Political rents	16	Group 1	<-3	29	0.38	0.041	✓
		Group 2	>3	47	0.61		
		Total		76			
Personnel relations	17	Group 1	<-3	13	0.17	0.019	✓
		Group 2	>3	63	0.83		
		Total		76	1.00		
Joint work meeting	18	Group 1	<-3	19	0.25	0.035	✓
		Group 2	>3	57	0.75		
		Total		76	1.00		
Managers' good reputation	19	Group 1	<-3	9	0.12	0.004	✓
		Group 2	>3	67	0.88		
		Total		76	1.00		
Managers' dealing mode with each employee	20	Group 1	<-3	23	0.16	0.049	✓
		Group 2	>3	53	0.84		
		Total		76	1.00		
Business rights	21	Group 1	<-3	12	0.16	0.043	✓
		Group 2	>3	64	0.84		
		Total		76	1.00		
Product quality indicators	22	Group 1	<-3	18	0.23	0.021	✓
		Group 2	>3	58	0.77		
		Total		76	1.00		
Business secrets	23	Group 1	<-3	50	0.66	1.000	-
		Group 2	>3	26	0.34		
		Total		76	1.00		

	Question No.	Groups	Groups characteristics	The number of each group	Percentage of each group	Significance	Result
Management philosophy	24	Group 1	<-3	14	0.18	0.011	✓
		Group 2	>3	62	0.82		
		Total		76	1.00		
Organizational culture	25	Group 1	<-3	58	0.76	0.003	✓
		Group 2	>3	18	0.24		
		Total		76	1.00		
Managerial processes	26	Group 1	<-3	21	0.27	0.048	✓
		Group 2	>3	55	0.73		
		Total		76	1.00		
Information systems	27	Group 1	<-3	41	0.53	0.811	-
		Group 2	>3	35	0.47		
		Total		76	1.00		
The importance of intellectual capital against physical capital	28	Group 1	<-3	44	0.58		-
		Group 2	>3	32	0.712		
		Total		76	1.00		
The importance of evaluating the disclosure of intellectual capital information	29	Group 1	<-3	31	0.41	0.003	✓
		Group 2	>3	45	0.59		
		Total		76	1.00		
The importance of intellectual capital in knowledge-based companies	30	Group 1	<-3	16	0.21	0.003	-
		Group 2	>3	60	0.79		
		Total		76	1.00		
Using as a management tool	31	Group 1	<-3	58	0.76	0.003	✓
		Group 2	>3	18	0.24		
		Total		76	1.00		
Attention to the quality of intellectual capital	32	Group 1	<-3	21	0.27	0.048	-
		Group 2	>3	55	0.73		
		Total		76	1.00		
Precise valuation of intellectual capital	33	Group 1	<-3	41	0.53	0.811	-
		Group 2	>3	35	0.47		
		Total		76	1.00		
Cost-benefit consideration	34	Group 1	<-3	44	0.58	0.712	-
		Group 2	>3	32	0.42		
		Total		76	1.00		
Auditing intellectual capital reports	35	Group 1	<-3	31	0.41	0.037	✓
		Group 2	>3	45	0.59		
		Total		76	1.00		
More competitive economic environment	36	Group 1	<-3	15	0.20	0.003	-
		Group 2	>3	61	0.80		
		Total		76	1.00		
Development of knowledge-based companies	37	Group 1	<-3	21	0.27	0.048	✓
		Group 2	>3	55	0.73		
		Total		76			
Economic structure of the country	38	Group 1	<-3	41	0.53	0.811	-
		Group 2	>3	35	0.47		
		Total		76	1.00		
Sixth Program of Economic Development	39	Group 1	<-3	40	0.52	0.712	-
		Group 2	>3	36	0.48		
		Total		76	1.00		
Prerequisites of the economic growth	40	Group 1	<-3	31	0.41	0.037	✓
		Group 2	>3	45	0.59		
		Total		76	1.00		
Measurement ambiguity	41		<-3	16	0.21	0.003	✓
			>3	60	0.79		
				76	1.00		
Measurement problems	42		<-3	17	0.21	0.003	✓
			>3	59	0.79		
				76	1.00		
Unique framework for reporting	43		<-3	19	0.27	0.048	✓
			>3	57	0.73		
				76	1.00		
Entering value judgments in reporting	44		<-3	43	0.53	0.811	-
			>3	34	0.47		
				76	1.00		
Unreliability of some information	45		<-3	44	0.58	0.712	-
			>3	32	0.42		
				76	1.00		
Senior management support	46		<-3	31	0.41	0.037	-
			>3	45	0.59		
				76			

Figure 1 after summarizing and categorizing them. Finally, in terms of the various aspects of intellectual capital reporting, extractive keywords were set up from the viewpoints of the corporate experts and academics in the form of the final themes in the final framework.

5.2 Analysis of questionnaire data

A questionnaire was designed and given to the experts to evaluate the degree of their agreement about the proposed qualitative model. After collecting and extracting the data from the completed questionnaires, the SPSS software version 19 was used to analyze them. The questionnaire consisted of 46 questions designed based on the components of the developed qualitative model (Figure 1). 76 questionnaires were completed and delivered to the researcher. Each item in the questionnaire measured the degree of the agreement of respondents about the corresponding statement based on the five-point Likert scale from the complete agreement to complete disagreement. Finally, the collected responses were quantitated as follows, and they were analyzed based on the numerical value.

Totally disagreeing=1, disagreeing=2, not commenting=3, agreeing=4, totally agreeing=5.

We first examined the reliability and validity of the questionnaire. Reliability is the stability of measures by repeating the measurement (Azkia and Darban Astaneh, 2003). Cronbach's alpha was used to assess the reliability of the questionnaire. A value of Cronbach's alpha equal to 0.781 for 46 questions of the questionnaire indicated that the questionnaire had sufficient reliability. Validity is the degree of conformity of observations and research questions with the main purpose of the research.

The Kolmogorov-Smirnov test was used to check the normality of the research variables.

H_0: Data has a normal distribution.

H_1: Data does not have a normal distribution.

Based on the results of the test at a significance level of 5% ($\alpha = 0.05$), it was found out that the distribution of none of the questions in the questionnaire was normal. Therefore, a non-parametric binomial test was performed for all the questions.

The hypotheses of the binomial test for checking the mean of the questions are as follows:

H_0: More than half of the respondents did not agree with the proposed statement ($P \leq 0.05$).

H_1: More than half of the respondents agreed with the proposed statement ($P > 0.05$).

Table 2 presents the results of the binomial test. The statement related to each question is given in a summarized form along with the related question number to facilitate the readability of the results.

6. Conclusion and Recommendations

The specific result of this study presents the reporting model of the intellectual capital in the oil industry companies, as illustrated in Figure 1. In addition to the various types of reporting, which include a mixed form of reporting, i.e. quantitative-qualitative reporting, the model provides factors and criteria for reporting intellectual capital. Moreover, the various aspects of reporting are discussed in general. Based on the interviewees' responses, the average weight of the components of the model is tabulated in the below table:

Furthermore, based on the results of the questionnaire analysis, 33% of the total answers were related to human capital criteria; also, 24% and 14% were respectively related to relational capital and structural capital; 10% and 19% were assigned to the aspects of intellectual capital reporting and the importance of intellectual capital measurement and reporting respectively.

Since the statistical population of the present study includes the managers and experts of oil companies as well as professors and experts in accounting and human resources fields and since the research method is qualitative and uses soft data (interview and questionnaire), no research similar to the current one in the field of intellectual capital reporting has been conducted to compare our results and to confirm previous internal or external findings. However, the only work done in Iran can be the work of Zahedi et al. (2013) which designed a model for measuring intellectual capital in Iranian state cultural organizations. It is necessary to explain that the majority of internal researches in Iran in this area are based on correlation and regression methods and have only examined the relationship between intellectual capital and firm performance indicators; most of them have used Pulic model (1997) for measuring intellectual capital. Furthermore, external works in the area of intellectual capital reporting have been limited to questionnaire research and content analysis as mentioned in the literature review section; however, due to the structure of the present study, we cannot compare our results with their findings.

Considering the magnitude of the oil industry in Iran having more than two thousand people with a high level of expertise in the industry and the connection of the oil industry with the different sectors of the economy,

reporting intellectual capital in this industry is of great importance. Therefore, the model of identifying and reporting intellectual capital should be designed and presented for oil companies, especially National Iranian Oil Company. The authors do not claim that the model presented is the only possible model, the only right model, or even the best possible model, but we claim that considering the current situation and the growth and expansion of intellectual assets at the level of companies, especially companies in the oil industry, we had better take a minimalistic action to capture the effects of intellectual capital in the financial statements of Iranian companies. This is important in addition to the usefulness of the users of this kind of information. Corporate executives also have the ability to manage their intellectual capital.

As pointed out in the literature review, the knowledge-based economy now plays a significant role in global economic growth and development. In recent decades, intellectual and intangible assets have replaced physical and fixed assets. In the current work, the experts also believed that the country's movement towards a knowledge-based economy, the development of knowledge-based companies, and a significant increase in competition among knowledge-based companies have increased the importance of intellectual capital more than before. Therefore, regarding the importance of intellectual capital in the oil industry companies due to the important role of knowledge therein, the issue of providing information about intellectual capital reporting has become significant at the macroeconomic level of the country's economy.

In addition, the study of the components and concepts obtained from the research process, as seen in Figure 1, as well as the examination of the codes derived from the interviews, shows that intellectual capital reporting may have some disadvantages. In this context, the difficulty in measuring intellectual capital, the low reliability of some information, the negative effects of the value judgments on the reporting process, and ambiguity in measuring some of the criteria have been mentioned by the interviewees.

Regarding the output effects of the intellectual capital reporting, based on the framework obtained, it was found out that one of the important implications of reporting intellectual capital in an organization is the application of intellectual

Table 3 - The average weight of the model components based on the interviewees' responses

Human capital		Relational capital		Instructional capital		Aspects of reporting IC		Importance of IC measurement and reporting	
Component	Weight	Component	Weight	Component	Weight	Component	Weight	Component	Weight
Technical staff	0.80	Oil customers	0.60	Highly disciplined environment	0.40	Attention to value judgment	0.60	Equal importance of intellectual and physical capital in the oil industry	0.33
Upstream section	0.73	Specific customers	0.80	Integrated laws	0.53	Senior management support	0.27	Importance of evaluating disclosure of IC information	0.40
Training and education	0.67	Customer long-term relationship	0.93	Reward system	0.47	Measurement problems	0.4	Using as a measurement tool in the oil industry	0.53
Highly skilled engineers	0.80	Vertical cooperation	0.67	Hierarchical supervision	0.60	Measurement problems	0.93	Distinguishing between the quality of IC in the oil and other industries	0.73
Downstream section	0.87	Customer royalty	0.8	Oil resources	0.87	Measurement ambiguity	0.87	The large number of skilled personnel in the oil industry	0.27
Good English knowledge	0.60	Limited number of customers' cooperation	0.87	Huge infrastructures	0.73	Unique framework for reporting	0.40	Cost-benefit consideration	0.80
Specific job requirements	0.73			Special equipment and infrastructures	0.80	Reliability of information	0.60		
Work discipline and environment	0.53								

capital reports as an important management tool. Also, most interviewees believed that intellectual capital reports should be audited.

The following topics are proposed for future research:

- Based on the results obtained herein, it is suggested that, in future research, a number of oil industry companies and users should be experimentally provided with the data modified by the present model. Then, the decisions made by the users who have modified information are compared with the decisions made by a control group who do not have this information.
- It is suggested that different groups of users of the financial statements of Iranian oil companies be studied, and their views on the impact of measuring intangible assets on the decisions they make are carefully documented and evaluated. Such information can be of great help in determining the best model for reporting intangible assets in financial reporting in oil companies.
- It is recommended that the model obtained from the current research be applied to a unique company in an exemplary manner.
- Conducting separate research in the area of quantitative variables can be reported for all companies.
- Performing a similar study on organizations and state-owned companies and comparing its results with the results of the present work.

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