Master's Thesis in Engineering

Assessment of Kazakhstan Petroleum Fiscal Regime for Investment Decision

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Graduate School of Seoul National University

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이 논문을 공학석사 학위논문으로 제출함

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Abstract

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Despite the rapid growth and development of renewable energy sources, the petroleum industry still plays a vital role in the world economy. Moreover, the oil and gas industry is a dominant sector in each country's economy whether it is a producing or consuming country, and the Kazakhstani economy is not an exception.

Kazakhstan's petroleum fiscal regime faces considerable challenges with respect to the tradeoff between two main goals of taxation, namely, how to obtain more economic rent and attract foreign investments in the industry.

Therefore, this thesis investigates the effects of Kazakhstan's petroleum fiscal regime on the investors' decisions, and compares Kazakhstan's fiscal terms with those of the Russian Federation to rank them.

The first part of this study consists of the descriptive analysis and qualitative method. In particular, it analyzes the "Survey of the decision makers' attitudes towards indicators of project assessment and Kazakhstan's fiscal regime" solicited from the South Korean oil and gas industry key players as

well as experts from the Ministry of Energy of the Republic of Kazakhstan. The findings are then summarized to provide a base for further quantitative analysis and identify approaches to improve the existing petroleum fiscal regime in Kazakhstan.

The second part of this study employs the qualitative method developed by Luo and Yan (2010), which includes calculation of the following indicators: Government Take, Front Loading Index. and Composite Score.

The assessment of a petroleum fiscal regime requires a rigorous and substantial work. The Government Take indicator is calculated in this study by simulating the discounted and non-discounted cash flow models, the Front Loading Index is calculated to bridge the gap between non-discounted and discounted Government Take, while the Composite score is computed by building linear weighting functions to identify the advantages of the Kazakhstan petroleum fiscal regime in comparison with the Russian Federation.

Therefore, this thesis contributes to Kazakhstan's petroleum taxation development, and provides policy recommendations to improve the investment climate in the oil and gas industry.

Key words: Fiscal Regime, Petroleum Taxes, DCF, NDCF

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Chapter 1. Introduction

This chapter introduces the purpose of this master's thesis, explains its significance, and establishes the rationale, objectives, contributions, and structure of the research.

1.1 Research rationale

Despite the rapid growth and development of renewable energy sources, the petroleum industry still plays a vital role in the world economy. Various oil and gas products are used worldwide in daily life. Therefore, the oil and gas industry is a dominant sector in each country's economy whether it is a producing or consuming country.

According to the U.S. Energy Information Administration's latest International Energy Outlook, petroleum-based fuels remain the world largest energy consumption sources (EIA, 2017). However, owing to the oil price collapse in 2014 from 110 dollar per barrel to 50 dollar per barrel and the oil price volatility continuing to date, international oil companies (IOC) have become cautious with regard to new exploration and oil and gas production projects. In this regard, investors consider not only resource factors, such as the geological conditions, infrastructure, exploration success ratio, and political stability, but also non-resource factors such as the attractiveness of a country's petroleum fiscal terms (Dongkun Luo & Yan, 2010).

Petroleum fiscal terms have a direct influence on petroleum production and the allocation of profit shares between IOCs and a host government. Furthermore, fiscal terms are important components that IOCs draw upon during the project evaluation. Resource countries manage fiscal terms to attract investments in oil and gas exploration projects. Therefore, formulating an appropriate petroleum fiscal policy is a difficult task, since it should consider interests of both IOCs and the host Government.

As of the end of 2017, Kazakhstan's proven crude oil reserves were estimated at 30 billion barrels, ranking at the 12th place worldwide, while natural gas proven reserves were estimated at 85 trillion cubic feet ("Kazakhstan - International - Analysis - U.S. Energy Information

Administration (EIA)," n.d.). According to Kazenergy "National Report," Kazakhstan exported 80% of the oil produced and around 30% of the natural gas produced as of the end of 2016, thus making the petroleum industry a pillar of Kazakhstan's economy and attracting many investments in the country (Kazenergy, 2017). Moreover, the forecasts of global oil prices suggest that the prices will remain at a low level in the long term, and the fierce competition between oil and gas producing countries with respect to attracting investments for exploration and production projects will grow. Therefore, an assessment of Kazakhstan's upstream petroleum fiscal regime is necessary for the Kazakhstani government.

It is important to explain the necessity to compare the Kazakhstani and Russian petroleum fiscal regimes. The Russian Federation, as one of the largest crude oil and dry natural gas producers worldwide, has enormous proven oil reserves, which were estimated at 80 billion barrels as of the end of 2016 (EIA, 2017). Furthermore, in 2014, the governments of Russia and Kazakhstan announced a new "Project Eurasia" that aims at discovering new large- and medium-sized fields in the Precaspian Basin on both Kazakhstani and Russian territories. It should be noticed that the Precaspian Basin is divided between Kazakhstan and Russia on a basis of 75% and 25% of the area, respectively. Since both countries highly depend on the petroleum industry, there will be a competition between them for attracting investment in exploration and production projects in the Precaspian Basin. Therefore, it is important to compare the petroleum fiscal regimes of these two countries.

1.2 Research objectives

Considering the information mentioned in previous Section 1.1, the main purpose of this research is to analyze Kazakhstan's petroleum fiscal regime and find out whether it can attract IOCs. One of the most important reasons to discuss the petroleum fiscal regime is that the tax framework, nowadays, is one of the major components of the overall attractiveness of a country to foreign investors. Moreover, owing to the reduction in global capital expenditure, investments are analyzed carefully and go to countries with more attractive regulatory and fiscal regimes.

Furthermore, this research ascertains through survey technique the effects of Kazakhstan's petroleum fiscal regime on the investors' decisions. Kazakhstan's petroleum fiscal regime faces many challenges with respect to the tradeoff between two main goals of taxation, namely, how to get more economic rent while attracting foreign investments in the petroleum industry (Bond, Stephen; Devereux, Michael; Saunders, 1987). A low level of tax rates leaves the host country, which is the resource owner, a small and unequal portion of profit (Mercier, 1999). Conversely, high tax rates discourage both investments in the new exploration and production projects and investments in maintenance projects that are required to sustain the existing operations and maximize future value added (Crowson, 2003).

Another significant objective of this thesis is to compare Kazakhstan's fiscal terms with those of the Russian Federation regime to rank them. Such analysis will be useful for investors to choose the country with a more appropriate petroleum tax regime with regards to the Eurasia project.

Therefore, this research also measures the Government Take and Front Loading Index indicators, with the results used for the quantitative analysis, specifically in the Composite Score indicator's calculations, to evaluate the attractiveness level of petroleum fiscal terms of the Republic of Kazakhstan and Russian Federation.

1.3 Research Contribution

This thesis regarding the assessment of Kazakhstan's petroleum fiscal regimes is significant for both Kazakhstan's government and IOCs for many reasons.

First, the drop in global oil prices poses a significant challenge for Kazakhstan's government, as it needs to evaluate its petroleum fiscal regime attractiveness level, and enhance it form the investor's perspective. As a result of the negative global trends in the oil and gas field, capital investments in exploration and production projects dropped significantly; not only in Kazakhstan, but also in all resource rich countries. According to IHS Markit outlook, global spending declined from $700 billion in 2014 to $380 billion in 2017 (see Figure 1.1). Despite the slight yearly growth in the forecasts of exploration and production capital investment spending, IHS Markit argues that investors selectivity focus on the highest-return projects (IHS Markit, 2018). In this regard, assessment of Kazakhstan's regime will help to understand the drawbacks of its petroleum fiscal terms and improve its investment climate.

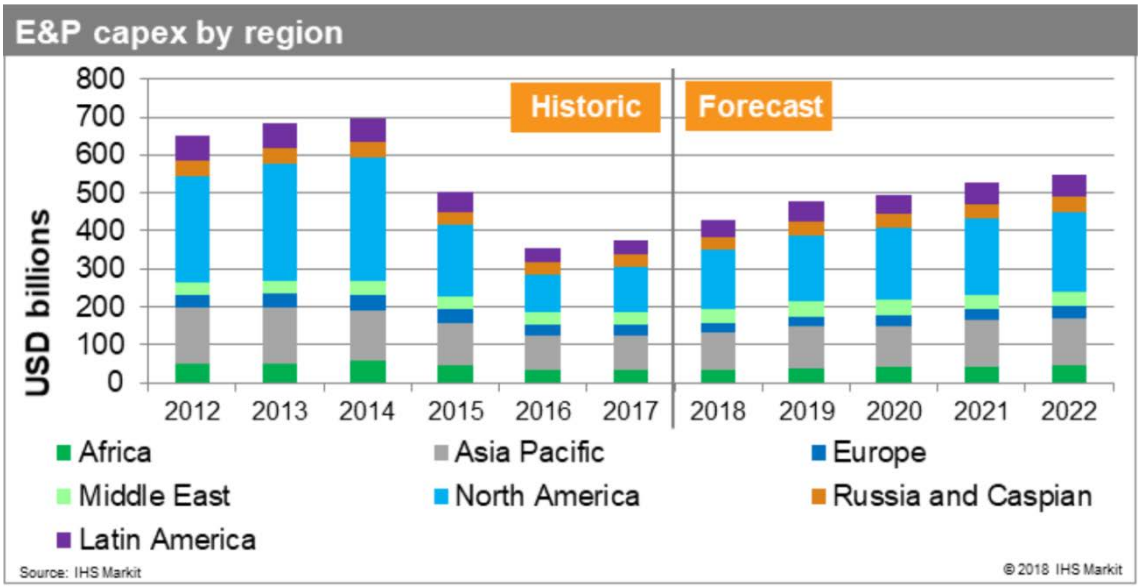

Figure 1.1 E&P capex by region

Source: (IHS Markit, 2018)

Second, the findings can help IOCs in their investment decision-making process, since assessment and comparison of petroleum fiscal regimes have a practical value. Thereby,

investors can be more self-assured in the phase of choosing a country for investment with regard to the Eurasia project.

Third, this study conducts in-depth analysis of Kazakhstan's petroleum fiscal regime terms, contributes to the development of oil and gas taxation, and provides policy recommendations to improve the investment climate in the oil and gas field. The analysis is conducted both qualitatively through surveys and quantitatively through comprehensive evaluation indicators. The survey envisages significant information from South Korean experts in energy related companies, who had experienced working at projects in Kazakhstan. More importantly, such analysis has not been conducted before with respect to Kazakhstan's petroleum fiscal regime.

1.4 Research structure

The rest of the thesis is structured as follows. Chapter 1 highlights the rationale, main objectives, and contribution of this thesis. Chapter 2 outlines the current state of the oil and gas industry in the Republic of Kazakhstan as well as petroleum taxation in Kazakhstan and the Russian Federation. Further, a theoretical framework of petroleum taxation is provided in Chapter 3, while a literature review conducted in Chapter 4.

Using the survey technique, Chapter 5 analyzes qualitatively the effects of petroleum taxation in Kazakhstan, and then examines the attitudes of decision makers using indicators for quantitative analysis. The findings of the survey are used in the quantitative analysis and summarized to improve the existing fiscal terms.

A quantitative analysis of Kazakhstan's petroleum fiscal regime is conducted in Chapter 6 in comparison with the Russian Federation. Additionally, discounted and non-discounted cash flow models are simulated in this chapter to measure the Government Take indicator and provide basis for the assessment of fiscal terms. Moreover, the Front Loading Index and Composite score are calculated in this chapter based on the Government Take results. Further, to examine the results of the quantitative analysis, this chapter provides a sensitivity analysis using two different scenarios of simulation, namely, discounted and non-discounted cash flow models.

The last Chapter 7 discusses the results and conclusion, provides recommendations, and identifies limitations of the thesis.

This Thesis consists of seven chapters as shown in Table 1.

Table 1. Thesis Structure

Chapter	Title	Information
Chapter 1	Introduction	Research rational, objectives and contribution of the study
Chapter 2	Current status of Oil and Gas industry in the Republic of Kazakhstan and Petroleum taxation in Kazakhstan and Russia	Information on Oil and Gas industry of Kazakhstan, Petroleum fiscal regimes in Kazakhstan and Russia
Chapter 3	Theoretical framework of petroleum taxation	Theoretical concepts that will be used as a background for the qualitative and quantitative analysis
Chapter 4	Literature review	Literature related to petroleum taxation
Chapter 5	Qualitative analysis	Survey technic, Analysis and Findings of the qualitative analysis
Chapter 6	Quantitative analysis	Model simulation, Analysis and Findings of the quantitative analysis
Chapter 7	Conclusion and recommendations	Results, conclusion, recommendations and limitations of study

Chapter 2. Current status of Oil and Gas industry in the Republic of Kazakhstan and Petroleum taxation in Kazakhstan and Russia

This chapter covers the information about macroeconomic situation, Oil and Gas industry and Petroleum fiscal regime in the Republic of Kazakhstan. Moreover, it determines petroleum taxation in Russian Federation and provides practical and concrete insights on petroleum fiscal terms in both countries for further quantitative analysis.

2.1 Oil and Gas industry of the Republic of Kazakhstan

2.1.1 Kazakhstan Macroeconomic Overview

The Kazakhstan economy is one of the rapidly growing in central Asia, mainly thanks to the major foreign investment in the petroleum industry, which has had a positive knock-on effect on other industries. However, economy growth is still greatly dependent on national petroleum production, and global oil prices.

Since independence in 1991, Kazakhstan showed high inflow of foreign investment and stable economic growth. Government policies of diversifying economic structure, ensuring competitiveness, together with an increasing investment climate and growth in supply of raw materials, have secured economic growth. Unfortunately, the international financial meltdown and liquidity issues have substantially reduced growth of economy. In 2006 and 2007, real GDP growth was 10.7% and 8.9% respectively. However, the period since 2006 has seen a reduction in GDP growth. In this respect, average GDP growth in Kazakhstan in 2006-2018 was 4.9 per year. The Figure 2.1 represents Kazakhstan GDP growth from 1991 up to date. The reasons for economic growth reduction in the country are the following:

- Kazakhstan economy integration in the global economy;

- Resource based economy and, subsequently, domestically produced raw materials' depend on global prices;
- active borrowing on international markets, which has led to the high external debt;
- a lack of investment opportunities;
- falling oil prices and KZT/Rouble devaluations

The access to global capital markets forces Kazakhstan to close interaction with International rating agencies. Currently, the Government working with three main rating agencies: Moody's Investors service, Standard & Poor's and Fitch ratings LTD (Ministry of National Economy of the Republic of Kazakhstan, 2019). The credit rating represents Kazakhstan's creditworthiness or ability to pay off its obligations in full and on time. The Table 2 shows information on foreign currency credit ratings of the Republic of Kazakhstan by Moody's Investors service, Standard & Poor's and Fitch ratings LTD.

Table 2. History of Kazakhstan's international foreign currency credit ratings

Agency	2015	2016	2017
Standard & Poor's	BBB (negative)	BBB- (negative)	BBB- (stable)
Moody's Investors service	Baa2 (stable)	Baa3 (negative)	Baa3 (stable)
Fitch ratings LTD	BBB+ (stable)	BBB (stable)	BBB (stable)

Source: (Ministry of National Economy of the Republic of Kazakhstan, 2019)

Considering all abovementioned, we can conclude that economic crisis which began in 2014, negatively affected the economy of the Republic of Kazakhstan. Due to World oil prices drop in 2015-2016, there was a significant slowdown in the country's real GDP growth. However, the macroeconomic indicators started to recover in 2017, which is associated with an increase in oil and mineral prices. Rating agencies confirmed Kazakhstan's long-term ratings with stable outlook, showing positive economic development tends in the future.

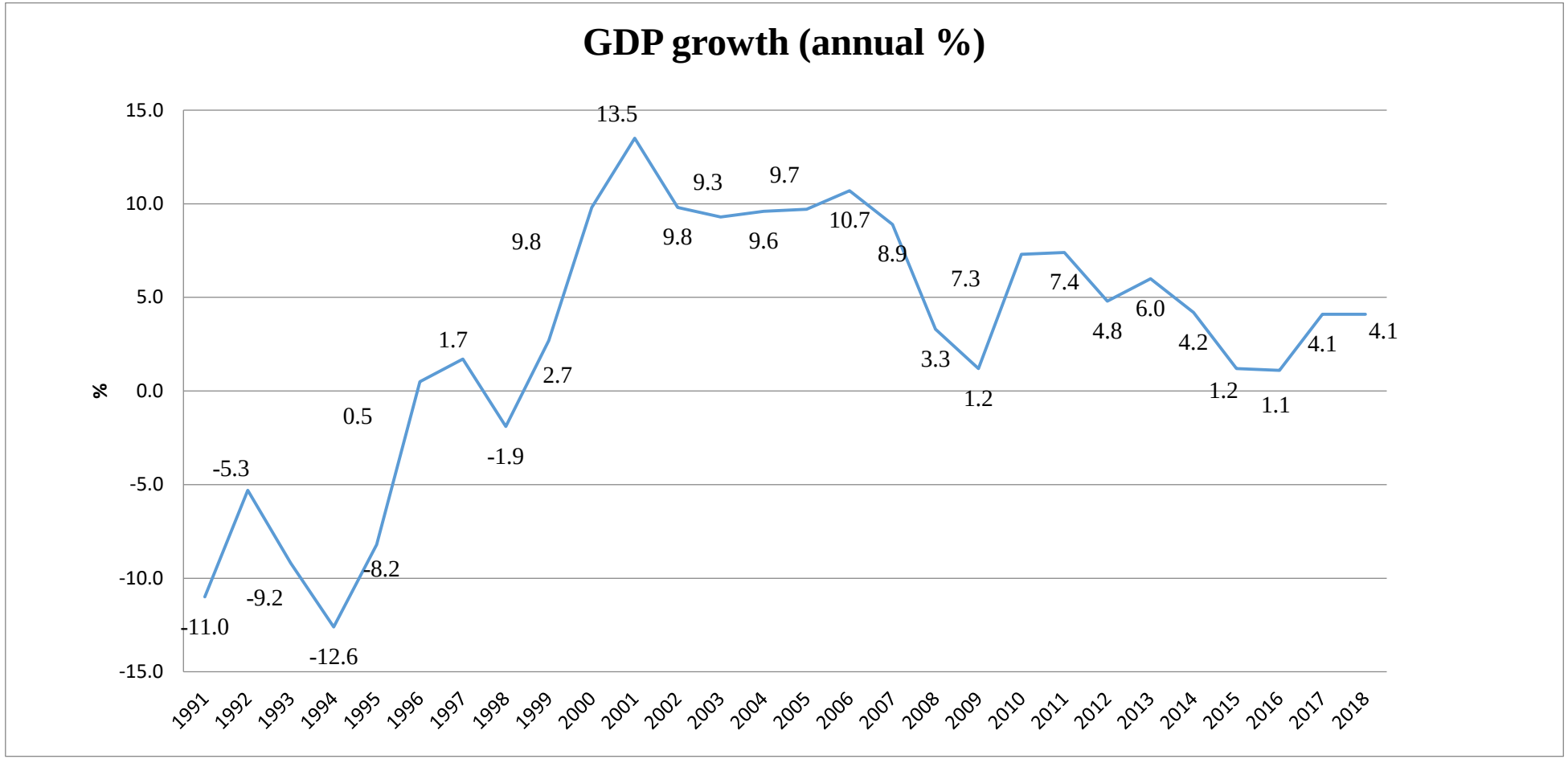

Figure 2.1 Kazakhstan GDP growth (annual %)

Source: (The World Bank, 2018)

2.1.2 Kazakhstan Oil and Gas Industry

2.1.2.1 Oil and Gas Reserves

Kazakhstan has been producing oil since 1911 and over the last 28 years after independence oil and gas revenues have played a vital role in Kazakhstan economy. According to BP statistics Kazakhstan's oil reserves amount about 1.8% of proved World reserves, at more than 3.9 billion tonnes(BP, 2018). Nowadays, number of oil fields is equal to 172, while condensate fields are equal to 42. Main oil and gas reserves (about 90% of all reserves) concentrated in fields listed in Appendix 1.

Kazakhstan's oilfields mainly located in 6 oblasts – Mangistau, Atyrau, West Kazakhstan, Aktobe, Karaganda and Kyzylorda. Notably that around 70% of all hydrocarbon reserves located in the West part of Kazakhstan (Figure 2.2).

Atyrau oblast recognized as most explored area in Kazakhstan in terms of oil reserves with more than 75 oil fields, West Kazakhstan oblast has 15 explored oil fields, while Aktobe oblast has 25. The 5th largest oil and gas region in Kazakhstan is the Kumkol group of fields situated in Kyzylorda and Karaganda oblasts.

Kazakhstan ranked at second place in terms of oil reserves (after Russia) and third place in terms of gas reserves (after Turkmenistan and Russia) between CIS countries. More than 70% of recoverable gas reserves are extracted from 3 main fields: Kashagan oil and gas field, Karachaganak oil and gas condensate field and Tengiz oil and gas field. Figure 2.3 shows the allocation of natural gas reserves by field in the Republic of Kazakhstan.

Kazakhstan's Oil and Gas industry further development will be supported by study of subsoil plots in the Aral Sea and Caspian Sea water zones, due to unstudied deep-sunk structures.

Figure 2.2 Kazakhstan Oil and Gas fields map

Source: (International Institute of Khasar Sea Studies, 2016)

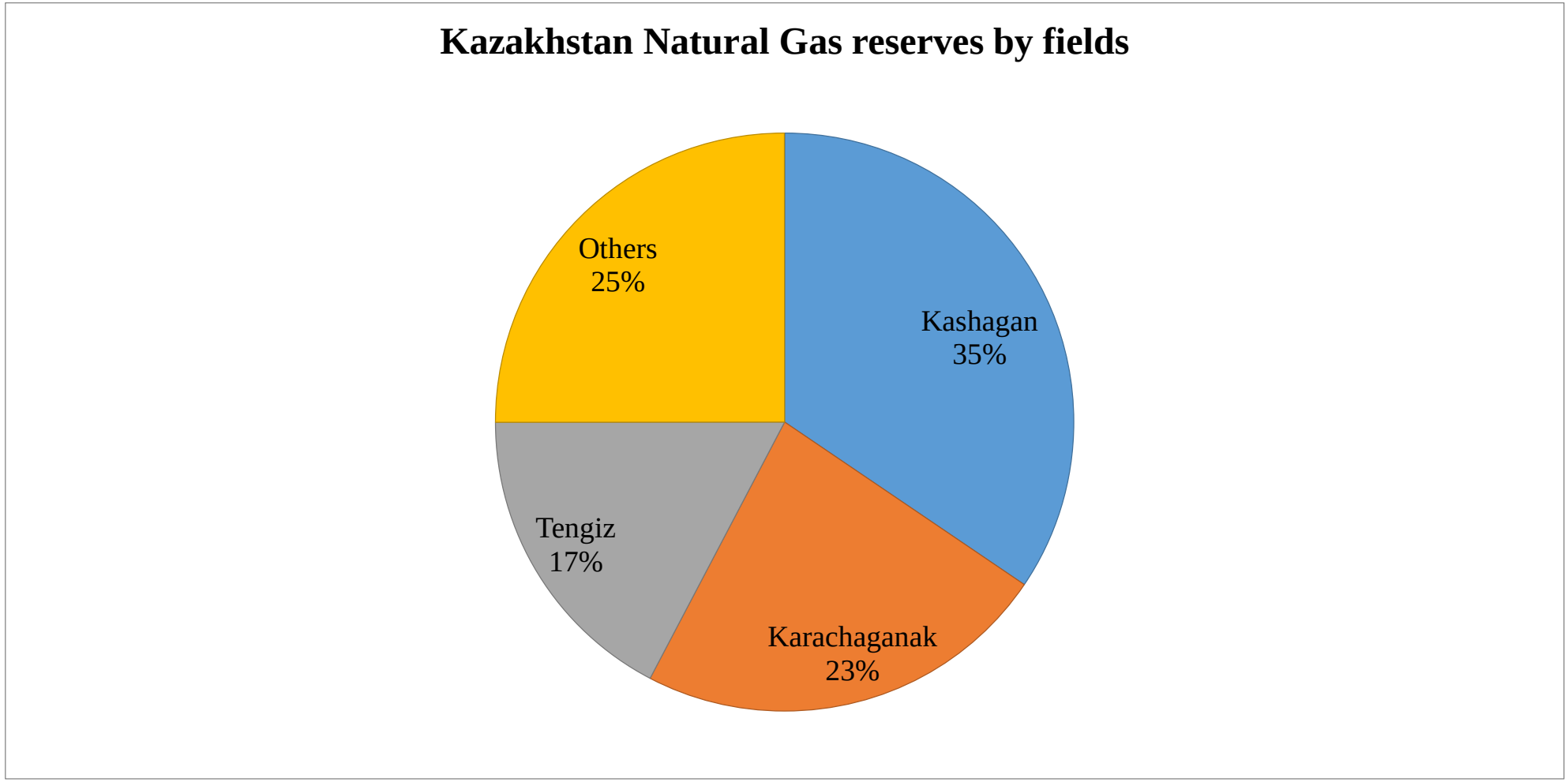

Figure 2.3 Kazakhstan Natural Gas reserves by fields

Source: (Kazakhstan Government decree No. 1072, 2010)

2.1.2.2 Oil and Gas Production and Export

According to Ministry of Energy of the Republic of Kazakhstan 86.2 million tonne oil produced, 14.9 million tonne refined and remaining 71.3 million tonne exported (more than 80%) as of the end of 2017(Ministry of Energy of the Republic of Kazakhstan, 2018). Notably, that 8.3 million tonnes produced in Kashagan oil field, 12.1 and 28.6 million tonnes produced in Karachaganak and Tengiz oil field respectively. Figures 2.4 and 2.5 provide the information on oil production and export for 2015-2017.

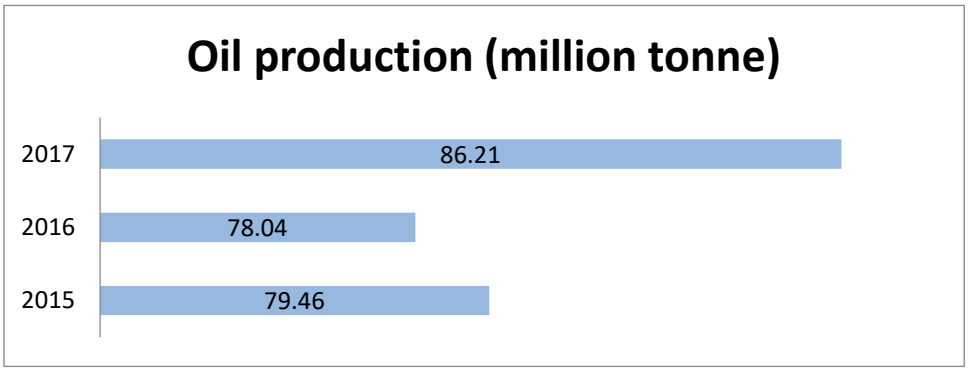

Figure 2.4 Kazakhstan Oil production

Source: (Ministry of Energy of the Republic of Kazakhstan, 2018)

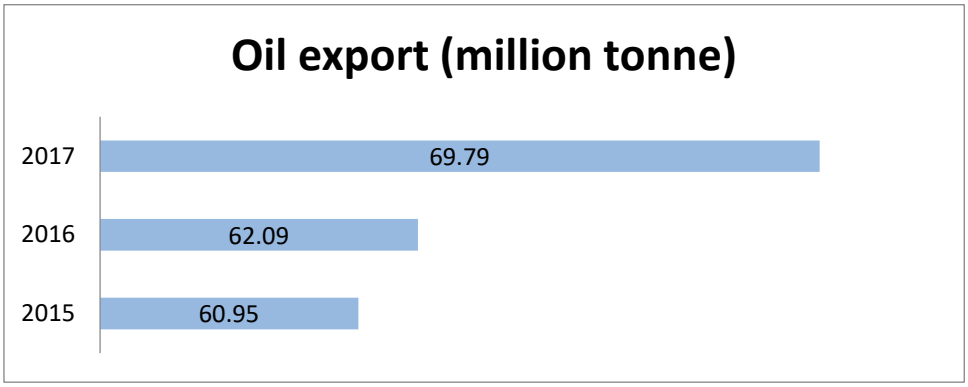

Figure 2.5 Kazakhstan Oil export

Source: (Ministry of Energy of the Republic of Kazakhstan, 2018)

2.1.2.3 Gas Production and Sales

The gas industry expanding quickly, the average annual growth in natural gas production is about 6%. Accordingly, gas production in Kazakhstan as of the end of 2017 was equal to 52.9 billion m^3(KazMunayGaz, 2017).

It should be noticed, that natural gas in Kazakhstan is extracting in conjunction with oil and condensate at almost all gas fields. Therefore, there are following challenges of gas production:

- Gas production not stable;
- It should be cleaned to commercial standard from non-carbon gases like helium, hydrogen sulphide, mercaptans and rich hydrocarbon fractions.

Notably, that around 45% of gas produced is reinjected to maintain seam pressure, burned or for own use. Figure 2.6 provide the information on gas production for 2015-2017.

Gas export was equal to 17.21 billion m^3 as of the end of 2017. Around 80% of gas exported supplies to CIS countries. 2017 was noteworthy because Kazakhstan exported gas to China for the first time, in amount of 1.1 billion m^3. With China being the most promising and capacious market in Asia, Kazakhstan signed an agreement to supply China with 5 billion m^3 of gas per year. The Figure 2.7 shows the information on gas export for 2015-2017.

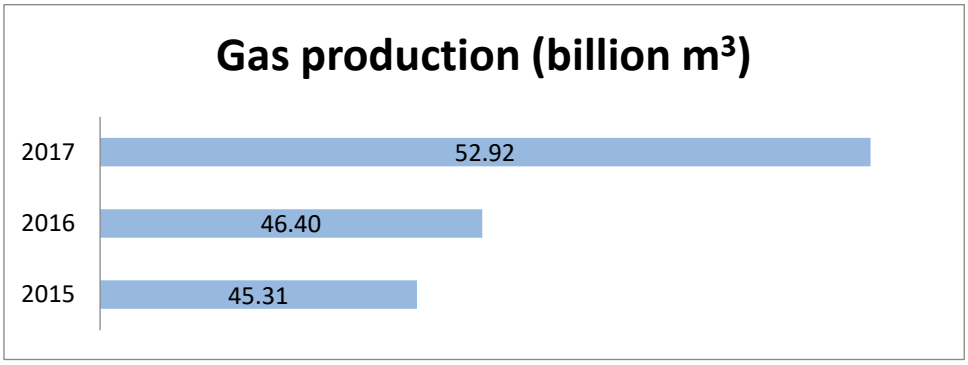

Figure 2.6 Kazakhstan Gas Production

Source: (Ministry of Energy of the Republic of Kazakhstan, 2018)

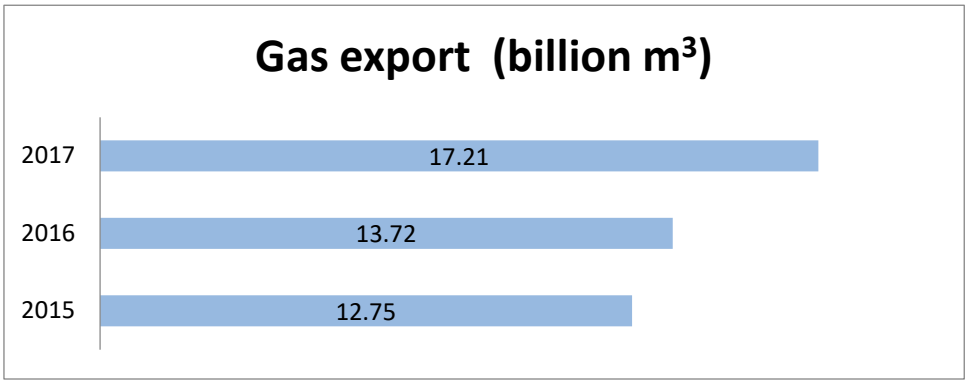

Figure 2.7 Kazakhstan Gas Export

Source: (Ministry of Energy of the Republic of Kazakhstan, 2018)

The huge portion of gas produced is by domestic market. 11 oblasts of the country are gasified, accordingly more than half of Kazakhstan population has an access to blue fuel. Furthermore, gasified public facilities number has risen up to 86%, from 22 090 to 41 189 for the last 5 years(KazTransGas, 2018). However, the negative aspect for the country is that domestic market use gas at price below the cost price, thereby national operator KazTransGas suffered losses around 200 billion tenge for the last 5 years.

As of the end of 2018, the highest oil and gas production level was seen at Tengiz and Karachaganak fields with 28 622 and 12 170 thousand tonnes of oil and 15 626 million m^3 and 18 913 million m^3 gas accordingly("Information-Analytical Centre of Oil and Gas" JSC, 2018). According to the Ministry of Energy's forecasts, Kazakhstan's oil and gas production is set to grow significantly, primarily due to the large oil and gas projects currently underway, namely, the Tengiz field, where expansion works are expected to increase production from the current 27 million tonnes to 39 million tonnes per year from 2023. Moreover, it is expected that Kashagan field, commissioned in October 2016, will produce about 100 billion cubic feet of natural gas per year(KMG, 2017).

2.1.2.4 Export Routes

Since Kazakhstan is landlocked country, there are 3 ways to export produced oil:

- Pipelines;
- Railways;

- Caspian Sea.

3 400 miles of pipeline system is operated by quasigovernmental company KazTransOil. Due to continuation of use Soviet Union time infrastructure, the big part of pipelines is integrated with major Caspian oil and gas export routes. Crude oil export pipelines are consist of the Kazakhstan–China pipeline, the Caspian Pipeline Consortium (CPC) pipeline to the Black Sea port of Novorossiysk and the Uzen–Atyrau–Samara pipeline to Russia, which are illustrated on Figure 2.8 (U.S. Energy Information Administration, 2019).

Figure 2.8 Kazakhstan major crude oil pipelines

Source: (U.S. Energy Information Administration, 2019).

Natural gas export carries out through two major pipelines the Central Asia Centre pipeline and Turkmenistan-China pipeline with length 5 and 7 thousand kilometers respectively. The total Kazakhstan pipelines length is 19 thousand kilometers, which installed by 316 gas compressor units and 56 compressor stations(KazTransGas, 2019). Another huge international pipeline Bukhara-Tashkent-Bishkek-Almaty mainly uses for serving local demand in south part of Kazakhstan. Domestic pipeline Beinu-Bozoi-Shymkent not only provide a gas for areas, which recently have not an access to gas, namely east, center, north and south regions, but also connected rich northwest region with the Central Asia Centre pipeline and allowed export to China. The major natural gas pipelines are shown in Figure 2.9. According to KazTransGas, Kazakhstan's gas transportation pipeline system can miss up to 85 billion m^3 and has a possibility to increase this volume up to 120 billion m^3.

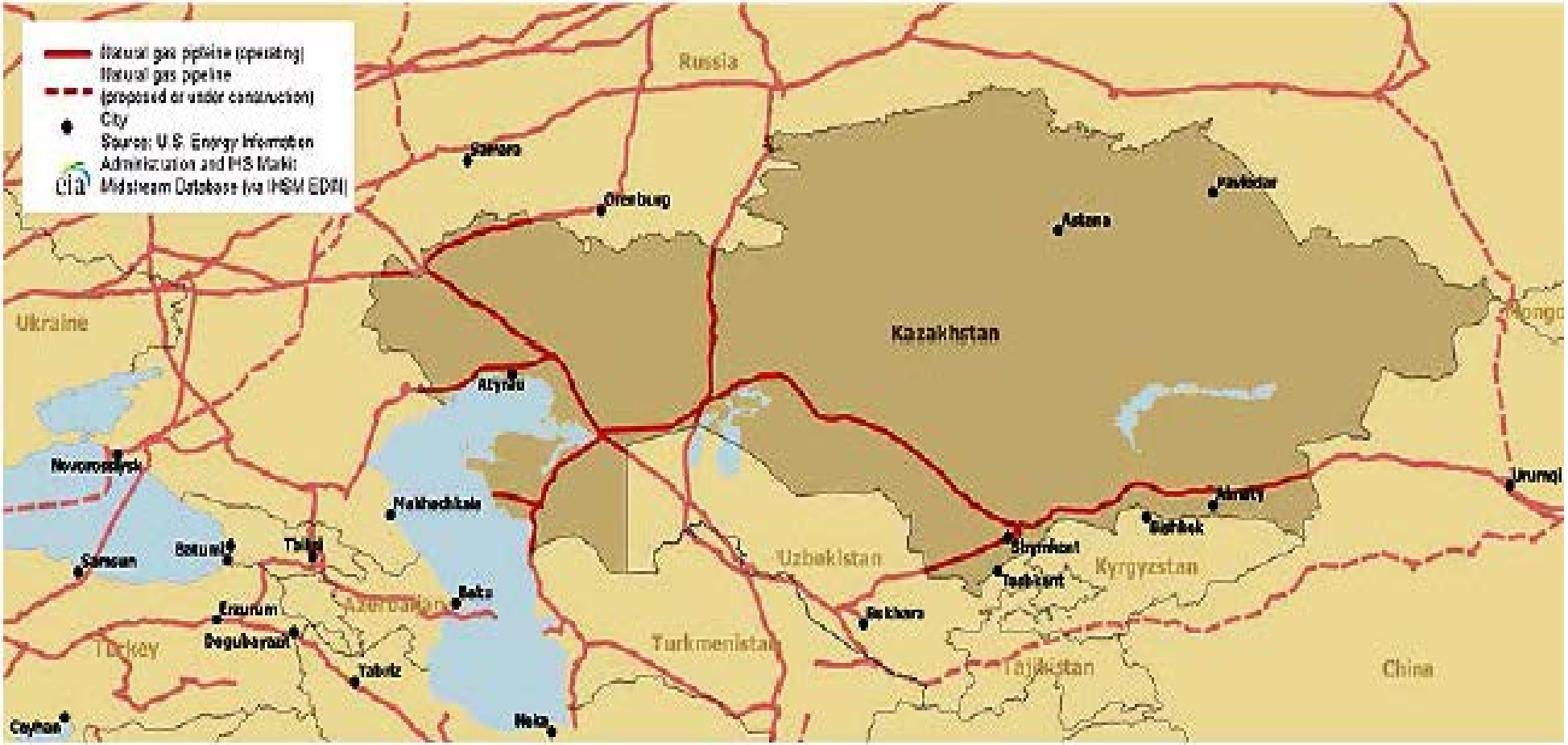

Figure 2.9 Kazakhstan major natural gas pipelines

Source: (U.S. Energy Information Administration, 2019)

.The extensive railways network are using mostly for liquids fuel transportation for domestic needs and for export. Railways help to deliver crude oil to oil refineries in the South and North part of Kazakhstan in a cheap way.

The Caspian Sea export way is used to ship crude oil to the Northern Route pipeline (Baku-Novorossiysk) or Baku-Tbilisi-Ceyhan pipeline for onward transport, mainly to Europe. Significant portion of crude oil exports transit to Netherlands, France, Italy, Switzerland and Austria.

2.1.2.5 Refining

There are three major oil refineries in the Republic of Kazakhstan, namely Shymkent, Pavlodar and Atyrau (Figure 2.10). The Shymkent oil refinery is on the South part of Kazakhstan and supplied mainly by oil fields at Kumkol. The Pavlodar refinery uses mainly western Siberia crude oil, which is delivered through the pipeline and located in north-central Kazakhstan. Since Atyrau refinery located in the West part of Kazakhstan it uses only domestic crude oil from the fields located nearby. There is also not significant in terms of production refinery in Aktau, which is process heavy crude oil to make bitumen for roads construction. The total capacity of Shymkent, Pavlodar and Atyrau is 15 million tonnes of oil per year.

The year on year Kazakhstan's crude oil processing increasing, hereby as of the end of 2017 the volume of crude oil processing increased by 2.8% and achieved 14.9 million tonnes. In accordance to Kazakhstan's Ministry of Energy forecasts the volume of crude oil processing will increase to more than 17 million tonnes in 2019. However, Kazakhstan has to import some light oil products to satisfy domestic demand. According to the Ministry, with the modernization of the refineries from 2019, total refining capacity will increase to 17.5 million tonnes of crude oil per year. The production of light oil products will grow by 3.3 million tonnes per year, the Ministry estimates, thus fully meeting domestic demand for light oil products.

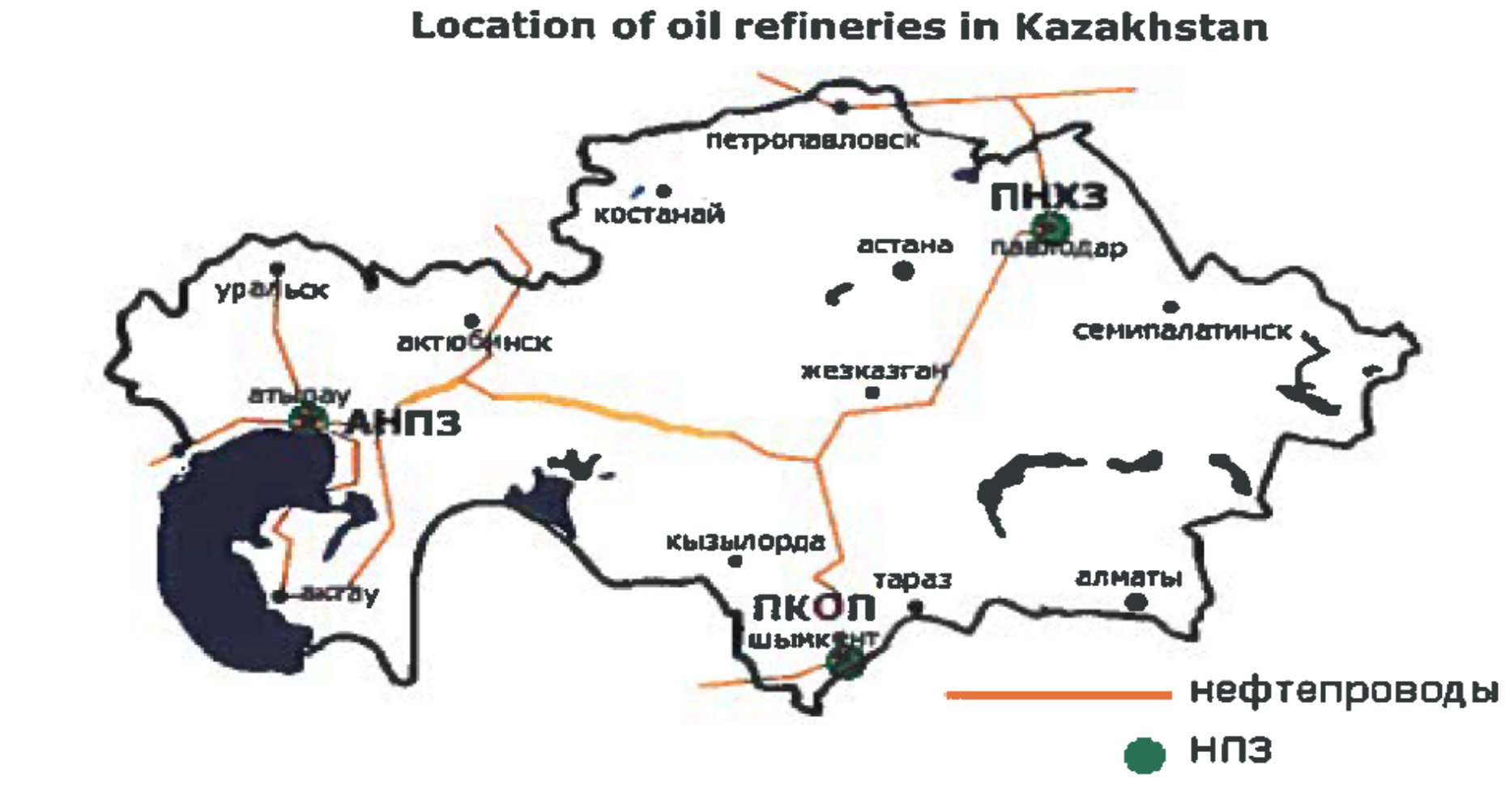

Figure 2.10 Location of oil refineries in Kazakhstan

Source:(Caspian Barrel, 2017).

2.2 Petroleum Taxation in the Republic of Kazakhstan

This section examines the key elements of fiscal framework utilized in Kazakhstan's petroleum sector. The main objective is to analyze Kazakhstan's petroleum fiscal components and outline the ground for further qualitative and quantitative analysis of this thesis.

It is worth to notice, that there are three petroleum taxation strategies that country can choose to design its own policy framework. First, is a "go-it-alone strategy" in which National Oil Company represents government's interests and undertakes oil exploration and production by itself. Such strategy is used in Saudi Arabia. Second fiscal policy strategy implies that resource country grants entire private ownership and full control for the oil company. Last strategy supposes that private (mostly international) and national oil companies form a partnership to undertake oil and gas production. Kazakhstan's petroleum fiscal policy framework used to follow the latter option. However, recently in 2018 there were amendments to Tax and Subsoil use Codes which added the possibility to get an entire private ownership for the resource through the auction.

Regarding the taxes applied in Kazakhstan's petroleum industry it is necessary to highlight Mineral extraction tax, Bonuses, Corporate income tax, Excess profit tax, Rent tax on export, Payment for compensation of historical costs and Alternative subsurface use tax. Further, in this section we will consider each of them in details.

2.2.1 Mineral extraction tax

Mineral extraction tax is a royalty type tax applied to the value of production of natural gas, crude oil and gas condensate. Notably, that when Oil Company plans to export produced goods, the value of production is based on world prices without deductions. In order to determine the "world price" of crude oil and gas condensate the arithmetic mean of daily quotations for each of the Urals Mediterranean (Urals Med) or Dated Brent (Brent Dtd) brands issued by Petroleum Argus source is used, while world natural gas price determined as arithmetic mean of daily quotations issued by Argus European Natural Gas source. Table 3

provides information on Mineral extraction tax rates determined by the annual volume of production.

Table 3. Mineral Extraction Tax rates

Annual volume of production (thousands tons)	Rate
0- 250	5%
251 - 500	7%
501 - 1,000	8%
1,001 - 2,000	9%
2,001 - 3,000	10%
3,001 - 4,000	11%
4,001 - 5,000	12%
5,001 - 7,000	13%
7,001 - 10,000	15%
Over 10,000	18%

Source: (Ernst & Young Global, 2017)

It should be noticed, that Mineral Extraction Tax rates reduced by 50% if the production processed inside the country.

2.2.2 Bonuses

There are two types of bonuses, which subsurface user expected to pay: signature and commercial discovery bonuses.

Signature bonus is the sum that oil company have to pay for the right to use the subsurface (Johnston, 1994). In Kazakhstan the amount of signature bonus defers in terms of the type of contract, for example signature bonus for the exploration contracts is equal to 2800 Monthly Calculated Index (hereinafter – MCI), for oil production contracts, where reserves are not approved is 3000 MCI and for oil production contracts where reserves are approved is calculated by applying a 0,04% rate to the approved reserves, but not less than 10 000 MCI. As of the January of 2019 MCI in Kazakhstan is equal to 2525 tenge.

Commercial discovery bonus is the sum that should be paid by Oil Company, when commercial discovery is made on the contract territory. Notably, that Kazakhstan government

has abolished it in 2019.

In should be noticed that usually bonuses can be deducted from the taxable income, which positively affect to International Oil Company's Net Cash Flow.

2.2.3 Corporate income Tax

Corporate income tax is the tax levied on all entities registered in the Republic of Kazakhstan (Tax Code of the Republic of Kazakhstan, 2019). Taxable income is calculated annually as a difference between aggregate annual income and deductions. Corporate income tax is levied at the rate 20% to taxable income. The aggregate annual income includes all types of earnings excluding Value added tax and excise duties.

2.2.4 Rent Tax on Export

Companies that export oil and crude oil products have to pay Rent Tax on Export. The volume of the exported crude oil multiplied by the world price for oil is the tax base for Rent Tax on Export. It should be noted that it is progressive type tax and rates are shown in Table 4. In order to determine the world price the arithmetic mean of daily quotations for the Urals Med or Brent Dtd brands is used. The information of daily quotations should be gathered from Platts Crude Oil Marketwire.

Table 4. Rent Tax on Export rates

Market Price (US dollar/bbl)	Rate
US$20 inclusively	0%
US$30 inclusively	0%
US$40 inclusively	0%
US$50 inclusively	7%
US$60 inclusively	11%
US$70 inclusively	14%
US$80 inclusively	16%
US$90 inclusively	17%
US$100 inclusively	19%
US$110 inclusively	21%
US$120 inclusively	22%
US$130 inclusively	23%
US$140 inclusively	25%
US$150 inclusively	26%
US$160 inclusively	27%
US$170 inclusively	29%
US$180 inclusively	30%
US$190 inclusively	32%
US$200 inclusively	32%

Source: (Tax Code of the Republic of Kazakhstan, 2019)

2.2.6 Excess profit tax

Excess profit tax is the tax calculated annually and levied on the portion of net income that exceeds 25% of deduction. The net income is calculated as the difference between aggregate annual income and deductions and less Corporate Income Tax. Excess profit tax is calculated by applying rates on tranches of excess income shown in Table 5.

Table 5. Excess Profit Tax rates

Net income allocation schedule for EPT, % of deductions	% for calculating marginal net income allocation for EPT	EPT rate (%)
Less than or equal to 25%	25%	0%
From 25% to 30% inclusively	5%	10%
From 31% to 40% inclusively	10%	20%
From 41% to 50% inclusively	10%	30%
From 51% to 60% inclusively	10%	40%
From 61% to 70% inclusively	10%	50%
Over 70%	Any excess	60%

Source: (Tax Code of the Republic of Kazakhstan, 2019)

2.2.7 Payment for historical costs compensation

Payment for compensation of historical costs is the fixed payment of the oil company to compensate to the Host country for geological survey and development of oil and gas fields costs of the contract territory, which were incurred before signing the contract. The amount of payment is calculated by authorized state body based on the costs used for the exploration of field.

Subsurface user's obligations to compensate for historical costs arise from the date when nondisclosure agreement is signed between authorized state body and Oil Company.

2.2.8 Alternative Subsurface use tax

Alternative Subsurface use tax applied by oil producers in order to substitute Mineral Extraction Tax, Excess profit tax and payment for compensation of historical costs. It can be applied only by subsurface users who are producing oil on continental shelf or in a certain deep

oilfields with regard to their intention and after submission an application to Alternative Subsurface use tax.

Alternative Subsurface use tax calculated annually and its taxable base can be found as a difference between aggregate annual income and deductions. Table 6 envisages information on tax rates applied to the taxable base.

Table 6. Alternative Subsurface use tax rates

Oil World price (US$/bbl)	Rate
US$50 inclusively	0%
US$60 inclusively	6%
US$70 inclusively	12%
US$80 inclusively	18%
US$90 inclusively	24%
From US$90 and above	30%

Source: (Tax Code of the Republic of Kazakhstan, 2019)

2.3 Russian Federation petroleum fiscal regime

This section aimed to analyze Russian Federation petroleum fiscal regime and outline the ground for further quantitative analysis in Chapter 6. Moreover it provides concrete insights on petroleum fiscal terms and mechanism to calculate main taxes applied in Russian Federation.

Since collapse of Soviet Union petroleum taxation regime in Russian Federation has undergone a numerous changes. Fjaertoft & Lars (2015) characterized 1990's in Russia as period of poor tax revenues and field-specific taxation. Moreover, Kryukov & Moe (2007) ascertain that Russian government in that time was not been able to control the costs of oil companies, which used such weaknesses to reduce a taxable income and finally to reduce governmental tax revenue.

The new tax system in early 2000's by introducing a new mechanisms of taxation and applying a policy "easy to monitor" allowed to increase tax revenue. Moreover, it helped to government accurately monitor expenses of oil companies and increase rational tax management. However, the importance to attract investments into economy force Russian government to introduce variety of tax breaks and incentives in the petroleum industry. Angevine and Cervantes (2011) identified Russian petroleum tax regime as complex and unstable. Therefore, quantitative assessment of petroleum fiscal terms will be valuable and will show the drawbacks and benefits of existing tax policy.

Regarding the taxes applied in Russian Federation petroleum industry it is necessary to highlight Royalty, Corporate profits tax, Bonuses and Export duty. Further, in this section we will consider each of them in details.

2.3.1 Royalty (Mineral Extraction Tax)

Royalty in Russian petroleum fiscal terms is levied on subsurface users extracting crude oil, natural gas and gas condensate. It is calculated as a multiplication of base rate per tonne of extracted crude oil, which is equal to RUB919 for 2018, and coefficient reflecting movements in world oil prices (C_p) and reduced by oil extraction factors indicator E_m (Tax Code of Russian

Federation, 2019).

The indicator E_m is calculated by the following formula:

$$E_m = C_{met} * C_p * (1 - C_d * C_r * C_{de} * C_{rd} * C_{can}) - C_k$$

Therefore, the full formula for Mineral Extraction Tax will be the following:

$$MET = base\ rate(RUB919) * \ C_p - C_{met} * C_p * (1 - C_d * C_r * C_{de} * C_{rd} * C_{can}) + C_k$$

2.3.2 Corporate Profits Tax

Russian tax system implies that all companies, no matter is it local or foreign companies, operating in Russia are subjects to corporate profits tax on their nonexempt profits. However, only foreign companies that have a permanent organization and earn any income from Russian sources are subjects to pay corporate tax. The taxable income is calculated as a difference between nonexempt revenue and deductions. Nonexempt revenue can be determined as a sum of sales income and non-sale income, while deductions consist of costs that are economically justified and documented with regard to Russian legislation. Capital expenses are not recognized as immediate deductions. However, exploration expenses are deductible within 12 months, while development expenses are deductible through the depreciation of constructed fixed assets.

Corporate profits tax rate is 20%, but it can be reduced up to 15,5% for particular categories of taxpayers. Notably, that tax losses can be carryforward up to infinite period of time.

2.3.3 Export duty

The rate for export duty for crude oil and gas condensate determined by the government and is changing every month. It is based on prices for Ural blend oil on Mediterranean and Rotterdam markets. Table 7 provides information for actual rates on export duty.

Table 7. Export duties rates

Actual price per barrel (US$)	General duty rate per barrel (US$)
Up to $15	0%
Between $15 and $20	35% × (actual price – $15)
Between $20 and $25	$1.75 + 45% × (actual price – $20)
More than $25	$4 + 30% × (actual price – $25)
US$90/bbl inclusively	24%
From US$90/bbl and above	30%

Source: (Tax Code of the Republic of Kazakhstan, 2019)

It should be noted that export duties for natural gas is 30% and for LNG is 0%.

2.3.4 Bonuses

Russian subsoil use licenses are divided on Exploration license, Production license and Combined license. The first type of license allows for subsoil user to explore the contracted area. The terms of exploration license are usually from 5 to 10 years depending on the region. The second type - production license can be granted to the auction or tender winner for oil and gas production. The terms are depending on the terms determined in feasibility study, but usually around 25 years. The last combined type license can be awarded to the auction or tender winner with respect to deposits that have proven reserves but require additional exploration. The terms are the same as in production type of license. Based on the type of license, subsurface user required to pay regular payments for subsoil use, signature bonus and additional fees specified in the license (Jennifer Josefson, 2019).

The maximum amount of signature bonuses is not specified in legislation. It is determined in the license for exploration and development. However, the minimum amount is established for subsurface users at rate not less than 5% of the amount of Mineral Extraction Tax with relation to oil and gas condensate, which calculation is based on the average forecasted capacity of the subsoil user (Ernst & Young Global, 2017).

Chapter 3. Theoretical framework

This chapter is focus on theoretical concepts that will be used as a background for the qualitative and quantitative analysis. Furthermore, it provides basic insights for main petroleum fiscal regime components. The first part of this chapter will consider the concept of neutrality, the next Section 3.2 discuss the fundamental concept of this study - economic rent theory.

3.1 The concept of neutrality for qualitative analysis

In this section, we will consider neutrality concept, which will be used as a criterion for the qualitative analysis in Chapter 5 to determine the effects of Kazakhstan's petroleum fiscal regime to investor's decisions.

Neutral tax regime is the regime that reduce disposable income but not influence to decisions on trade, production or consumption (Garnaut & Clunies-Ross, 1983).

Neutrality is the situation when Government gets nothing when company makes losses and generates revenues when company earns profits (Raja, 1999). Accordingly, Amundsen, Andersen and Gaute Sannarnes (1992) argued that neutrality criterion is focus on the interference of tax system and operational and investment decisions in such a way as to cause them to deviate from what is the social optimum.

Neutral regime does not hinder investment decisions while non-neural regime affects the decision making process, thereby resources are not allocated efficiently (A. G. Kemp & Rose, 1983). Furthermore, distortionary tax in petroleum industry can adversely affect investment decisions to development exploration and production oil and gas project.

It should be stressed that compromise between government and international oil company should exist when the optimal petroleum tax system is under design. The host country in most cases is trying to get high revenues and receive it in the early stage of the project. At the same time investor tends to accept the reasonable level of tax, especially in fiscal terms that has a

cost recovery limits and adopt risk sharing attitude.

However, there are arguments on neutrality concept for fiscal regime, especially petroleum fiscal regimes, due to its complicated administration. Some studies have questioned the suitability of neutrality as major criterion for petroleum fiscal regimes. Petroleum fiscal regime has to consider individual characteristics of oil field: geological structure, size, location and quality of oil. Therefore, the host country have to consider and calculate different levels of rent, expected income and discounted rates in order to assess each oil and gas field properly and impose differentiated tax. It is inappropriate hard and careful work taking much time. However, this thesis is focus on assessment on fiscal terms regardless the project quality, scale and administration.

Neutral fiscal regime provides incentives for investors to exploit natural resources, as neutral tax reduces disposable income, but does not affect decisions on production, consumption or trade (Nakhle, 2004). In this regard the concept of neutrality is aimed to stimulate investor's participate in resource extraction projects.

Nakhle (2004) considering Royalty, Brown tax, Income tax and Resource rent tax ascertain that Royalty is non-neutral tax, because it is impose on the value of production, while other taxes are neutral, because they are levied on net operating income or net profit. For example, Government applying non-neutral tax can get tax revenue even if company's profit is zero, while using neutral tax such as Income tax, levied on taxable income after operational and capital costs deductions will not have any tax revenues until company will get profit.

If the Host country wants to increase investment climate and involve investors to oil and gas exploration and production projects, it should hold neutral tax regime and provide incentives to international oil companies. At first glance, the application of the neutral regime significantly reduces tax revenue, however it was found that government that switched non-neutral Royalty payment to neutral Resource rent tax increased tax revenues (Fraser & Kingwell, 1997).

Accordingly, neutral tax regime not only increase investments to oil and gas exploration and

production projects, but also positively effect on production growth and implicitly influence to social greater prosperity.

Moreover, Raja (1999) argued that since government, using neutral tax regime, get tax revenues only, when international oil companies gets profit, it encourage them to develop new oil and gas fields, thereby raising the total tax revenue.

Manaf, Saad, Ishak, & Mas'ud (2014) found that neutral tax regime reduces international oil company's risk premium and lower the required return on a project. Thus, the government will get more profit from the project.

However, there are a lot of countries applying non-neutral fiscal regime and get a substantial amount of investments. It is believed that extracting company have to compensate to Host country the resource that will never be replaced again. Johnston (1994) ascertained that nevertheless on tough non-neutral tax regime, some countries are attractive to investors due to good geological conditions of oil field.

Considering all above mentioned, it can be concluded that in order to create favorable investment climate government should apply neutral fiscal regime, however non-neutral taxes, like royalty, can also be used to protect country's interests.

3.2 Economic rent concept

This section aims to introduce the concept of economic rent based on the previous studies, particularly in the oil and gas resources and explain why it is considered as the base for an ideal tax by many authors.

Banfi, Filippini, & Müller (2003) defined economic rent as “the earnings above the costs on capital, workforce and other factors used to exploit the resource. It is the net income after deductions of capital costs and labour inputs”. With capital and labor inputs it is necessary incorporate inputs of risk taking and entrepreneurial reward.

Dickson (1999) ascertain that economic rent is the true value of natural resource, the difference between revenues generated in the field and costs of extraction. Garnaut & Ross (1979) stated that there will not be adverse effect to continue or initiate new operations by company if taxes are imposed on economic rent.

Kemp, Stephen & Masson (1997) argued that since tax seeks to capture economic rent, then the tax revenue increases when economic rent rises and decreases when it falls. Therefore, the tax base responds in the appropriate direction to variations in costs and crude oil prices. Kemp & Rose (1983) stated that the possibility of substantial economic rent increasing by a stable tax system. Swan (1984) stated that it is fair to society to have a tax system, which gets as much economic rent as possible.

Significant amount of economic rent generated when the non-renewable natural resources exploited. Particularly, oil and gas are the strategic commodity and scarce resources that do not have perfect substitutes. Therefore, substantial amounts of economic rent earns during oil and gas extraction.

Raja (1999) ascertained that taxes should be focused at taxing positive NPV, since positive NPV could be considered as economic rent. Similarly, Rowland (1983) believed that “economic value of the oil license is equal to difference between the present value of future inflows and present value of future outflows. The future costs include monetary and non-

monetary items, such as equipment and exposure to risk respectively. Accordingly, the net present value is the economic rent of this oil contract. If it is positive, then Oil Company will enjoy the net profit from that license". Therefore economic rent concept can be used as a base for the evaluation cash flow models of the oil and gas projects.

It is obvious that IOC during petroleum project evaluation can calculate its return and economic rent will be considered as a bonus above the costs to exploit the field. Table 8 provides the major economic rent concepts summary.

This thesis will apply economic rent concept in qualitative analysis, particularly in cash flow model to compare the attractiveness level of Kazakhstan and Russian Federation petroleum fiscal regimes.

Table 8. Summary of economic rent concepts

№	Concept	Author
1	The difference between the resource extraction revenues and costs of extraction is the true value of the natural resource.	Dickson (1999)
2	The tax based on economic rent is an ideal tax.	Nakhle (2004)
3	Extra revenue earned by investors is economic rent.	Raja (1999)
4	Economic rent is the earnings above the costs on capital, workforce and other factors used to exploit the resource. It is the net income after deductions of capital costs and labour inputs	Banfi et al. (2003)
5	Economic rent is the excess earnings over the amount necessary to induce it to do its work.	Wessel (1967)
6	Government is focusing on capture as much economic rent as possible through various taxes, levies, bonuses and royalties.	Lubiantara (2007)
7	Justifiable base for petroleum taxation can be constituted by economic rent.	Kyari (2013)
8	The government take is growing when economic rent increases and falling when economic rent decreases in petroleum fiscal regimes that focus on capture economic rent.	Nakhle (2008)
9	Economic rent is the surplus over the payment needed to induce a factor to do its work.	Wessel (1967)
10	When the own-price elasticities of factor supplies are greater than zero, but less then infinite, the area above the long-run supply curve of the competitive industry does not, contrary to widespread belief, give us a measure of economic rent.	Mishan (1968)
11	The concept of economic rent is a nineteenth century notion referring to excess returns to resources that are in limited supply.	(Schoemaker, 1990)

Chapter 4. Literature review

This chapter covers literature survey on petroleum fiscal regimes, qualitative and quantitative methodologies used in previous studies. Moreover, it describes the contributions and findings of previous studies and shows the gap between previous studies and this research.

4.1 Petroleum fiscal regimes

This section is aimed to provide information on petroleum fiscal regime studies conducted before and explain the difference of concessionary and contractual type of regimes. Moreover it clarifies the difference between current research and previous studies.

Royalty, bonuses, domestic market obligations, cost recovery limits, host government participation and various profit and non-profit based taxes are the petroleum fiscal regimes in oil and gas industry (Johnston, 1994). However, petroleum fiscal regime varies depending on host countries interests. Lingbi (2006) ascertain that the core of international petroleum contracts is the petroleum fiscal regimes, which determine the income allocation between host government and IOC, thereby adjust the profit of the company.

Petroleum fiscal terms affect the overall investment climate and in essence are the mechanism whereby Host country receives income on behalf of its people (Stauffer & Gault, 1985).

Blake & Roberts (2006) argued that there are many fiscal regimes in use today than there are oil & gas producing countries and Production Sharing Contracts is the most popular tool.

Petroleum fiscal regimes are non-resource based factor that IOC considers before to invest to the country, since its attractiveness significantly influences to feasibility of the project. Accordingly, petroleum fiscal regime is important component to evaluate country's attractiveness and provide valuable information to assess the oil and gas exploration and production project for IOC (Yuhua & Dongkun, 2009).

Petroleum fiscal regime varies from country to country, while fiscal arrangements effect on the range of fiscal instruments applied to petroleum operations(Amoako-Tuffour, Joe & Owusu-

Ayim, 2010). However we can define two major types of fiscal regime: Concessionary (Royalty/tax system) and contractual. Johnston (1994) classified petroleum fiscal systems as shown in Figure 4.1.

Under Concessionary or Royalty/Tax systems Government Take comes through the combination of income tax, royalty, lease sales and special petroleum taxes. The main difference between concessionary and contractual systems is the ownership (Dongkun Luo & Yan, 2010). Concessionary system assumes that ownership of the resource in the subsurface transferred from the Host country to private company. Thus, the private company for the limited time gets exclusive rights to extract hydrocarbons in a defined area.

Accordingly, contractual system implies that Host country holds its ownership to oil and gas fields. Usually, countries using this type of system have national oil company to represent their interests. Contractual system divided into product sharing contracts and service contracts, under which the contractor receives compensation in kind (crude) or in cash respectively. It is a small distinction, thus both are commonly referred to production sharing agreements (Johnston, 1994). There is also separation in service contracts system, which is differentiated to risk service and pure service contracts. The pure service contracts (risk free) imply that contractor carries out exploration and development work for the resource country for fee, while in risk contracts contractor agrees to share risks and gets more benefits if the project will be successful.

There are a lot of studies exploring petroleum fiscal regimes of advanced countries, in particular OECD countries. However, there still has not been study researching Kazakhstan petroleum fiscal regime.

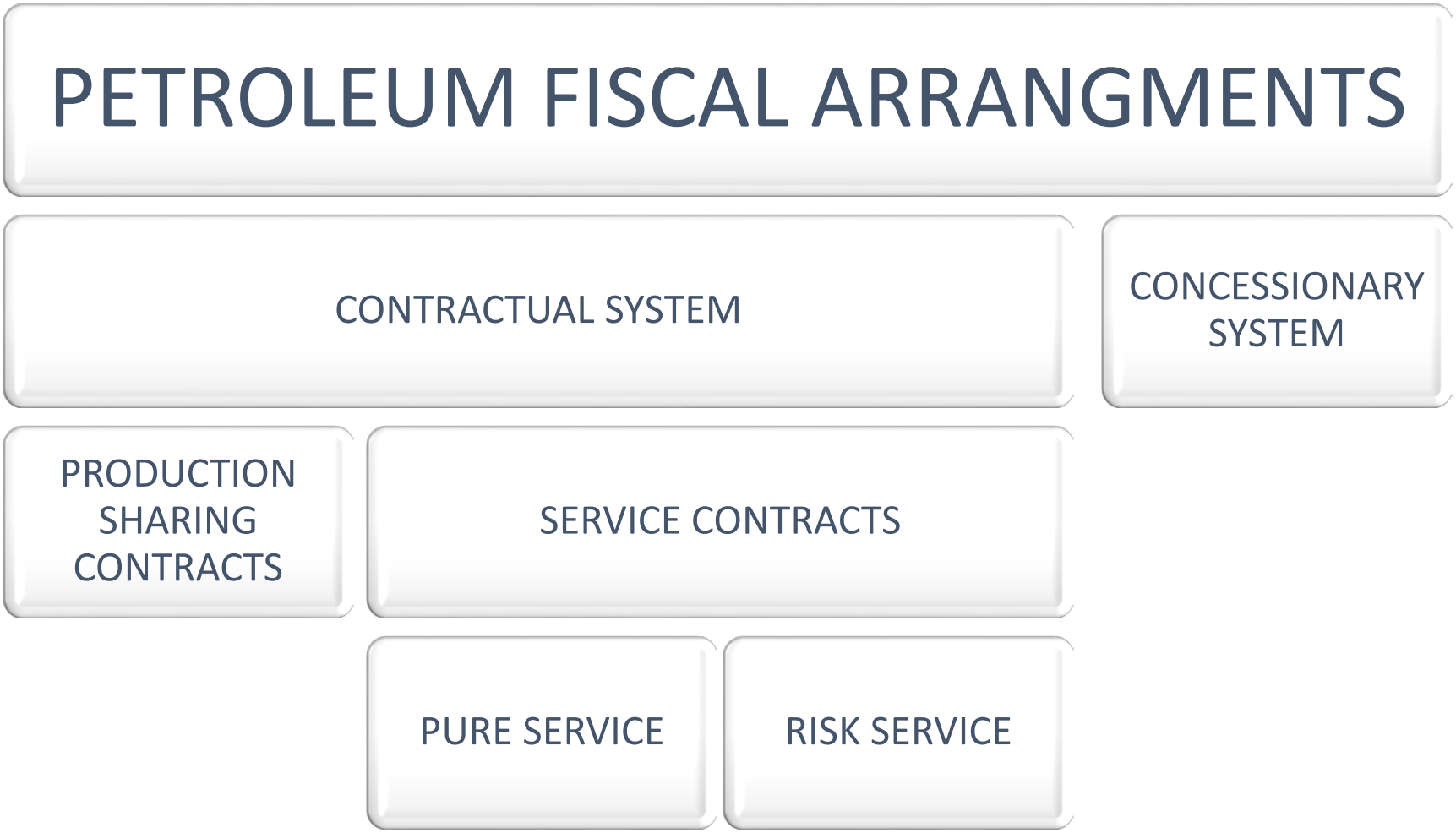

Figure 4.1 Classifications of Petroleum Fiscal Systems

Source: (Johnston, 1994).

4.2 Qualitative method

This section is aimed to provide the information on previous studies used the qualitative method in order to analyze fiscal terms. Qualitative method is used in this study to analyze Kazakhstan fiscal terms considering opinions of Korean energy related companies' decision makers. As it was mention in previous chapter, qualitative analysis is based on neutrality criterion in this thesis.

Kankam & Ackah (2014) using qualitative method compared Nigeria, Uganda, Cote d'Ivoire, Equatorial Guinea, Congo, Ghana and Cameroon's fiscal regimes and found that Ghanaian regime is progressive, however should be revised in order to add additional oil entitlements to profit.

Dimitric (2003) studied the costs of tax compliance for business entities which pay personal income tax and corporate income tax in the Republic of Croatia. Through the qualitative analysis it was found that corporate and personal income tax payers propose to reduce tax, increase communication between departments in tax system.

More recently, Yücedoğru & Hasseldine (2016) used qualitative analysis to investigate the factors influencing Small and Medium-sized enterprises' tax moral and found that there are six factors influencing on SME tax moral.

Sapiei, Abdullah, & Ismail (2013) through qualitative analysis studied the compliance burden of Malaysian corporations from the perspective of tax preparers. There are three main areas investigated in this paper: 1)The difficulties faced by companies in terms of tax; 2) Suggestions to reduce tax burden; 3) Reasons to engage external tax preparers. Based on qualitative analysis authors proposed to simplify tax requirements, converge accounting standards with tax law and improve the transparency and accountability in tax administrative matters.

Finally, it should be noted that, survey not only identifies the most common methods and techniques adopted by the respondents when the evaluating the effects of fiscal regime, but also it provides valuable guidance for the quantitative analysis.

4.3 Quantitative method

The main purpose of this section is to find the analytical framework for quantitative analysis of the petroleum fiscal regimes. Based on economic rent concept, this chapter derives a cash flow model and discounted cash flow model that clearly shows how the “fiscal take” is calculated and influencing on the revenue and profitability of the project.

In the absence of complexity it is easy to calculate the fiscal take: all the revenues less costs we will get a pre-tax cash flow. Then applying tax rate we can determine the tax take, which will be deducted from pre-tax cash flow. However, petroleum taxation requires a deep understanding of various taxes (Nakhle, 2004).

Devereux & Morris (1983) studied the United Kingdom Continental Shelf tax regime using the cash flow model, and demonstrated the effects of taxation on profitability of the oil field. Other authors such as Kemp & Rose (1983) and Kemp, Stephen & Masson (1997) also tried to study petroleum fiscal regimes using small-scale economic models, however their models were not fully described.

More recently, Furtado, Gonçalves, & Costa (2019), analyzed the impact of the contract change from concession to product share contract on the exploration and production project’s economic expediency and investors decision making process. Authors used the Monte Carlo simulation model to calculate the NPV and Expected monetary value and found that oil company’s surplus share not experienced really harmful effect after changing the type of contract, since government take increased only for 3%.

Analyzing fiscal regimes helps to understand petroleum economic rent ground and find out how the risks and profit allocated between host country and international oil company (Johnston, 1994).

4.3.1 Government take

According to Johnston (1994), Government Take is the one of the most comprehensive indicators to compare the petroleum fiscal terms. It shows how much government gets from the

total project revenue during the contract term. Government Take includes the contract bonuses, all the taxes implied to the project and share of government equity participation in the project (Dongkun Luo & Yan, 2010).

Kemp and Masson (1997), Kaiser and Pulsipher (2004), lsehunwa, Uzoalor and Ifeoma (2011) analyzed government take in order to find how much government gets under upstream petroleum fiscal regimes. Authors used the cash flow model in their studies based on reasonable assumptions with the given fiscal components.

Tordo (2007) argued that Government Take is the percentage of pre-tax project net cash flow, which taking into account the government participation ratio in the project. He stated that it can be calculated both in discounted or non-discounted values.

According to Luo and Yan (2010), there are three ways to calculate Government take. First, is non-discounted cash flow method, which shows the difference between revenues inflows and outflows of the project at a certain level of oil price without taking into account time value of money. The portion of government's income of the total project revenue, including the allocation the revenue under the fiscal regime, is the non-discounted "Government Take". It should be noted, that non-discounted cash flow model as well as discounted cash flow model are based on economic rent concept.

The second way to calculate a Government Take is a discounted cash flow method, which is used to estimate the value of project today based on its future cash flows. Discount rate is used to find the present value of projected future cash flow. Back (2003) using discounted cash flow model analyzed international fiscal regimes with portfolio management techniques and traditional project ranking in oil and gas exploration and production projects. Qing, Xueyan and Yanling (1999) argued that for Government Take calculation is better to use discounted cash flow method since oil and gas projects usually lasts more than 25 years. Johnston (1994) argued that cash flow analysis is the best way to calculate Government Take.

In order to determine discounted Government Take the calculation of discounted cash flow

should be based on certain discounted rate and cash inflows and outflows should be simulated on certain level of oil price and output (Luo & Yan, 2010). Emhjellen and Alaouze (1999) ascertained that discounted cash flow method is commonly used by International oil companies and it is generally applied in previous studies. Moreover, Laughton, Sagi and Samis (2000) stated that discounted cash flow method for several decades was the most commonly used method.

Some authors mentioned the drawbacks of discounted cash flow method. Accordingly, Nakhle (2004) found that discounted cash flow model requires a lot of assumptions and model is very sensitive to changes in this assumptions. Beidleman (1984) argued that discount rate determination is complex but necessary process since it influence to the total profitability of the project.

The last fastest and easiest way to calculate Government Take is prompt and intuitive method. This method developed by Kronman (2005), in order to simplify the process of cash flow model calculations, since it requires a numerous data and complex calculations. In this regard prompt and intuitive method reduces the time to calculate Government Take. It assumes that total project income is 100%, while calculations are made based on the license conditions. Moreover, Kronman (2005) stated that the result of prompt and intuitive method is equal to non-discounted cash flow method.

4.3.2 Front loading index

Front loading index was developed by Luo & Yan (2010) in order to reveal the influence of different time sequences of income gaining by resource country to the project attractiveness. Moreover, this indicator makes up the difference between discounted Government Take and non-discounted Government Take. The main objective of International Oil Company is to maximize the profit and return invested money as soon as possible, thus delayed payments to the Host country can increase projects attractiveness and enhance the recovery of cost. Generally, recourse country's revenue does not depend on the project's profit, because there are

signature and discovery bonuses, Import Duties levied on the equipment came abroad and Value Added Tax, that not depend on International Oil Company's profit and occurring during the construction period. Such factors lead to the difference between discounted and non-discounted Government Take. However, if there will be a petroleum fiscal regime that implies host country's revenue depending on the profit of the project, then there will not be front loading for the International Oil Company. Front Loading Index can be interpreted as smaller this index is, the less risk for IOC in the beginning stage of the project and more attractive fiscal terms of the contract (Dongkun Luo & Yan, 2010).

4.3.3 Composite score

Luo & Yan (2010) stated that Composite Score is a comprehensive evaluation indicator which combines Government Take indicator and Front Loading Index indicator and reflects the decision maker's attitudes on the contribution of both indicators to the fiscal regime attractiveness. Using this indicator, authors compared attractiveness of main fiscal terms of 11 countries and stated that calculation of this indicator implies to exclude the field resource potential, oil prices and project scale to provide all Host countries with the same level of total income and compare only attractiveness of country's fiscal regime.

More recently, Swe and Emodi (2018) using Composite Score indicator compared petroleum fiscal regimes of Myanmar, Cambodia, Indonesia, Vietnam, Australia, United States, Canada and Mozambique. The results helped to rank the attractiveness of petroleum fiscal regimes of abovementioned countries, where Cambodia took 1st place, Indonesia 2nd place, Australia 3rd, Vietnam 4th, Mozambique 5th, Myanmar 6th, Canada 7th and United States 8th place.

Composite score indicator can be interpreted as the smaller it is, the greater attractiveness of petroleum fiscal regime.

Considering all abovementioned, it should be stated that there was many studies exploring the effects of petroleum taxation on profitability of the oil & gas project, but yet there is no such study conducted on Kazakhstan fiscal regime.

4.4 Summary

This chapter reviewed the previous studies exploring petroleum fiscal regimes, identified the qualitative and quantitative methodologies used to assess fiscal terms, describes the contributions and findings of previous studies and shows the gap between previous studies and this research. Table 9 summarizes main reviewed studies and findings.

Table 9. The summary of main previous studies

№	Author and research	Findings
1	Johnston D. (1994). International petroleum fiscal systems and production sharing contracts.	Describes the fundamentals of petroleum fiscal regimes, provided the insights for evaluation of Government Take and provide necessary information on the two main fiscal systems.
2	Blake A. J. & Roberts M. C. (2006). Comparing petroleum fiscal regimes under oil price uncertainty.	This study analyzes and compares five upstream petroleum fiscal regimes under crude oil price uncertainty. Using the Monte Carlo simulation model the governmental tax claims were analyzed and fiscal systems of Papua New Guinea, Tanzania, Trinidad and Tobago, Alberta Canada and Nigeria were ranked in terms of attractiveness.
3	Kankam & Ackah (2014) The optimal petroleum fiscal regime for Ghana: An analysis of available alternatives.	This research using qualitative method compared Nigeria, Uganda, Cote d'Ivoire, Congo, Equatorial Guinea, Cameroon and Ghana's fiscal regimes and found that Ghanaian regime is progressive, however should be revised in order to add additional oil entitlements to profit.
4	Kemp & Rose (1983) The Effects of Taxation of Petro leum Exploitation: A Comparati ve Study.	This paper studied petroleum fiscal regimes of United Kingdom, Indonesia, Australia, Egypt, Nigeria, Norway, Texas, Malaysia, Alaska (two systems), Papua New Guinea and US Outer Continental Shelf (US, OCS) (four systems). By using small-scale economic models authors highlighted the main distortions emanating from overzealous taxation.
5	Furtado, Gonçalves, & Costa (2019) Risk and rewards	This research using Monte Carlo simulation model analyzed the impact of the contract change from

	dynamics: Measuring the attractiveness of the fiscal regime in the presence of exploratory risks.	concession to product share contract on the exploration and production project's economic expediency and investor's decision making process. It was found that oil company's surplus share not experienced really harmful effect after changing the type of contract, since government take increased only for 3%.
6	Lsehunwa, S; Uzoalor, E & Ifeoma (2011) Evaluation of True Government Take under Fixed and Sliding Royalty Scales in Nigerian Oil Industry.	In this study the impact of changing fiscal terms to sliding royalty on Government take in both Joint Ventures (JV) and Production Sharing Contract (PSC) arrangements analyzed. The cash flow models results showed that government take under sliding royalty scale rates higher than royalty based on either volume of production or price of oil alone.
7	Luo and Yan (2010) Assessment of fiscal terms of international petroleum Contracts	Authors using the linear weighted function of fiscal terms score, government take and front-loading indicators analyzed attractiveness of 11 countries' petroleum fiscal regimes and rank them.
8	Back (2003) A Discussion on the Effect of International Fiscal Regimes on Portfolio Selection in the Petroleum Industry.	This research using discounted cash flow model analyzed international fiscal regimes with portfolio management techniques and traditional project ranking in oil and gas exploration and production projects.
9	Beidleman (1984). Discounted cash flow reinvestment rate assumptions.	In this research the misunderstandings regarding the reinvestment rate assumptions of the DCF models is analyzed. The author found the implications regarding optimal ranking for reinvestment rate.
10	Nakhle (2004). Petroleum Taxation : A Critical Evaluation with Special Application to the UK Continental Shelf by Carole Nakhle	This study investigates the wealth allocation between Government and oil company evaluating the petroleum fiscal regime in the UK North Sea. Using the DCF and MAP models author identified the fiscal terms which are acceptable for Government and oil companies.

Based on the previous studies review we can conclude that in order to compare attractiveness of petroleum fiscal regime mostly the discounted cash flow model was used by previous researchers. Moreover, as it was mentioned before discounted cash flow model is the most

commonly used method (Laughton, Sagi & Samis, 2000). However, previous researches did not study the impacts of different time sequences on the attractiveness of petroleum fiscal regime. Therefore, this study applies both qualitative and quantitative analysis to in order to investigate attractiveness of Kazakhstan petroleum fiscal regime in comparison with Russian Federation.

Furthermore, this thesis overcome the gap of previous studies applying the method introduced by Luo & Yan (2010) which combines discounted Government Take, non-discounted Government Take, Front Loading Index and Composite Score indicators. Moreover, the results of qualitative analysis identifying the attitudes of decision makers will be used in linear weighting method to calculate Composite Score indicator.

Chapter 5. Qualitative analysis

This chapter carries out a qualitative analysis of Kazakhstan fiscal regime and finds the opinion of Korean energy companies decision makers on the indicator selection for further quantitative analysis. Section 5.1 is introduction part. Section 5.2 explains survey design and its methodology. Section 5.3 describes findings, while Section 5.4 provides a summary and conclusion. The questionnaire presented in Appendix 2.

5.1 Introduction

The assessment of petroleum fiscal regime requires a rigorous and substantial work. This chapter aims to analyze empirically Kazakhstan's petroleum fiscal regime as well as to find the opinion of decision-makers on Indicator for further quantitative analysis. In particular, it describes and analyzes the "Survey of decision makers attitudes towards indicators of project assessment and Kazakhstan fiscal regime" solicited from Korean oil and gas industry key players as well as the experts from Ministry of Energy of the Republic of Kazakhstan. The findings are then summarized in order to provide the base for further quantitative analysis and find a ways to improve existing petroleum fiscal regime in Kazakhstan.

The survey was started on June 20th and ended on September 27th in 2019. The questionnaire was designed to achieve the objectives of this thesis, particularly to find the effects of Kazakhstan petroleum fiscal terms to investor's decision-making process. It also addresses the attitudes of decision makers for indicators which should be used in further quantitative analysis.

The questionnaire was sent to experts in governmental and private Korean oil companies, which participated in oil and gas exploration and production projects in the Republic of Kazakhstan. With regard to thesis committee recommendation the results was compared with opinions of experts from Ministry of energy of Republic of Kazakhstan.

Mostly interviews were carried out in person. The questionnaire was sent in advance through the email, after acquaintance with the questions, the face-to-face interview was conducted.

The major contributions of this part of thesis research are to make a ground for quantitative analysis, as well as to provide recommendations for Kazakhstan petroleum fiscal policy design. This survey analyzes petroleum fiscal terms from the perspective of private and governmental Korean companies, as well as from Kazakhstan government policy makers. It should be worthy to conduct such analysis, since investor's (represented by Korean oil companies) and government's (represented by Ministry of Energy of the Republic of Kazakhstan) interests are compete to each other and have different perspectives for petroleum taxation. Specific set of the questions was made to solicit the views of both sides and clearly addressed in this survey.

Moreover, this survey is important, since it combines the views of experts who know Kazakhstan's petroleum fiscal terms well and provides valuable information coming from those who have big experience in oil and gas field. It is worth to notice that such analysis hard to find in the previous studies, especially for Kazakhstan petroleum fiscal regime. In addition, it allows conducting a detailed assessment of fiscal regime and finding the effects of petroleum taxation terms for the investor's decision making process from Governmental and investor's standpoints.

5.2 Survey design

This section explains the questionnaire design and survey implementation process. It provides the insights for the sample surveyed and identifies any source of bias. Further, in this section described the techniques for the survey analysis and discussed the oil and gas field expert's questionnaire responses.

5.2.1 Questionnaire design

The questionnaire designed based on analysis conducted on Chapter 2 and 3 considering the principal issues important for the petroleum taxation in the Republic of Kazakhstan. Therefore, it designed to find opinions of respondents on two main areas:

1) Analysis of respondent's attitudes for the indicators. This work is significant for the further quantitative analysis and helps to identify the weights of Government Take and Front Loading Index indicators, which will be used to calculate the Composite Score indicator. It also discusses importance of "time value of money" concept for the project evaluation and identifies attitudes of respondents to Government Take and Front Loading Index indicators. This analysis is covered in Part 1 including questions from one to six.
2) Analysis of respondent's attitudes for Kazakhstan's Fiscal Regime. Such analysis is essential for Kazakhstan Government and foreign investors, since fiscal terms influence to investment climate of the country. Moreover, it helps to identify the drawbacks and benefits of petroleum fiscal terms in Kazakhstan. Consequently it finds the ways to encourage the exploration and production projects in Kazakhstan. This work is covered in Part 2 including questions from one to eight.

The questionnaire consists of 17 questions in total, including 6 and 8 questions for each area of research interests accordingly and 3 questions providing general information on respondents.

5.2.2 Sample selection

This thesis sample is not simple and not focused on random people. It is purposive and

involves respondents with specific knowledge, experience and characteristics in order to contribute for broad comparison between certain group of people, especially in oil and gas field. Moreover, sample size is not important as the competence and expertise of the respondents regarding the petroleum taxation and acquaintance with oil and gas projects evaluation.

In this regard, the target population of this thesis is tax and energy experts from Korean governmental and private petroleum companies with experience of working in Kazakhstan oil and gas projects. The experts from Ministry of Energy of the Republic of Kazakhstan were also included in the target population for the comparison the views of two competing parties, namely Host country and foreign investors.

The sample selection process is difficult task, since it requires establishing a list of governmental and private Korean companies participated in Oil and Gas projects in Kazakhstan. However, selection of governmental companies is easier than selection of private companies, since there are a limited number of such companies. The difficulty of selection private companies is based on the problem that most of the Korean oil companies participated in Kazakhstan projects are closed or bankrupt.

With the help of thesis supervisor Professor Eunnyeong Heo and Professor Eungkyu Lee the list of Korean oil companies, which has experience in Kazakhstan oil projects was completed. The information on each company was obtained by checking their websites. The companies were divided in two groups: “Governmental” and “Private”. The chosen companies have a long-term partnership with Kazakhstan government and still developing the oil fields in the country. Therefore, the experts from these companies can provide valuable information regarding Kazakhstan petroleum tax regime.

Finally, the experts from Ministry of Energy of the Republic of Kazakhstan was included to the sample since they participate in energy policies development and provide recommendations to the government in order to increase investment climate in oil and gas field.

After the accomplishment of the list of companies and governmental institution, the sample of tax and energy experts were selected. In total were chosen 35 respondents, where 15 of respondents were from Korean National Oil Company (hereinafter – KNOC), 9 respondents from LG International (hereinafter – LGI) and 11 respondents from Ministry of Energy of the Republic of Kazakhstan. The interviews with respondents from KNOC were organized by my supervisor Professor Eunnyeong Heo, while meetings with respondents from LGI were arranged by Professor Eungkyu Lee. The respondents from Ministry of Energy were contacted by myself through the email and phone calls.

5.2.3 Source of bias

The popular problem of scientific studies is that bias can make them less reliable. It is really important to use the basis of chance to select people for the research (University of Glasgow, n.d.). Thus, potential source of bias of this study is a sample selection bias, which can appear because of the lack of randomness in target population selection process. This thesis is mainly focused on respondents from Korean oil companies and Ministry of Energy of the Republic of Kazakhstan which can be reflected in high proportion of investor side respondents compared with Kazakhstan government representatives.

However, this potential source of bias does not weaken the reliability of the research because of the following reasons.

First, Kazakhstan petroleum fiscal regime is complicated and requires a deep understanding of various taxes interactions. Therefore, tax and energy experts supposed to be the most trustworthy source of information regarding to petroleum fiscal terms details.

Second, since the number of oil companies is much larger than number of government institutions, it is not surprising that this thesis involved more respondents representing the investors in the sample.

Lastly, because this thesis analyzes the effects of petroleum fiscal terms on investor's decision-making process, the survey sample needs to include experts with considerable experience on

managing a large portfolio of assets and performance in oil and gas projects in Kazakhstan. Moreover, it explains the higher number of respondents from the investor side.

5.2.4 Survey technique

The main survey technique is based on interview under 14 main questions and 3 additional questions with general information provided in Appendix 2. Fink (2015) argued that the most used survey technique is the data collection method. The main advantage of the interview technique is the face-to-face contact between interviewee and interviewer. Such technique allows conducting a wider discussion to collect valuable information and ask additional questions under the given topic.

The respondents of this survey were contacted through the phone calls or email and asked to participate in the interview. Furthermore, they were aware and confident that their responds are confidential. The copy of the questionnaire was sent in advance in order to let respondents become familiar with the questions. The interviews were taken place in the Seoul National University territory and at the respondent's working place. The interview duration was 20-30 minutes in average. The answers of respondents were recorded by note taking during the interview. In 7 cases, the interview arrangement was difficult because of the respondent's lack of time and unexpected business trips. In these instances, the questionnaire was sent via email and the response was obtained through the email also.

5.3 Findings

The summary of main findings is summarized in this section. Two main topics of this survey, as well as the general information about respondents illustrated in sub-sections, namely: respondent's general information, respondent's attitudes for the indicators and respondent's attitudes for Kazakhstan's Fiscal Regime. In order to secure the confidentiality of the respondents the different notations are used in this analysis as shown in Table 10.

Table 10. Respondents Notation

Name of the organization	Number of respondents	Notation
Korean National Oil Company	15	Respondent NOC
LG International	9	Respondent POC
Ministry of Energy of the Republic of Kazakhstan	11	Respondent GOV

5.3.1 Respondent's general information

This sub-section is aimed to provide respondents background information as well as demographic characteristics related to this research. It consists of the respondent's work experience in oil and gas sector, name of the organization and position in the company.

Accordingly, 50% of respondents representing the investor side have work experience in Oil and Gas Exploration and Production field over than 10 years, while 42% of experts have experience from 5 to 10 years and 8% have experience from 3 to 5 years. It confirms the respondent's expertise to provide valuable information on petroleum fiscal regime in oil and gas field. The Figure 5.1 represents the work experience of respondents from KNOC and LGI.

The 62% of investor side respondents were from KNOC, while other 38% were from LGI. Each of the experts poses a high position in their company.

The respondents work experience representing the Host country's policy makers shown in Figure 5.2. Accordingly, 55% of the respondents have experience more than 10 years, while 27%

of experts have work experience from 5 to 10 years and 18% of respondents have work experience less than 5 years.

5.3.1 Respondent's attitudes for the indicators

The first part of the survey analyzes the attitudes of the respondents for the indicators which will be used in further qualitative analysis. Questions from one to six address respondent's view on the Time Value of Money, Front Loading Index indicator, Government Take indicator and provide the explanation on the respondent's choice for one of these indicators.

Regarding to the importance of the Time Value of Money for the project evaluation and decision making process, from an investors perspective 92% of the respondents are agree and strongly agree that the Time Value of Money is important for the project evaluation and decision making process, while 8% believes that it is true to some extent. However, from the Host country representatives side 63% of respondents are agree and strongly agree with the importance of this concept for the project evaluation, 27% argues that it is true to some extent while other 9% do not agree with it. Table 11 shows the respondent's answers for the first question.

Table 11. Respondent's attitudes for the Importance of the Time Value of Money for the project evaluation and decision making process

Answer	Investor side respondents	Host country side respondents
Strongly disagree	0%	0%
Do not agree	0%	9%
True to some extent	8%	27%
Agree	46%	18%
Strongly agree	46%	45%

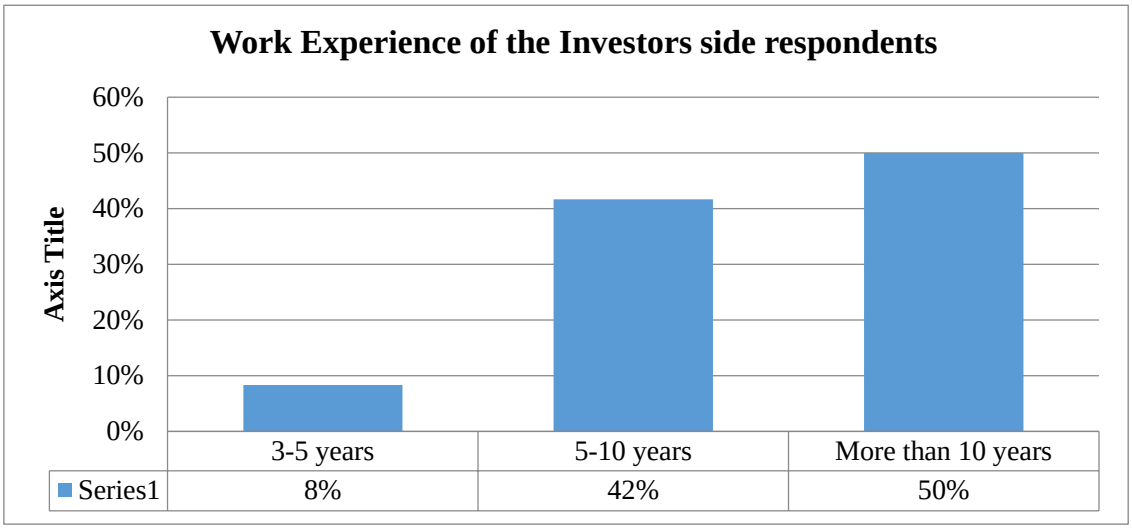

Figure 5.1 Work experiences of the Investor side respondents

Source: Author's calculations

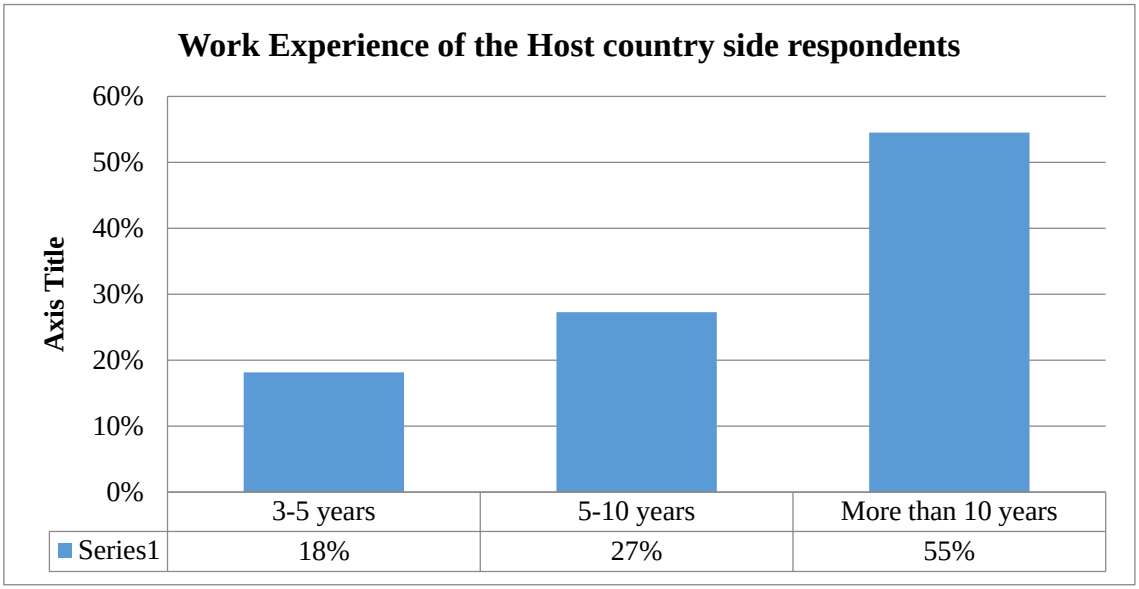

Figure 5.2 Work experiences of the Host country side respondents

Source: Author's calculations

Regarding to the comprehensiveness of FLI indicator 63% of the investor side respondents argues that it is true to some extent that this indicator is more comprehensive than common indicator they used in their projects evaluations. 21% agree and strongly agree with it, while 17% do not agree and strongly disagree with it. Meanwhile, 64% of the government side respondents believe that it is true to some extent, 27% do not agree and 9% agree with this. Table 12 represents the summary of the respondents' answers regarding to the comprehensiveness of FLI indicator.

Table 12. Respondent's attitude to the comprehensiveness of FLI indicator.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	4%	0%
Do not agree	13%	27%
True to some extent	63%	64%
Agree	17%	9%
Strongly agree	4%	0%

Considering the comprehensiveness of Government Take indicator 71% of respondents from the investor side believes that it is true to some extent that this indicator is better than common indicator they use for the project evaluation. 25% of experts agree with it, while 4% are disagreeing with this statement. The respondents from host country side are mostly answered that it is true to some extent 55%, another 36% are not agree with it, while 9% agree (see Table 13).

Table 13. Respondent's attitude to the comprehensiveness of Government Take indicator.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	0%	0%
Do not agree	4%	36%
True to some extent	71%	55%
Agree	25%	9%
Strongly agree	0%	0%

The next question was about respondent's attitude to use unfamiliar indicator like Government Take or Front Loading Index for the project evaluation. The 50% of the respondents from investor side said that it is true to some extent, 13% were agree and 33% and 4% were not agree and strongly disagree to use unfamiliar indicator. The host country side respondents were also answered that it is true to some extent, 9% were agree, while 9% and 18% were not agree and strongly disagree with it (Table 14).

Table 14. Respondent's attitude to use unfamiliar indicator.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	4%	18%
Do not agree	33%	9%
True to some extent	50%	64%
Agree	13%	9%
Strongly agree	0%	0%

The penultimate question of this section asked respondents to choose between Government Take and Front Loading Index indicators, in order to determine which of them is better to use to assess attractiveness of petroleum fiscal regime. This question was aimed to find a weight of each indicator with regard to calculation of Composite score indicator in further quantitative analysis. In this regard the answers of respondents will not be compared between Investor side and Host country side respondents, but will be measured as total sample. Consequently, the last open ended question was asked to explain why they chose one of these indicators.

Accordingly, the 63% of total number of respondents chose the Government Take Indicator, while the rest 37% decided to choose the Front Loading Index indicator. Table 15 represents selection of all respondents to the indicator which is better to use for fiscal regime attractiveness evaluation.

Regarding the last question indicating why respondents chose one of the indicators, it is necessary to mention that mostly respondents told that they believes that Government Take is more comprehensive and important than Front Loading Index. However, it is worth to notice

the comments of some of them, who told that:

"*The value of money is an important issue, but it seems more critical to see how much profit is allocated for each party, before starting to think about the time value of money" (Respondent POC 5).*

"I have chosen the Government Take indicator, because it shows all the revenue, which Host country gets from the project" (Respondent GOV 2).

"I have chosen the Government Take indicator, since it important to know the real revenue allocation between Host country and International Oil Company" (Respondent NOC 7).

The respondents, who chose the Front Loading Index indicator, mostly noted that it seems more important and reliable than Government take. The most noticeable comments are the following:

"Considering that a lot of projects start from exploration stage in Kazakhstan, it is worth to know the difference between discounted and non-discounted GT" (Respondent POC 2).

"FLI looks more comprehensive for the assessing attractiveness of petroleum fiscal regimes, since the investor would like to pay at later stage of the project after getting some investment back" (Respondent NOC 6).

"I think so, because it does not matter how much Government Take will be, as a possible participation in a project guarantees essential amount of profit" (Respondent GOV 8).

Table 15. Respondent's selection for the indicator.

Name of the indicator	%	Frequency
Government Take	63%	22
Front Loading Index	37%	13

5.3.2 Respondent's attitudes for Kazakhstan's Fiscal Regime

The second part of the survey identifies the attitudes of the respondents for Kazakhstan Fiscal Regime. Questions from one to eight examines respondent's view on Mineral Extraction Tax, Corporate Income Tax, Commercial discovery bonus abolishment, Host government's

participation ratio, Tax holidays, Losses, Value Added Tax and absence of the Cost Recovery Limit mechanism.

The first question of the second part of survey explains the Mineral Extraction Tax and asks respondents whether such tax rates can positively affect to the investment in Kazakhstan. Accordingly, 54% of respondents from investor's side said that they strongly disagree and do not agree that such rates are fair for the investors, while 29% said that it is true to some extent that it can positively affect to the investment and 17% told that they agree with it. 55% of the Host country side respondents said that it is true to some extent that such level of Mineral Extraction Tax Rates can positively affect to the investment in Kazakhstan, while another 45% agreed with it. As we can see from Table 16, there is different view on the Mineral Extraction Tax rates level between Host Country and Investors. This can be explained by competitive objectives of two sides of respondents.

Table 16. Respondent's attitude on Mineral Extraction Tax.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	8%	0%
Do not agree	46%	0%
True to some extent	29%	55%
Agree	17%	45%
Strongly agree	0%	0%

42% of investor side respondents believe that it is true to some extent that Corporate Income Tax rate level existing in Kazakhstan can positively affect to the investment. 33% are strongly disagree and do not agree with this, while 25% are agreed with this. And again the different opinion was found from the host country side, accordingly 82% of the respondents from Ministry of Energy of the Republic of Kazakhstan argued that they agree and strongly agree that such level of corporate tax can positively affect to the investment in Kazakhstan, while another 18% believes that it is true to some extent. Therefore we can conclude that in order to make Kazakhstan's fiscal regime more favorable for investors, Government should revise the

structure of Corporate Income Tax and find the ways to create incentives for the investors, who is going to explore a new fields in Kazakhstan. Table 17 shows the difference of views of the Investor side respondents and Host country side respondents.

Table 17. Respondent's attitude on Corporate Income Tax.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	8%	0%
Do not agree	25%	0%
True to some extent	42%	18%
Agree	25%	73%
Strongly agree	0%	9%

Regarding the commercial discovery bonus abolishment in Kazakhstan starting from 2019, the respondents from both sides are agreed that this fact can positively affect to investment in Kazakhstan. 46% and 42% of respondents from investor side agree and strongly agree with it respectively, while another 13% believes that it is true to some extent. The respondents from Host country side told that they agree and strongly agree with this, 45% and 55% respectively (see Table 18).

Table 18. Respondent's attitude on Commercial Discovery Bonus abolishment.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	8%	0%
Do not agree	25%	0%
True to some extent	42%	18%
Agree	25%	73%
Strongly agree	0%	9%

Further, respondents were asked to express their attitudes on Government Participation Ratio in Kazakhstan and tell whether it is good for attracting investment in Kazakhstan or not. Accordingly, 50% of respondents from investor side believe that it is true to some extent, 33% agrees with this, 4% are strongly agree with this, while 13% do not agree that it can positively effect on investment in Kazakhstan. The Government side respondents were more confident

with this issue, thus 45% and 27% of respondents are agreed and strongly agreed respectively, while other 27% believed that it is true to some extent. Table 19 shows Investor and Host Government side respondent's answers under this issue.

Table 19. Respondent's attitude on Government Participation Ratio.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	8%	0%
Do not agree	25%	0%
True to some extent	42%	18%
Agree	25%	73%
Strongly agree	0%	9%

Regarding the absence of Tax holidays in Kazakhstan petroleum fiscal regime, 50% of investor side respondents said that they do not agree that it can positively affect to the investment in Kazakhstan, 8% were strongly disagree with it, 33% stated that it is true to some extent, while other 8% agreed with it. Pre much same answers gave the respondents from Host country side, hereby 55% and 18% were do not agree and strongly disagree that absence of Tax holidays in Kazakhstan can positively affect to the investment in Kazakhstan, 18% were argued that it is true to some extent, while other 9% agreed with it (see Table 20).

Table 20. Respondent's attitude on absence of tax holidays.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	8%	0%
Do not agree	25%	0%
True to some extent	42%	18%
Agree	25%	73%
Strongly agree	0%	9%

The next question addressed the respondent's attitudes on the mechanism of carrying forward losses for up to 10 years pertaining to subsurface use contracts. Hereby 38% of respondents from investor side stated that it is true to some extent that this can positively affect to the

investment in Kazakhstan, the same percent of respondents agreed and 17% strongly agreed with it, while other 8% were not agree with this. The respondents from Host country side mostly believed that this mechanism should have a positive effect on investment in Kazakhstan. Table 21 provides the information on respondent's answers for this question.

Table 21. Respondent's attitude on mechanism for losses that can be carried forward for up to 10 years.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	0%	0%
Do not agree	8%	0%
True to some extent	38%	18%
Agree	38%	64%
Strongly agree	17%	18%

Regarding the Value Added Tax level in Kazakhstan, 46% and 29% of respondents from investor side were agreed and strongly agreed respectively, that decrease of the tax level in 1990 from 20% to 12% positively affected to the investment in Kazakhstan. 24% argued that it is true to some extent, while only 4% did not agree with it. Meanwhile 64% and 36% of respondents from Host country side agreed and strongly agreed that this measure positively affected on investment in Kazakhstan (see Table 22).

Table 22. Respondent's attitude on Value Added Tax reduction.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	0%	0%
Do not agree	4%	0%
True to some extent	21%	0%
Agree	46%	64%
Strongly agree	29%	36%

In the last question of the survey the respondents were told that Kazakhstan does not have Cost Recovery Limit mechanism and asked whether it can negatively affect to the investment in Kazakhstan. The investor side respondents' answers were different some were agreed and some

were against, while Host country side respondents mostly argued that it cannot positively affect to the investment in Kazakhstan (see Table 23).

Table 23. Respondent's attitude on absence of Cost Recovery Limit.

Answer	Investor side respondents	Host country side respondents
Strongly disagree	4%	36%
Do not agree	33%	45%
True to some extent	29%	18%
Agree	25%	0%
Strongly agree	8%	0%

5.4 Summary & Conclusion

This chapter conducts a qualitative analysis of decision makers' attitudes on the indicators for assessment of fiscal terms and their attitudes on Kazakhstan petroleum tax regime. It compares the viewpoints of investor side respondents and Host country side respondents, in order to find a ways to improve Kazakhstan petroleum fiscal terms and identify appropriate indicator for further qualitative analysis. Considering competitive objectives of both sides of respondents, the analysis conducted in this chapter is contribute to the progress of this thesis.

The main findings of the first part of survey determined the attitudes of respondents on the indicators for the evaluation tax regime and then compared between two Host country side respondents and investor side respondents. Regarding the importance of Time value of money both sides of respondents mostly confirmed its significance for the project evaluation and decision-making process.

Considering the comprehensiveness of Government take and Front Loading Index indicators the both sides of respondents mostly had a similar opinions and told that it is true to some extent that these two indicators is more comprehensive for the petroleum project evaluation than common indicator they usually use. With regard to use such unfamiliar indicators for project evaluation, which is seems more comprehensive than common indicator they use, 37% and 27% of investor and host country side respondents accordingly refused it, while other believed that it is true to some extent. Therefore we can conclude that these indicators are good enough for evaluation petroleum fiscal regimes.

Consequently, the respondents have chosen between Government Take and Front Loading Index indicators in order to measure the weights of each for calculation Composite score indicator in next chapter. Since the results will be used in further quantitative analysis, the answers of both sides of respondents were combined in order to find total weights of decision maker's opinion regarding these two indicators. Accordingly, 63% of respondents chose Government take and other 37% chose Front Loading Index.

The second and last part of the survey was aimed to find the effects of main petroleum fiscal terms existing in Kazakhstan to investor's decision making process. In this regard, opinions of investor side respondents were compared with Host country side respondents.

The controversial responds were found regarding the Royalty rate, Corporate Income Tax level and Cost Recovery Limit absence in Kazakhstan. Regarding the Royalty rate it was found that Host country side respondents believes that Royalty rates existing in Kazakhstan can positively influence to investment, while investor side respondents mostly were disagree with this. Therefore, in order to increase attractiveness of petroleum fiscal regime in Kazakhstan, government should revise the mechanism of calculation of Royalty Tax and simplify it. Regarding the Corporate Income Tax level around 33% of investor side respondents argued that Corporate Income Tax level is too high and believes that it can negatively affect to investment in Kazakhstan, while other 67% believes that Corporate Tax level is fair for investors. However, Government side respondents stated that Corporate Income Tax level can positively affect to investment in Kazakhstan. Regarding the Cost Recovery Limit mechanism some of the investor side respondents argued that it is necessary to introduce it in order to increase the attractiveness level of fiscal regime.

However, the almost all respondents stated that absence of tax holidays regime for subsurface users can negatively affect to investment in Kazakhstan. Only small percent of respondents believed that it is not significant instrument for fiscal regime. Therefore, Kazakhstan Government should consider opportunity to provide such incentives for subsurface users, especially for the oil and gas exploration projects.

Additional comment was given by Respondent NOC3, who told that Domestic Market Obligations are not transparent and there is no clear governmental rules on its calculation. Domestic Market Obligations should be fair for all investors and it will be better to specify some share from oil produced which each investor should provide to the Government.

Notably, that both sides of respondents stated that commercial discovery bonus abolishment can

positively affect to investment in Kazakhstan. The same answers were given for Host Government Participation Ratio, Losses and Value Added Tax reduction, what shows that Kazakhstan Government chose a right policy direction for increasing investment climate in Oil and Gas field.

The analysis done in this chapter fulfills the first objective of this thesis and finds the effects of current petroleum fiscal regime existing in Kazakhstan on investor's decision-making process. Moreover, it identifies investor's opinion on the indicator for quantitative analysis which will be done in next chapter.

Chapter 6. Quantitative analysis

This Chapter is focused on quantitative comparison of Kazakhstan and Russian petroleum fiscal regimes. It commences from introduction part, than it explains the models adopted for the analysis. Further this chapter provides the data and main assumptions for the discounted and non-discounted cash flow models. The discussion of the results and sensitivity analysis for testing the results of models will be also provided in this chapter. Ultimately, there will be conclusion of the quantitative analysis.

6.1 Introduction

This chapter is aimed to quantitatively assess opinions expressed in previous chapter and find attractiveness level of Kazakhstan petroleum fiscal regime in comparison with Russian Federation. In order to fulfill the second objective of this thesis the discounted and non-discounted cash flow models, which clearly shows the oil and gas project revenue allocation between Host country and International Oil Company, will be used in this chapter. Discounted cash flow model will help to find the impact of time sequence differences on project revenue and profit. Creedy (2001) argued that cash flow models provide a proper framework for transparent and manageable analysis of different interdependent petroleum tax regimes. Furthermore, attractiveness of petroleum fiscal terms of Kazakhstan and Russian Federation will be compared by using linear weighting function of Composite Score.

As it was mentioned in Chapter 4 the number of fiscal regimes is much higher than number of countries in the World (Johnston, 1994), thereby, petroleum fiscal regime in Kazakhstan and Russian Federation is based on complex rules in order to satisfy country's and subsurface users' interests. The main principles of petroleum fiscal terms in Kazakhstan and Russian Federation are taken from the Petroleum tax guide developed by Ernst & Young Global (2017).

This chapter divided into six sections as follows: Section 6.2 explains a models simulation

incorporating different indicators. Section 6.3 underlines a data and main assumptions used in the quantitative analysis. Section 6.4 discusses results and main findings, while Section 6.5 conducts a sensitivity analysis of the models to test the robustness of the results. The last section 6.6 concludes the chapter.

6.2 Model

This section commences with explanation of the method developed by Luo and Yan (2010) and explains the models simulated in this thesis in order to assess attractiveness level of Kazakhstan and Russian Federation petroleum fiscal regime. Nowadays, International Oil Companies use a wide range of evaluation methods to compare different types of petroleum fiscal regimes. Therefore, in Chapter 4 explained the reason to use abovementioned method in qualitative analysis of this thesis.

With regard to comprehensiveness and revenue allocation between Host country and International Oil Company the different indicators as Government Take, Front Loading Index and Composite Score have been chosen to assess the attractiveness level of petroleum fiscal regime. Accordingly, based on the theoretical framework and literature review provided in previous chapters this section provides a modelling framework illustrated in Figure 6.1.

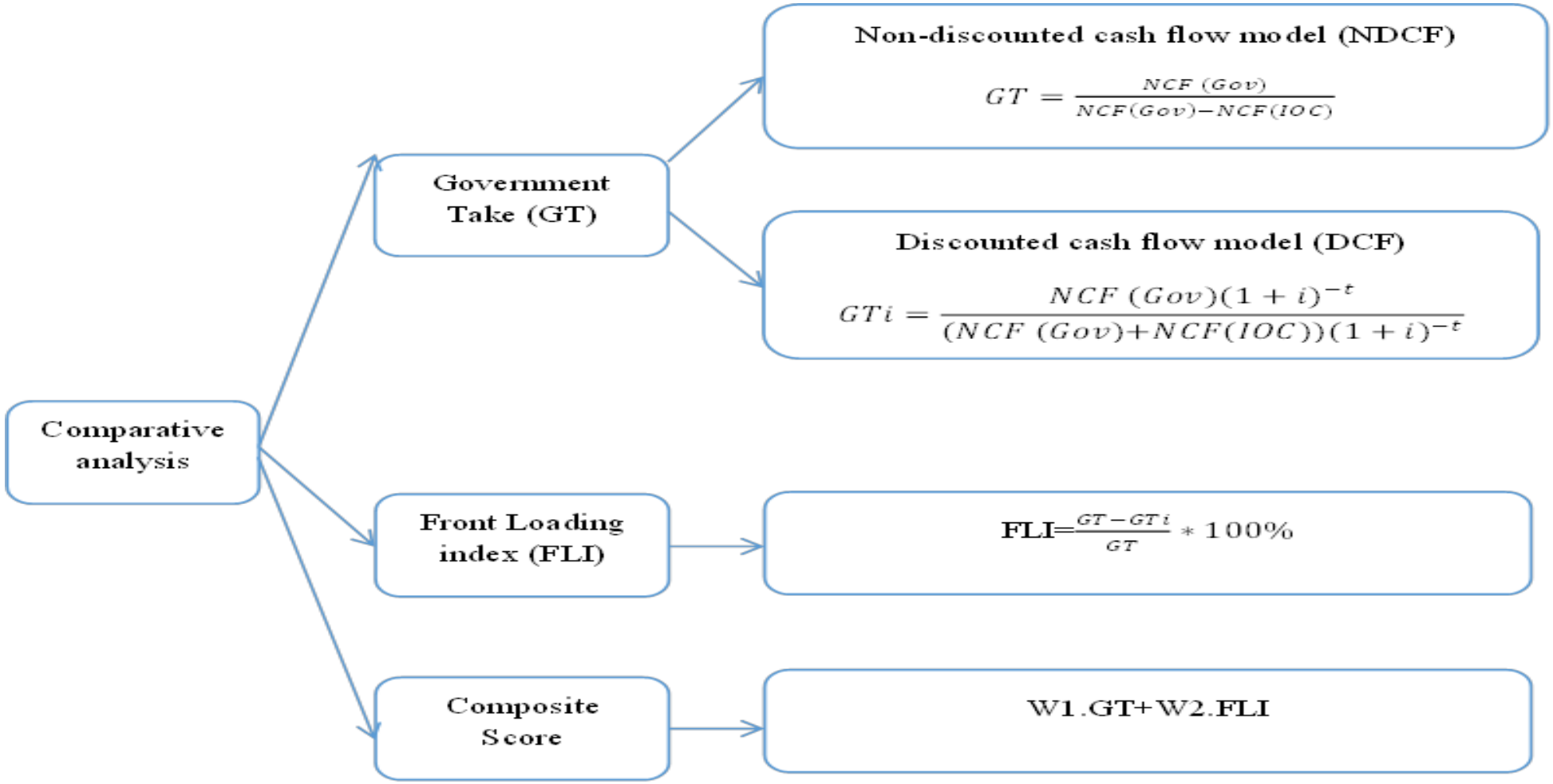

Figure 6.1 Modelling framework

Source: Luo & Yan (2010)

6.2.1 Government Take

The fundamental indicator of this thesis is Government Take, since Front Loading Index and Composite Score calculations will be based on the results of this indicator. As it was mentioned in Chapter 4 Government Take combines a different petroleum tax instruments, like Royalty, Bonuses, Income tax and other taxes into one indicator.

The calculation of Government Take will be based on Equation 1 implemented by Bindemann (1999):

$$GT = \frac{NCF\ (Gov)}{NCF(Gov)+NCF\ (IOC)} * 100\% \qquad \text{Eq. (1)}$$

Where, Host country's Net Cash Flow represented by NCF (Gov) and Net Cash Flow of International Oil Company represented by NCF (IOC).

Luo and Yan (2010) argued that petroleum contract fiscal terms are attractive for International Oil Companies when the Government Take is low. Therefore, the lower result of Government Take will be found, the more attractive fiscal regime.

In this thesis Government Take will be calculated using non-discounted and discounted cash flow models. Next subsections discuss the equations used in both models.

6.2.1.1 Non-Discounted Cash Flow Model

Non-discounted cash flow model developed in this thesis based on the revenue gained from production and costs for exploration and development of the oil and gas field. This model does not consider the Time Value of Money concept, so the value of non-discounted Government Take determined as the Host country's income from the total project revenue.

Notably, that according to Johnston (1994) the calculation of Government Take using the non-discounted cash flow model requires different equations, which varied in terms of contractual system (the explanation provided in Chapter 4) in the country. With regard that Kazakhstan and Russian Federation petroleum fiscal arrangements are related to Concessionary system, this model is based on the following equations:

$$GR_t = P_t * Q_t \qquad \text{Eq. (2)}$$

Where, GR_t is gross revenue in year *t*; P_t is an oil price in year *t* and Q_t is the total oil production in year *t*.

$$R_t = GR_t * RR \qquad \text{Eq. (3)}$$

Where, R_t is an amount of royalty in year *t*; RR – royalty rate, which depend on the level of oil production.

$$NR_t = GR_t - R_t \qquad \text{Eq. (4)}$$

Where, NR_t is Net Revenue in year *t*.

$$TI_t = NR_t - OC_t - DD\&A_t - IDC_t \qquad \text{Eq. (5)}$$

Where, TI_t – Taxable Income in year *t*; OC_t – Operating costs in year *t*; $DD\&A_t$ – Depreciation, depletion and amortization in year *t*; IDC_t – Intangible drilling costs in year *t*.

$$CIT_t = If\ TI_t\ is\ positive, then\ TI_t * CIT\ Rate, otherwise\ 0 \qquad \text{Eq. (6)}$$

Where, CIT_t is a corporate income tax in year *t*.

$$NCF_t = GR_t - R_t - OC_t - DD\&A_t - IDC_t - CIT_t \qquad \text{Eq. (7)}$$

Where, NCF_t is the after tax net cash flow in year t, GR_t is the gross revenue in the year t, R_t is a total royalties paid in year t, OC_t – Operating costs in year t; $DD\&A_t$ – Depreciation, depletion and amortization in year t; IDC_t – Intangible drilling costs in year t.

The non-discounted cash flow models, simulated using abovementioned formulas for the Kazakhstan and Russia petroleum fiscal regimes, are attached in Appendix 3 and 4 respectively.

6.2.1.2 Discounted Cash Flow Model

Considering the importance of time value of money concept, the Government Take was calculated through the discounted cash flow model. This model is used to estimate the value of Government Take based on its future cash flow. Moreover, the determined value of discounted Government Take will be used in Front Loading Index calculation, which is aimed to reveal the influence of different time sequences of income gaining by resource country to the project attractiveness.

Emhjellen & Alaouze (1999) argued that Discounted Cash Flow model is the most commonly

used technique by oil companies in order to evaluate expected future cash flow. There are three main steps for this method:

First is the estimation of project net cash flow at each time period.

Second, the projected net cash flow needs to be discounted using discount rate incorporating risk premium.

Lastly, discounted cash flows are summed to calculate Net Present Value.

The simulation of Discounted Cash Flow model for Kazakhstan and Russian petroleum fiscal regimes will be based on the following formula:

$$GTi = \frac{NCF\ (Gov)(1+i)^{-t}}{(NCF(Gov)+NCF\ (IOC))(1+i)^{-t}} * 100\% \qquad \text{Eq. (8)}$$

Where, GTi is a discounted Government Take, *i* – discounted rate and *t* – the time of cash flow.

The calculation of discounted Government Take for Kazakhstan and Russian petroleum fiscal regime attached in Appendixes 5 and 6 respectively.

6.2.2 Front Loading Index

Front Loading Index is an alternative indicator to assess attractiveness of petroleum fiscal regime. It is used in this research in order to show the difference between Non-Discounted and Discounted Government Take. It is important, because some tax instrument like signature and discovery bonuses in the beginning of the project, Royalty and Export duties in the production stage cause front loading for the International Oil Company and affect to the total profitability of the project. As it was mentioned in Chapter 4, this indicator shows the influence of different time sequences of income gaining by resource country to the project attractiveness.

The calculation of Front Loading Index in this thesis was based on the formula as follows:

$$FLI = \frac{GT - GTi}{GT} * 100\% \qquad \text{Eq. (9)}$$

Where GT is a Non-Discounted Government Take and GTi is a Discounted Government Take.

Front Loading Index can be interpreted as smaller this index is, the less risk for IOC in the beginning stage of the project and more attractive fiscal terms of the contract.

6.2.3 Composite Score

Composite score is a comprehensive indicator, which combines the effects of Government Take and Front Loading Index indicators using the weights found through the qualitative analysis and survey technique. Moreover, this indicator reflects the decision maker's attitudes on the contribution of both indicators to the fiscal regime attractiveness.

Composite score calculated in this thesis using the linear weighting function as follows:

$$CS = W1 * GT + W2 * FLI \qquad \text{Eq. (10)}$$

Where, CS is a Composite Score, W1 and W2 is the weights determined in Chapter 5 for Government Take and Front Loading Index respectively, which are related to the contribution of these two indicators to the attractiveness of petroleum fiscal regime.

Luo and Yan (2010) argued that International Oil Companies expect the smaller result of Composite Score indicator, while Host country (resource owner) prefers to get higher result. Therefore, the interpretation of this indicator is as follows:

The smaller result of Composite score indicator is, the greater attractiveness of petroleum fiscal regime.

6.3 Data and Assumptions

The data for the Non-discounted and Discounted Cash Flow models in this thesis collected from the Government documents, secondary sources and previous studies, while Composite score indicator was calculated using the findings obtained through the survey technique.

The tax instruments for the analysis of Kazakhstan petroleum industry were gathered from Tax Code of the Republic of Kazakhstan (2019) as well as from the Ernst & Young Global Oil and Gas Tax Guide (2017), while information about Russian Federation petroleum fiscal regime analysis was obtained from Tax Code of Russian Federation (2019) and Ernst & Young Global Oil and Gas tax Guide (2017).

Discount rate is assumed to be 10 per cent in real terms in this research, since majority of previous studies applied the same rate. Moreover, Kemp and Rose (1983) and Rowland (1983) argued that such rate mirror the Oil and Gas Industry's discount rate.

Based on the previous studies the amount of oil reserves for the Kazakhstan and Russian petroleum fiscal regimes assumed to be 40 000 MBBL and the project life is a 15 years. Intangible and Tangible Capital expenditures (herein after – CAPEX) are calculated based on the Johnston (1994) book. Accordingly, CAPEX includes 20% Intangible and 80% Tangible capital expenditures in total 91000 million US$ over the first 4 years of the project life. Moreover, Tangible CAPEX depreciated straight line over the 5 years of the project life. Operating costs are assumed to be 2.9 US$ per barrel oil produced in average for the life of the project. Kaiser (2007) claimed that operating expenditures are usually stable at around 2.5 US$ per barrel oil.

The oil price per barrel forecast was obtained from Bloomberg agency assumptions kindly provided by one of the largest world consulting big four companies – KPMG. Appendix 7 provides the information on oil price forecast for the 2019-2033. It should be noted that, most of the previous studies used Brent Crude Oil price for comparative analysis.

The Royalty (Mineral Extraction Tax) for Kazakhstan Petroleum Fiscal Regime calculated based on the information provided in Chapter 2, specifically, the volume of annual oil production was multiplied by rate related to that volume of production. Meanwhile, the calculation of Royalty (Mineral Extraction Tax) for Russian Petroleum Fiscal regime is shown in Appendix 8. Moreover, it was assumed that conversion factor, which is denoting the quality of oil, is equal to unity, while allowance is zero.

For the both fiscal regimes it was assumed that Host Government participation ratio in the project will be zero. Furthermore, there will not be domestic market obligations and bonuses, since all these instruments are negotiated between Host country and International Oil Company separately. Therefore, discounted and non-discounted cash flow models were simulated based on the Mineral Extraction Tax, Export Duties and Corporate Income Tax instruments for Kazakhstan and Russian petroleum fiscal regimes. It should be noticed that Kazakhstan and Russia provides an ability to carry losses forward. In this regard in both models losses are carried forward and International Oil Company starts to pay taxes when Net Cash Flow is positive.

After accomplishment the discounted and non-discounted cash flow models, this study commences the calculations of Front Loading Index and Composite Indicators. In this way Front Loading Index was calculated based on the Non-Discounted and Discounted Government Take results obtained from abovementioned models. Accordingly, the Weights of Government Take and Front Loading Index Indicators were found in Chapter 5 through the survey technique.

6.4 Results & Discussion

This section is aimed to summarize the main results of quantitative analysis for the Kazakhstan and Russian petroleum fiscal regimes. The discussion will start from the results of non-discounted cash flow model, after there will be considered the discounted cash flow model, Front Loading Index and Composite Score results.

Non-discounted cash flow model showed that the Government Take under Kazakhstan petroleum fiscal regime is better for International Oil Companies comparing to Russian Government Take. The Figure 6.2 highlights the findings of simulated non-discounted cash flow model.

Discounted cash flow model results confirmed the findings of non-discounted cash flow model and the results are as follows: Kazakhstan Government Take is 42%, while Russian Government Take is 60%. The results are shown in Figure 6.3.

Front Loading Index was calculated using the equation (9) which incorporates the results of Discounted and Non-discounted Government Take. The results showed that Kazakhstan and Russian Federation petroleum Fiscal Regimes are on the same level. It means that both petroleum fiscal regimes have the same influence of different time sequences of income gaining by resource country to the project attractiveness. Consequently, the Figure 6.4 illustrates the results of Front Loading Index for Kazakhstan and Russian petroleum fiscal regimes. Notably, that Front Loading Index can be interpreted as smaller this index is the less risk for IOC in the beginning stage of the project and more attractive fiscal terms of the contract.

Finally, since the results of the Government Take and Front Loading Index showed the different results, this study incorporates the comprehensive indicator Composite Score, which combines Government Take indicator and Front Loading Index indicator and reflects the decision maker's attitudes on the contribution of both indicators to the fiscal regime attractiveness.

It was calculated using the equation (10), which include the weights found in Chapter 5 and the results of Government Take and Front Loading Index.

The results of Composite Score allowed ranking Kazakhstan petroleum fiscal regime on the first place comparing to Russian tax conditions. Figure 6.5 provides the results of Composite score for Kazakhstan and Russian petroleum fiscal regimes.

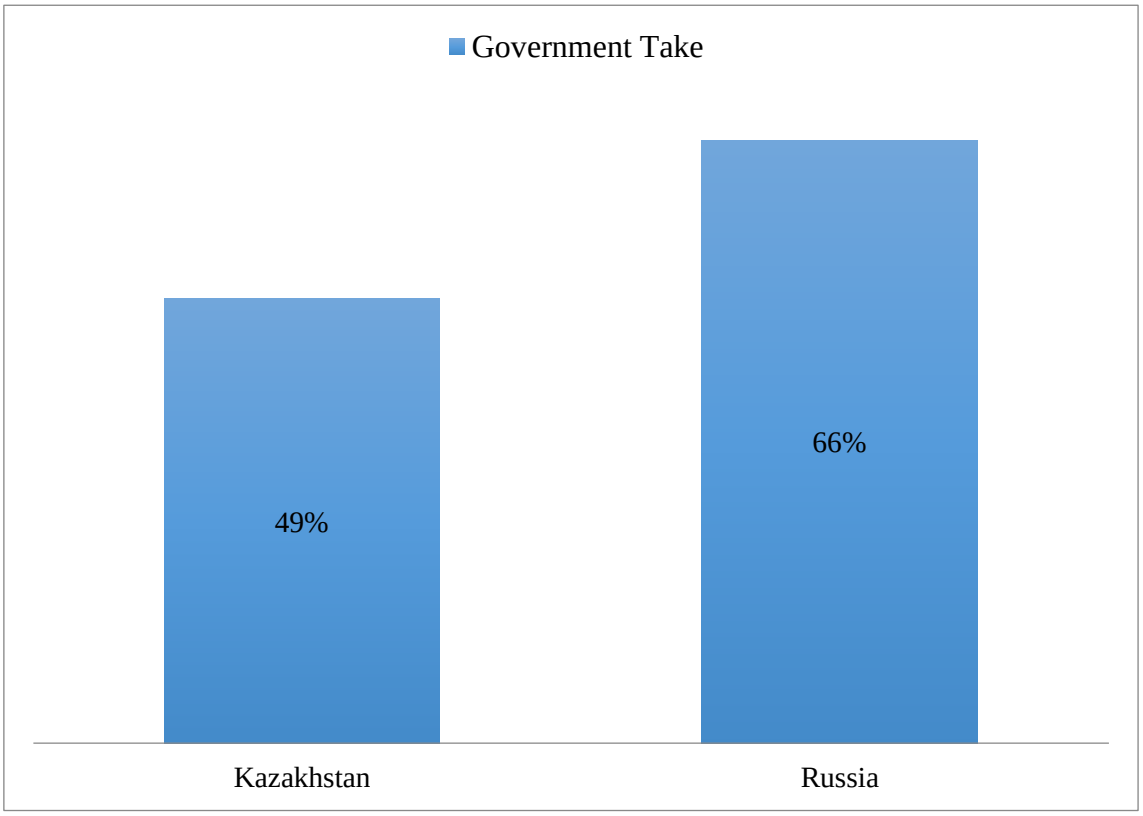

Figure 6.2 Government Take calculated through the non-discounted cash flow model

Source: Authors calculations.

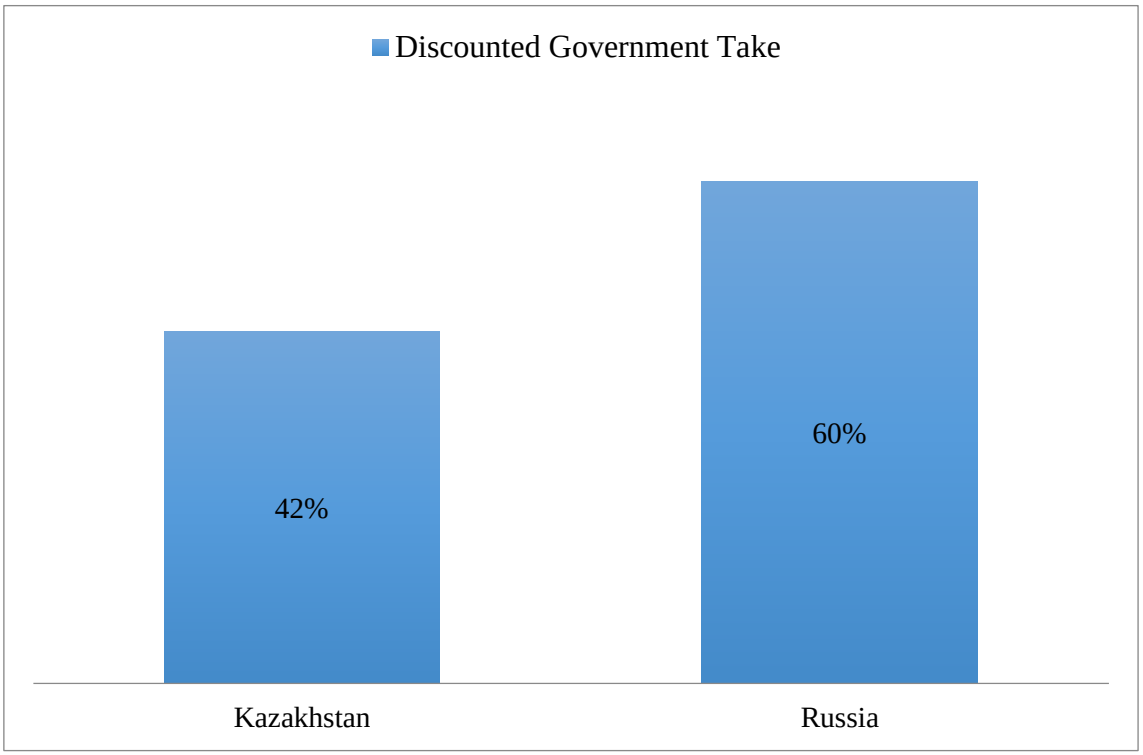

Figure 6.3 Government Take calculated through the discounted cash flow model

Source: Authors calculations.

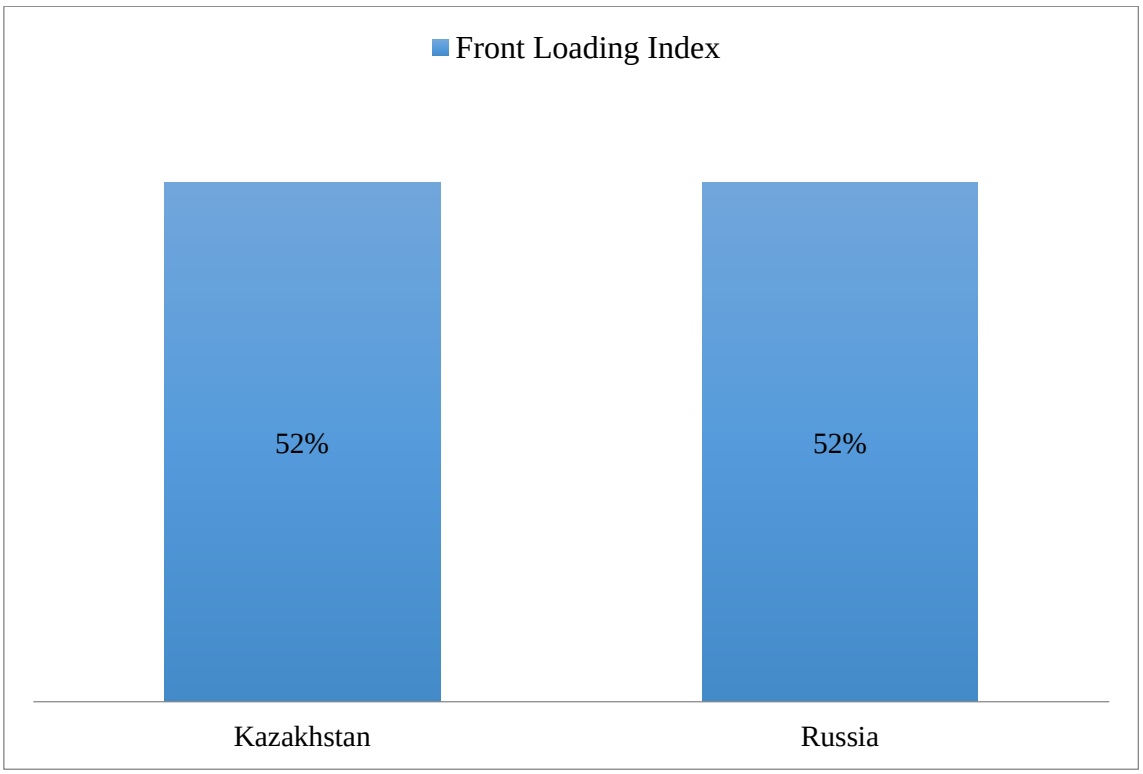

Figure 6.4 Front Loading Index for Kazakhstan and Russian Petroleum Fiscal Regimes

Source: Authors calculations.

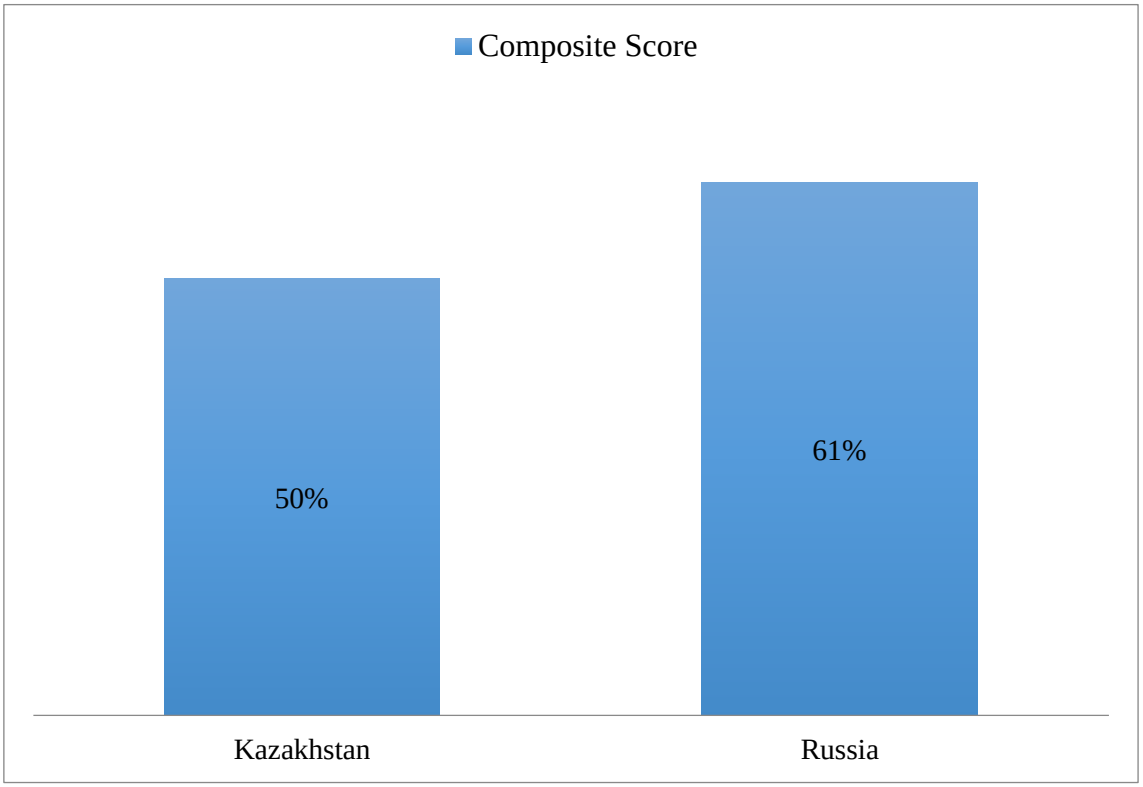

Figure 6.5 Composite Score for Kazakhstan and Russian Petroleum Fiscal Regimes

Source: Authors calculations.

6.5 Sensitivity Analysis

This section is aimed to test the results robustness of the discounted and non-discounted cash flow models in the presence of uncertainty. In this regard both models will be recalculated under alternative assumptions to determine their impact on the indicators discussed in the Section 6.4. Saltelli A. et al. (2008) argued that sensitivity analysis is important for the models involving many input variables.

In this regard, discounted and non-discounted models will be tested in this study in terms of Oil price and Oil production level variables in order to make findings more reliable.

For the first sensitivity analysis scenario it was assumed that oil price is constant and will be equal to 25 US$ per barrel for the whole life of the project. Furthermore, the oil production was decreased to 40% during the life time of the project. Accordingly, total oil production for the whole project in this scenario was equal to 24000 MBBLS. The results are shown in Table 24.

Table 24. The results of sensitivity analysis for the Low oil price and Low oil production level scenario.

Country	Non-Discounted Government Take	Discounted Government Take	Front Loading Index	Composite Score	Attractiveness Rank
Kazakhstan	30%	26%	52%	38%	1
Russia	53%	48%	52%	52%	2

Based on the results of the Low price and Low oil production level scenario, we can see the huge gap between Kazakhstan and Russian petroleum fiscal regimes. It can be explained by the absence of export duties in Kazakhstan fiscal regime for the oil price below 40 US$ per barrel.

The second scenario is based on the high Oil Price and high Oil production level assumptions. Likewise, the oil price was increased up to 100 US$ per barrel and will be constant for the

whole life of the project. Meanwhile, Oil production was increased up to 100 000 MBLLS. Table 25 provides the results of all indicators calculated under discussed assumptions.

Table 25. The results of sensitivity analysis for the High oil price and High oil production level scenario.

Country	Non-Discounted Government Take	Discounted Government Take	Front Loading Index	Composite Score	Attractiveness Rank
Kazakhstan	50%	44%	51.4%	51%	1
Russia	75%	71%	52%	58%	2

As we can see from the findings, Government Take, Discounted Government Take and Composite Score indicators are depend on the Oil Price and Oil Production Level variables, while Front Loading Index is stable for this variables fluctuation. It can be explained by the impact of oil production level to royalty rate in Kazakhstan and Russian petroleum fiscal regimes. Furthermore, there is an influence of oil prices to export duty rates for both nations' fiscal terms.

It should be mentioned, that non-discounted and discounted Government Take, and Composite Score indicators increasing, when the Oil Price and Oil Production level are high and vice versa. It shows that Kazakhstan and Russian petroleum fiscal regimes are progressive.

The calculation of Scenario 1 with low Oil Price and low Oil production for Kazakhstan petroleum fiscal regime provided in Appendix 9, 10, while calculations for Scenario 2 reflecting high Oil price and high Oil production level reflected in Appendix 11 and 12 representing non-discounted and discounted cash flow models. Appendixes from 13 to 16 establish calculations of Scenario 1 and Scenario 2 for Russian petroleum Fiscal regime.

Consequently, the results of sensitivity analysis are consistent between all scenarios and confirms the findings mentioned in Section 6.4, thereby Kazakhstan petroleum fiscal regime is more attractive than Russian.

6.6 Conclusion

This chapter quantitatively compared the attractiveness level of Kazakhstan and Russian petroleum fiscal regimes and focused on ranking them using the comprehensive indicator. The evaluation done in this chapter is based on the discounted and non-discounted cash flow models as well as on calculations of Government Take, Front Loading Index and Composite Score indicators. Moreover, it provides a particular approach to assess petroleum fiscal terms attractiveness that applied to Kazakhstan and Russian regimes.

The results of non-discounted and discounted cash flow models showed that Kazakhstan tax regime is more attractive than Russian petroleum tax conditions for the International Oil Companies.

However, the Front Loading Index results evaluated both tax regimes on the same level of attractiveness. Therefore, based on the study Luo & Yan (2010) this research applied the comprehensive Composite Score indicator the rank the attractiveness of petroleum fiscal terms of these two countries. Accordingly, composite score results showed that Kazakhstan petroleum fiscal regime is more attractive. Table 26 summarizes the findings of the quantitative analysis.

Table 26. Summary of the quantitative analyze findings.

Country	Non-Discounted Government Take	Discounted Government Take	Front Loading Index	Composite Score	Attractiveness Rank
Kazakhstan	49%	42%	52%	50%	1
Russia	66%	60%	52%	61%	2

In order to test the reliability of the results there was conducted sensitivity analysis under different Oil Price and Oil Production levels. In this way, Discounted and Non-Discounted cash flow models were recalculated on the low Oil Price and low Oil Production level, as well as high Oil Price and Oil Production level assumptions. The result of sensitivity analysis confirmed the findings of this chapter and established Kazakhstan petroleum fiscal regime on the first rank

comparing to Russian fiscal terms. Moreover, it was found that results of non-discounted Government Take, Discounted Government Take are fluctuating under Oil Price and Oil Production level changings in both countries petroleum fiscal regimes. Such fluctuations explained by dependence of Mineral Extraction Tax (Royalty) to Oil Production level and Export Duties dependence to Oil Price variables.

Ultimately, based on the findings of quantitative analysis there should be concluded that International Oil Companies in the process of overseas selection can find that Kazakhstan and Russia has the same level of attractiveness in terms of the risk faced in the earlier stage of the project, while Kazakhstan fiscal terms looks more attractive than Russian in terms of non-discounted Government Take, discounted Government Take and Composite Score Indicator.

Chapter 7. Conclusion and Recommendations

This chapter summarizes all the findings of this thesis and completes the assessment of Kazakhstan's petroleum fiscal regime in comparison with that of the Russian Federation. It starts with the thesis summary in subsection 7.1 where the principal findings of this research are discussed. Subsection 7.2 provides policy recommendations based on the findings, while subsection 7.3 identifies the research limitations.

7.1 Summary and conclusion

There are two principal objectives of this thesis; the first is to find the effects of Kazakhstan's petroleum taxation on the investors' decision-making, and the second is to assess Kazakhstan's fiscal regime in comparison with that of the Russian federation.

The analytical process of this research starts with describing the current status of the oil and gas industry in the Republic of Kazakhstan in Chapter 2, where Kazakhstan and Russia's Petroleum fiscal regimes are also discussed to identify the key features of tax components.

Chapter 3 establishes the main theoretical concepts that are used as a background for the qualitative and quantitative analysis, with the most frequent criterion for the qualitative analysis being neutrality. Moreover, it shows that the economic rent concept should be used as a base for the quantitative analysis, specifically for simulating cash flow models of the oil and gas projects.

Chapter 4 provides a literature review on petroleum fiscal regimes and qualitative and quantitative methodologies used in previous studies. Moreover, the main differences between concessionary and contractual systems are explained.

In the subsequent chapters, qualitative and quantitative analyses are carried out using methods that differ from approaches adopted in previous studies.

With regard to the first objective, Chapter 5 seeks to determine the effects of Kazakhstan's petroleum taxation on the investors' decision-making based on the qualitative analysis.

Accordingly, a survey technique is used, with the respondents answers being divided into host government side respondents and investor side respondents to identify the effects of Kazakhstan's petroleum taxation from the oppose viewpoints. As stated by Sunley, Baunsgaard, & Simard (2002), nowadays, there are many tax instruments and structures for policy makers to design a fiscal regime, which can secure economic rent for the governments and attract investments from IOCs. Therefore, the main findings of the qualitative analysis in Chapter 5 are summarized as follows:

1) Regarding the indicator that measures fiscal regime attractiveness, 63% of respondents chose the Government Take indicator. Therefore, it can be inferred that investors are more interested in revenue allocation between a government and IOCs, rather than the influence of different time sequences of income gains by the resource country.
2) The government side and the investor side respondents have opposing opinions regarding the mineral extraction tax and corporate income tax levels existing in Kazakhstan.
3) Both sides of respondents agreed that commercial discovery bonus abolishment and ability to carry forward losses for up to 10 years will have a positive influence on the investment in Kazakhstan.
4) In terms of the host government participation ratio, majority of respondents agreed that it is a good policy to have an ability to share the project risks with the government or develop a new project independently.
5) The absence of tax holidays and cost recovery limit in Kazakhstan's tax regime has a negative effect on attracting investments from the perspective of both sides of respondents.
6) Respondents form both the government and investor sides agreed that the value added tax reduction in Kazakhstan has a positive effect on the investment attracting process.

Chapter 6 fulfills the second objective of this thesis by comparing the Kazakhstani and Russian

petroleum fiscal regimes. It incorporates the calculation of non-discounted and discounted Government Take, Front Loading, and Composite Score indicators by simulating discounted and non-discounted cash flow models, as well as linear weighting function calculation. The main findings are summarized as follows:

1) Kazakhstan's Petroleum Fiscal Regime is better in terms of non-discounted and discounted Government Take Indicators.
2) In terms of the Front Loading index, Russian and Kazakhstani Fiscal Regimes are on the same level.
3) The Composite Score indicator showed that Kazakhstan's petroleum fiscal terms are better than those of the Russian Federation.

Moreover, Chapter 6 demonstrates the sensitivity analysis, which is aimed at testing the robustness of the results. Accordingly, the results of sensitivity analysis are consistent in all scenarios, thus confirming the findings of the quantitative analysis.

As identified in previous chapters, fiscal terms affects the profitability of oil projects as well as the attractiveness of fiscal regimes.

Finally, it can be concluded that the Kazakhstani and Russian governments should revise their existing tax policies to increase attractiveness of the new exploration projects especially in Caspian Basin under the project "Eurasia". The tax policies of both governments should be based on international best practices with regard to geological challenges of the perspective fields, including reservoir quality risk, great depth, overpressure, etc. For instance, the Norway government has reduced the petroleum tax burden for oil fields with high geological costs and low production level tapped off the Royalty (Bjerkedal, 2000). Thus, tax regimes should consider providing tax incentives, such as tax holidays, a cost recovery mechanism, and revise the calculation of mineral extraction tax, which should incorporate both oil production, market price, and the geological conditions of oil fields.

7.2 Recommendations

The results of quantitative analysis show that Kazakhstan's petroleum fiscal regime is more attractive than that of the Russian federation. However, despite the fact that the Republic of Kazakhstan achieved a significant progress with respect to improving the investment climate, there is a room for further progress.

The main problem for IOCs that operate in Kazakhstan and those planning to invest in Kazakhstan, is that the government take is still high, compared to other resource rich countries, as the non-discounted government take is 49% of the total revenue. Such level of government take can be good for the fields with low-risk exploration and low-cost development, while in the case of the Precaspian Basin, the country's main prospective area, considerable exploration costs are required. In this regard, the Kazakhstani Government should recalibrate its petroleum fiscal policy to encourage new exploration projects and provide incentives to oil and gas producers to invest and expand their presence in Kazakhstan's oil and gas industry. Thereby, based on the findings of this thesis, there are several policy recommendations for the Kazakhstani Government:

1) The formation of rates for mineral extraction tax that should be revised by introducing a new method, depending not only on oil production and market price, but also on the geological conditions of the oil fields, especially small- and medium-size ones.
2) The establishment of tax holidays for new exploration projects with regard to the "Eurasia Project" to increase attractiveness of the Precaspian Basin exploration projects.
3) It should provide a cost recovery limit mechanism for new exploration projects with difficult geological conditions.

Moreover, according to Kazenergy's National Report (2017), foreign investors are concerned with the frequent changes in tax instruments, which sometimes are retroactive, thus reducing the confidence of investors in Kazakhstan's fiscal regime. This fact has also been confirmed

during the interview with respondents from South Korean National Oil Companies, who argued that the domestic market obligations for oil companies are not clear. In fact, the quantity of oil and gas for the domestic market is determined by the Order of the Ministry of Energy and differs from company to company. In this regard, the Kazakhstani Government should clarify the formation of domestic market obligations and provide a fair allocation mechanism between all subsurface users based on percentage of the total amount produced.

Finally, it should be noted, that the Kazakhstani Government should focus on improving its petroleum fiscal regime, considering the reduction in funds on the global markets for new oil and gas exploration projects, and based on the fact that a sound fiscal regime is one of the key components for the attractiveness of the whole country's investment climate.

7.3 Limitations

This thesis qualitatively and quantitatively analyzes the attractiveness of Kazakhstan's petroleum fiscal regime. However, any research is limited under a number of areas that need to be further analyzed, and this work is not an exception.

This thesis needs to extend the assessment of the petroleum fiscal regime by incorporating a full cycle exploration costs analysis. Unfortunately, owing to data and time limitations, this thesis is carried out based on the development phase of the project. However, such additional analysis could supplement this thesis by demonstrating the exploration risks value with respect to the whole project attractiveness as well as all the benefits for investors.

The second limitation of this research is that the comparison of Kazakhstan's petroleum fiscal regime is conducted with only one country, the Russian Federation. Further analyses can be undertaken by adding a greater number of countries to the evaluation. For example, Kazakhstan's tax regime can be compared to those of Central Asian countries to find out the attractiveness of petroleum fiscal regimes in this region.

Another limitation of this study is based on the discount rate of return, which is a key metric for future cash flow projection and highly affects project revenue. This research applies discount rate equal to 10% to simulate the discount cash flow model for Kazakhstani and Russian tax regimes; however, generally, the calculation of the discount rate depends on many risk factors such as the company's debts, equity, and inventories. Likewise, further studies can compare the attractiveness of fiscal regimes based on different discount rates, which will take into account all the investors' risks.

Moreover, this thesis can be complemented by undertaking the more compound oil price models, to show the influence of oil price change on the total project revenue and the government take amount.

Another possible expansion of this study can be related to considering the macroeconomic factors such as inflation, consumer price index, and other factors that influence the total project

revenue and the whole petroleum tax regime attractiveness.

Bibliography

Amoako-Tuffour, Joe and Owusu-Ayim, J. (2010). An Evaluation Of Ghana's Petroleum Fiscal Regime. *Ghana Policy Journal*, *4*(December).

Amundsen, E. S., Andersen, C., & Gaute Sannarnes, J. (1992). Rent Taxes on Norwegian Hydropower Generation. *The Energy Journal*, *13*(1). https://doi.org/10.5547/ISSN0195-6574-EJ-Vol13-No1-6

Back, M. J. (2003). A Discussion on the Effect of International Fiscal Regimes on Portfolio Selection in the Petroleum Industry. In *SPE Hydrocarbon Economics and Evaluation Symposium*. Society of Petroleum Engineers. https://doi.org/10.2118/82011-MS

Banfi, S., Filippini, M., & Müller, A. (2003). Rent of Hydropower Generation in Switzerland in a Liberalized Market. *CEPE Working Paper Series*. Retrieved from https://ideas.repec.org/p/cee/wpcepe/01-20.html

Beidleman, C. R. (1984). Discounted cash flow reinvestment rate assumptions. *Engineering Economist*, *29*(2), 127–139. https://doi.org/10.1080/00137918308967702

Bindemann, K. (1999). *Production-sharing agreements : an economic analysis - ORA - Oxford University Research Archive*. Oxford Institute for Energy Studies. Retrieved from https://ora.ox.ac.uk/objects/uuid:3ba0589f-8c3a-43b9-b034-24f7dae7e0c5

Blake A. J. & Roberts M. C. (2006). Comparing petroleum fiscal regimes under oil price uncertainty. *Resources Policy*, *31*(2), 95–105. https://doi.org/10.1016/j.resourpol.2006.08.001

Bond S., M. Devereux & M. Sunders (1987) "North Sea Taxation for the 1990's", The Institute for Fiscal Studies.

BP. (2018). Downloads | Statistical Review of World Energy | Energy economics | BP. Retrieved October 27, 2018, from https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html

Bulekbaev, Z., Eskuzhiev, B., Filipev, G., Kamalov, S., Korostyshevskii, M., Kuandikov, B., … Vocalevskiy, E. (1996). *Oil and Gas fields of Kazakhstan, Reference bo*. (A. Kazhegeldin, A. Abdulin, H. Bespayev, C. Daukeev, L. Miroshnichenko, & E. Vocalevskiy, Eds.). Almaty.

Caspian Barrel. (2017). Малым НПЗ Казахстана придется закрыться — Caspian Barrel. Retrieved from http://caspianbarrel.org/ru/2017/06/malym-npz-kazahstana-pridetsya-zakrytsya/

Creedy, J. (2001). Tax Modelling. *Economic Record*, *77*(237), 189–202. https://doi.org/10.1111/1475-4932.00014

Crowson. (2003). *Astride mining: issues and policies for the minerals industry*. *Mining Journal Books Ltd*. https://doi.org/10.1016/j.resourpol.2004.04.006

Dimitric, M. (2003). A qualitative analysis of the costs of tax compliance in the Republic of Croatia.

EIA. (2017a). Country Analysis Brief : Russia, (October), 1–32.

EIA. (2017b). International Energy Outlook. Retrieved July 29, 2019, from https://www.eia.gov/todayinenergy/detail.php?id=32912

Emhjellen, M., & Alaouze, C. M. (1999). A Comparison of Oil Project NPV's in the North Sea Obtained using the Weighted Average Cost of Capital Discounting Method and a Modern Asset Pricing Method. *Papers*.

Ernst & Young Global. (2017). Global oil and gas tax guide 2017.

Fink, A. (2015). *How to Conduct Surveys: A Step-by-Step Guide*. *SAGE Publications* (6th ed.).

Fjaertoft, Daniel; Lars, P. L. (2015). Russian petroleum tax policy – Continuous maneuvering in rocky waters. *Energy Policy*, *87*, 553–561.

Fraser, R., & Kingwell, R. (1997). Can expected tax revenue be increased by an investment-preserving switch from ad valorem royalties to a resource rent tax. *Resources Policy*, *23*(3), 103–108.

Furtado, L. S., Gonçalves, E., & Costa, L. A. R. (2019). Risk and rewards dynamics: Measuring the attractiveness of the fiscal regime in the presence of exploratory risks. *Energy Policy*, *132*, 1274–1287.

Garnaut R. & Clunies-Ross A. (1983). Taxation of Mineral Rents. *OUP Catalogue*.

GARNAUT R. & ROSS A. C. (1979). The Neutrality of the Resource Rent Tax. *Economic Record*, *55*(3), 193–201.

"Information-Analytical Centre of Oil and Gas" JSC. (2018). Infographs. Retrieved August 24, 2019, from http://www.iacng.kz/en/

International Institute of Khasar Sea Studies. (2016). Operations at large Kazakh oil field run over schedule. Retrieved August 20, 2019, from http://www.iikss.com/en/index.php/route/news_det/Mjk0MQ/Operations_at_large_Kazakh_oil_field_run_over_schedule

Jennifer Josefson A. R. (2019). Mining in the Russian Federation: overview | Practical Law. *Thomson Reuters Journal*.

Johnston, D. (1994). *International petroleum fiscal systems and production sharing contracts*. PennWell Books.

Kaiser M. J. (2007). Fiscal system analysis-concessionary systems. *Energy*. https://doi.org/10.1016/j.energy.2007.04.013

Kankam D. & Ackah I. (2014). The optimal petroleum fiscal regime for Ghana: An analysis of available alternatives. *International Journal of Energy Economics and Policy*, *4*(3), 400–410.

Kazakhstan - International - Analysis - U.S. Energy Information Administration (EIA). (n.d.). Retrieved May 26, 2019, from https://www.eia.gov/beta/international/analysis.php?iso=KAZ

Kazakhstan Government decree No. 1072. on approval Oil and Gas industry development program, 2010-2014 (2010). Retrieved from http://adilet.zan.kz/rus/docs/P100001072_

Kazenergy. (2017). National report, 322.

KazMunayGaz. (2017). *Annual Report*. *Index on Censorship* (Vol. 17). https://doi.org/10.1080/03064228808534495

KazTransGas. (2018). *CITIZENS OF KAZAKHSTAN ARE USED THE GAS AT THE PRICE BELOW OF COST. OVER THE LAST FIVE YEARS, THE POPULATION LEVEL OF GASIFICATION INCREASED FROM 30% TO 50% - kaztransgas*. Retrieved from http://www.kaztransgas.kz/index.php/en/press-center/press-releases/1586-citizens-of-kazakhstan-are-used-the-gas-at-the-price-below-of-cost-over-the-last-five-years-the-population-level-of-gasification-increased-from-30-to-50

KazTransGas. (2019). Gas pipeline system of Kazakhstan is recognized as the best in the Central Asia - kaztransgas. Retrieved August 27, 2019, from http://www.kaztransgas.kz/index.php/en/press-center/press-releases/978-gas-pipeline-system-of-kazakhstan-is-recognized-as-the-best-in-the-central-asia

Kemp A. G. & Rose D. (1983). The Effects of Taxation of Petroleum Exploitation: A Comparative Study. In *Energy Economics in Britain* (pp. 131–140). Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-011-7355-1_9

Kemp A. & Stephen L; Masson K. (1997). A Reassessment of Petroleum Taxation in the UKCS. *DEPARTMENT OF ECONOMICS*.

KMG. (2017). *Annual report, 2017*.

Kryukov V. & Moe A. (2007). Russia's Oil Industry: Risk Aversion in a Risk-Prone Environment. *Eurasian Geography and Economics*, *48*(3), 341–357. https://doi.org/10.2747/1538-7216.48.3.341

Laughton D. G., Sagi J. S. & Samis M. R. (2000). Modern Asset Pricing and Project Evaluation in the Energy Industry. *The Journal of Energy Literature*, *6–1*, 3–46. Retrieved from https://pdfs.semanticscholar.org/4286/8a3a48f624bf086dadcf5b3d7e6e98a877d3.pdf?_ga=2.143318517.1939243347.1570863775-1232719444.1570863775

Lsehunwa S; Uzoalor E. & Ifeoma. (2011). Evaluation of True Government Take under Fixed and Sliding Royalty Scales in Nigerian Oil Industry. *Australian Journal of Basic and Applied Sciences*, *5*(3), 735–741.

Luo D. (2010). Assessment of fiscal terms of international petroleum contracts. *Elsevier*. Retrieved from https://www.sciencedirect.com/science/article/pii/S1876380411600098

Luo D. & Yan N. (2010). Assessment of fiscal terms of international petroleum contracts. *Petroleum Exploration and Development*, *37*(6), 756–762. https://doi.org/10.1016/S1876-3804(11)60009-8

Manaf N. A. A., Saad N., Ishak Z. & Mas'ud A. (2014). Effects of Fiscal Regime Changes on Investment Climate of Malaysia's Marginal Oil Fields: Proposed Model. *Procedia - Social and Behavioral Sciences*, *164*, 55–61. https://doi.org/10.1016/J.SBSPRO.2014.11.050

Mercier (1999). Royalty that slides with oil price can add value to producing fields. *Oil & Gas Journal*, *97*(12), 92–94. Retrieved from https://www.cheric.org/research/tech/periodicals/view.php?seq=230860

Ministry of Energy of the Republic of Kazakhstan. (2018). Statistics / Information on current activities / Activity / Ministry of Energy of the Republic of Kazakhstan. Retrieved August 20, 2019, from http://en.energo.gov.kz/index.php?id=9105

Ministry of National Economy of the Republic of Kazakhstan. (2019). History of credit ratings of the Republic of Kazakhstan | Ministry of National Economy of the Republic of Kazakhstan. Retrieved August 19, 2019, from https://economy.gov.kz/en/pages/history-credit-ratings-republic-kazakhstan

Mishan E. J. (1968). What is Producer's Surplus? *The American Economic Review*, *58*(5), 1269–1282.

Nakhle C. (2004). Petroleum Taxation : A Critical Evaluation with Special Application to the UK Continental Shelf by Carole Nakhle, *2004*(July).

Nakhle C. (2008). *Petroleum taxation sharing the oil wealth: a study of petroleum taxation*

yesterday, today and tomorrow. *Taylor & Francis e-Library* (Vol. 245). https://doi.org/10.1017/CBO9781107415324.004

Rowland C. (1983). The economics of North Sea oil taxation. Retrieved from https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.345466

Saltelli A.; Ratto M.; Andres T.; Campolongo F.; Cariboni J.; Gatelli D.; Saisana M.; Tarantola S. (2008). *Global Sensitivity Analysis: The Primer*. *John whilley & Sons, Ltd*.

Sapiei N., Abdullah M. & Ismail K. (2013). A Qualitative Findings of Tax Compliance Burden: Analysis of Tax Preparers Survey. *American Journal of Economics*, *3*(i), 1–5. https://doi.org/10.5923/c.economics.201301.01

Schoemaker P. J. H. (1990). Strategy, Complexity, and Economic Rent. *Management Science*, *36*(10), 1178–1192. https://doi.org/10.1287/mnsc.36.10.1178

Stauffer T. R. & Gault J. C. (1985). Exploration Risks and Mineral Taxation: How Fiscal Regimes Affect Exploration Incentives. *The Energy Journal*, *Volume 6*(Special Issue). Retrieved from https://ideas.repec.org/a/aen/journl/1985si-a09.html

Sunley E., Baunsgaard T. & Simard D. (2002). Revenue from the Oil and Gas Sector: Issues and Country Experience. *IMF Conference Proceedings on Fiscal Policy Fonnulation and Implementation in Oil Producing Countries*.

Swan P. L. (1984). RESOURCE RENT TAX: THE ISSUES. *Economic Papers: A Journal of Applied Economics and Policy*, *3*(3), 1–10. https://doi.org/10.1111/j.1759-3441.1984.tb00458.x

Swe W. T. & Emodi, N. V. (2018). Assessment of Upstream Petroleum Fiscal Regimes in Myanmar. *Journal of Risk and Financial Management*, *11*(4), 85. https://doi.org/10.3390/jrfm11040085

Tax Code of Russian Federation (2019). Retrieved from http://www.consultant.ru/cons/cgi/online.cgi?rnd=9F65814A0128D77AF35470DC88063C59&req=doc&base=LAW&n=326593&dst=103340&fld=134&REFFIELD=134&REFDS

T=68&REFDOC=334395&REFBASE=LAW&stat=refcode%3D16610%3Bdstident%3D103340%3Bindex%3D525#1hz2izk98oe

Tax Code of the Republic of Kazakhstan (2019). Retrieved from https://online.zakon.kz/document/?doc_id=36148637#pos=19272;-38&sdoc_params=text%3D%25D0%25BD%25D0%25B0%25D0%25BB%25D0%25BE%25D0%25B3%2520%25D0%25BD%25D0%25B0%2520%25D0%25B4%25D0%25BE%25D0%25B1%25D1%258B%25D1%2587%25D1%2583%26mode%3Dindoc%26topic_id%3D361

The World Bank. (2018). GDP growth (annual %) | Data. Retrieved August 14, 2019, from https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=KZ

Tordo S. (2007). *Fiscal Systems for Hydrocarbons*. The World Bank. https://doi.org/10.1596/978-0-8213-7266-1

U.S. Energy Information Administration. (2019). Country Analysis Executive Summary: Kazakhstan, (Figure 1), 1–5.

University of Glasgow. (n.d.). Understanding Health Research · Common sources of bias. Retrieved October 19, 2019, from https://www.understandinghealthresearch.org/useful-information/common-sources-of-bias-2

Wessel R. H. (1967). A Note on Economic Rent. *The American Economic Review*, *57*(5), 1221–1226.

Yücedoğru R. & Hasseldine J. (2016). Understanding tax morale of SMEs: A qualitative study. *EJournal of Tax Research*, *14*(3), 531–566.

Yuhua Z. & Dongkun L. (2009). Investment optimization in oil and gas plays. *Petroleum Exploration and Development*, *36*(4), 535–540. https://doi.org/10.1016/S1876-3804(09)60145-2

Appendix 1: Main Oil and Gas fields in the Republic of Kazakhstan

№	Name	Reserves (million tonne)
1.	Kashagan	2000
2.	Tengiz	1000
3.	Karachaganak	200
4.	Uzen	110
5.	Zhanazhol	83
6.	Korolevskoe	77
7.	Severnie buzachi	68
8.	Severnaya Truva	64
9.	Kalamkas	61
10.	Zhetibai	53
11.	Karazhanbas	44
12.	Alibekmola	39
13.	Akshabulak centralnii	24
14.	Kumkol	16

Source: (Bulekbaev et al., 1996)

Appendix 2: Questionnaire

SURVEY OF DECISION MAKERS ATTITUDES TOWARDS INDICATORS OF PROJECT ASSESSMENT AND TOWARDS KAZAKHSTAN FISCAL REGIME

Dear Sir/Madam,

Mr. Kaliaskarov Sergozha is performing this survey under the supervision of President Korea society of innovation and Director of the International Energy Policy Program (IEPP) Seoul National University - Professor Eunnyeong Heo. This survey is carrying out in order to find opinion of Korean energy related companies with regards to attitude of Government Take and Front loading index indicators to the attractiveness of fiscal regime and to find their opinion to Kazakhstan's petroleum fiscal regime. It should be noted, that all the gathered data will be used only for academic research purpose and we will ensure confidentiality of your responses.

The main goal of this questionnaire is to identify indicators which should be used to rank attractiveness of petroleum fiscal regime and find the attractiveness of Kazakhstan's petroleum fiscal regime. This questionnaire can be completed within 20 minutes.

Notations:

Government Take is the indicator, which combines different impacts of fiscal terms, such as bonuses, royalties, taxes, profit oil split, government equity participation and other fees that host government receive during the project. It could be measured by the following equation:

$$\frac{NCF(Gov)}{NCF(Gov) + NCF(IOC)} * 100\%$$

Where, NCF (Gov) is the Host government's net cash flow; NCF (IOC) is the International oil company's net cash flow. The result can be interpreted as follows: "The higher Government Take, the less attractive fiscal regime for the International oil company (IOC)".

Front loading index (FLI) is the ratio that shows the difference between discounted value of Government Take and non-discounted value of Government Take. It is used to reflect the impact of time sequence differences of host nation on the project and IOCs' profit. Notably,

that in early stage of the project signature and commercial discovery bonuses, business tax and other fiscal terms cause front-loading to IOC, therefore host government revenue may grow faster than total project's profit. FLI could be measured by the following equation:

$$FLI = \frac{GT - GTi}{GT} * 100\%$$

Where, GT – non discounted Government take, GTi – discounted Government take. FLI can be interpreted as follows: "The higher Front Loading Index is, the higher risks will IOC face in the earlier stage of the project, and the less attractive contract terms to IOCs".

If you have any questions, suggestions or comments about this survey, do not hesitate to contact me via e-mail sergoja@gmail.com

We greatly appreciate your participation in this study and thank you in advance for your respond.

Sincerely yours

Kaliaskarov Sergozha

Questions:

Part I: Respondent's attitude for indicators

1. To what extent do you agree that the "Time Value of Money" is important for project evaluation and your decision making process?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

2. To what extent do you agree that FLI indicator, which affects different time sequence on the project's profit for IOC, is more comprehensive, than common indicator you usually use in the project evaluation?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

3. To what extent do you agree that GT indicator, which combines different impacts of fiscal terms, is more comprehensive, than common indicator you usually use in the project evaluation?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

4. To what extent do you agree to use unfamiliar indicator, which is seems better than you used before, for the project evaluation?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree

- Strongly agree

5. How do you think, which indicator is better to measure attractiveness of fiscal regime? (Please select one)
   - Government Take (which combines different impacts of fiscal terms)
   - Front Loading Index (which shows the impact of different time sequence on the project's profit for IOC)

6. Please briefly explain why did you choose one of the abovementioned indicators?

_____

_____

Part II: Respondent's attitude for Kazakhstan's Fiscal Regime

1. Royalty or Mineral Extraction Tax (payment for the right to use subsoil, which is based on the value or volume petroleum produced) in Kazakhstan is depend on annual volume produced and varied from 5% to 18%. To what extent do you agree that such progressive rates can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

2. Corporate Income Tax (the tax, which all the companies should pay from taxable income) in Kazakhstan is 20%. To what extent do you agree that it can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

3. Commercial discovery bonus (fixed payment paid by companies when a commercial discovery is made on the contract territory) has been abolished in 2019. To what extent do you agree that it can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

4. Host government's participation ratio (share of government in the project). There are two ways to sign oil and gas Exploration and Production contract in Kazakhstan: Auction and Partnership with National Oil Company. According to first method the Government participation ratio is zero, while the second method envisages the host nation's participation which is negotiable. To what extent do you agree that it can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

5. Tax holidays (period of time, when companies do not pay any taxes). Kazakhstan does not have a tax holiday regime for subsurface users. To what extent do you agree that it can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

6. Losses (negative profit). In Kazakhstan losses pertaining to subsurface use contracts may be carried forward for up to 10 years for repayment at the expense of the taxable income. To what extent do you agree that it can positively affect to the investment in Kazakhstan?

- Strongly disagree
- Do not agree
- True to some extent
- Agree
- Strongly agree

7. Value added tax (tax charged on taxable services and goods whenever value is added at each stage of production or sale) The Rate of the VAT has been reduced from 20% to 12% in 1990. To what extent do you agree that it can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

8. Cost Recovery Limit (certain volume of the exploration, production, operating and administrative costs, which will be compensated to the oil company from petroleum project revenue). Currently Kazakhstan has not cost recovery limit mechanism, therefore, to what extent do you agree that it can positively affect to the investment in Kazakhstan?
   - Strongly disagree
   - Do not agree
   - True to some extent
   - Agree
   - Strongly agree

GENERAL INFORMATION

Name of the company: _____
Position in the company: _____
Work experience in Oil & Gas Exploration and Production field:
□1-2 years □3-5 years □5-10 years □More than 10 years

Appendix 3: Non-discounted Cash Flow Model: Kazakhstan case

Year	2019	2020	2021	2022	2023	2024	2025	2026
Oil Production (MBBLS)	0	0	0	3,500	6,000	5,500	5,200	4,000
Oil Price ($/bbl)	70	70	65	65	65	66	67	68
Gross Revenue ($M)	0	0	0	227,500	390,000	363,354	349,193	273,057
Royalty ($M)	0	0	0	25,025	50,700	47,236	45,395	32,767
Export duty	0	0	0	49,000	84,000	77,000	72,800	56,000
Net Revenue ($M)	0	0	0	153,475	255,300	239,118	230,998	184,290
Intangible Cap EX ($M)	9,000	5,500	3,500	0	0	0	0	0
Tangible Cap EX ($M)	9,000	9,000	30,000	25,000	0	0	0	0
Operating Expense ($M)	0	0	0	11,000	13,000	12,500	11,800	11,000
DD&A Straight-Line ($M)	0	0	0	14,600	14,600	14,600	14,600	14,600
Total Applied deductions ($M)	9,000	14,500	18,000	43,600	27,600	27,100	26,400	25,600
Tax Loss Carry Forward ($M)	0	9,000	14,500	18,000	0	0	0	0
Taxable Income ($M)	-9,000	-14,500	-18,000	109,875	227,700	212,018	204,598	158,690
20% Income Tax ($M)	0	0	0	21,975	45,540	42,404	40,920	31,738
Net Cash Flow ($M)	-18,000	-14,500	-33,500	95,500	196,760	184,215	178,278	141,552
NCF GOV	0	0	0	96,000	180,240	166,640	159,115	120,505
NCF IOC	-18,000	-14,500	-33,500	95,500	196,760	184,215	178,278	141,552

Appendix 3: Non-discounted Cash Flow Model: Kazakhstan case (Continuation)

Year	2027	2028	2029	2030	2031	2032	2033	
Oil Production (MBBLS)	4,000	3,500	3,000	2,000	1,800	1,500	0	40,000
Oil Price ($/bbl)	69	71	72	73	74	76	77	
Gross Revenue ($M)	277,693	247,038	215,437	146,132	133,903	113,644	0	2,736,949
Royalty ($M)	33,323	27,174	21,544	13,152	12,051	10,228	0	318,595
Export duty	56,000	56,000	48,000	32,000	28,800	24,000	0	583,600
Net Revenue ($M)	188,370	163,864	145,893	100,980	93,052	79,416	0	1,834,754
Intangible Cap EX ($M)	0	0	0	0	0	0	0	18,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	73,000
Operating Expense ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	115,300
DD&A Straight-Line ($M)	0	0	0	0	0	0	0	73,000
Total Applied deductions ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	247,800
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	41,500
Taxable Income ($M)	178,370	153,964	136,093	91,480	84,552	71,116	0	1,586,954
20% Income Tax ($M)	35,674	30,793	27,219	18,296	16,910	14,223	0	325,691
Net Cash Flow ($M)	142,696	123,171	108,874	73,184	67,641	56,893	0	1,302,764
NCF GOV	124,997	113,967	96,762	63,448	57,762	48,451	0	1,227,886
NCF IOC	142,696	123,171	108,874	73,184	67,641	56,893	0	1,302,764
						Government Take Ratio		49%
						IOC Take Ratio		51%

Appendix 4: Non-discounted Cash Flow Model: Russian case

Year	2019	2020	2021	2022	2023	2024	2025	2026
Oil Production (MBBLS)	0	0	0	3,500	6,000	5,500	5,200	4,000
Oil Price ($/bbl)	70	70	65	65	65	66	67	68
Gross Revenue ($M)	0	0	0	227,500	390,000	363,354	349,193	273,057
Royalty or MET($M)	0	0	0	67,252	115,288	105,681	99,917	76,859
Export duty	0	0	0	56,000	96,000	89,756	86,558	67,917
Net Revenue ($M)	0	0	0	104,248	178,712	167,917	162,718	128,281
Intangible Cap EX ($M)	9,000	5,500	3,500	0	0	0	0	0
Tangible Cap EX ($M)	9,000	9,000	30,000	25,000	0	0	0	0
Operating Expense ($M)	0	0	0	11,000	13,000	12,500	11,800	11,000
DD&A Straight-Line ($M)	0	0	0	14,600	14,600	14,600	14,600	14,600
Total Applied deductions ($M)	9,000	14,500	18,000	43,600	27,600	27,100	26,400	25,600
Tax Loss Carry Forward ($M)	0	9,000	14,500	18,000	0	0	0	0
Taxable Income ($M)	-9,000	-14,500	-18,000	60,648	151,112	140,817	136,318	102,681
20% Income Tax ($M)	0	0	0	12,130	30,222	28,163	27,264	20,536
Net Cash Flow ($M)	-18,000	-14,500	-33,500	56,119	135,489	127,253	123,655	96,745
NCF GOV	0	0	0	135,381	241,511	223,601	213,738	165,312
NCF IOC	-18,000	-14,500	-33,500	56,119	135,489	127,253	123,655	96,745

Appendix 4: Non-discounted Cash Flow Model: Russian case (Continuation)

Year	2027	2028	2029	2030	2031	2032	2033	
Oil Production (MBBLS)	4,000	3,500	3,000	2,000	1,800	1,500	0	40,000
Oil Price ($/bbl)	69	71	72	73	74	76	77	
Gross Revenue ($M)	277,693	247,038	215,437	146,132	133,903	113,644	0	2,736,949
Royalty or MET($M)	76,859	67,252	57,644	38,429	34,587	28,822	0	768,590
Export duty	69,308	61,861	54,131	36,840	33,871	28,843	0	681,085
Net Revenue ($M)	131,526	117,925	103,661	70,863	65,445	55,978	0	1,287,275
Intangible Cap EX ($M)	0	0	0	0	0	0	0	18,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	73,000
Operating Expense ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	115,300
DD&A Straight-Line ($M)	0	0	0	0	0	0	0	73,000
Total Applied deductions ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	247,800
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	41,500
Taxable Income ($M)	121,526	108,025	93,861	61,363	56,945	47,678	0	1,039,475
20% Income Tax ($M)	24,305	21,605	18,772	12,273	11,389	9,536	0	216,195
Net Cash Flow ($M)	97,221	86,420	75,089	49,090	45,556	38,143	0	864,780
NCF GOV	170,472	150,718	130,548	87,542	79,846	67,201	0	1,665,870
NCF IOC	97,221	86,420	75,089	49,090	45,556	38,143	0	864,780
						Government Take		66%
						IOC Take Ratio		34%

Appendix 5: Discounted Cash Flow Model: Kazakhstan case

Year	2019	2020	2021	2022	2023	2024	2025	2026
Periods	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Oil Production (MBBLS)	0	0	0	3,500	6,000	5,500	5,200	4,000
Oil Price ($/bbl)	70	70	65	65	65	66	67	68
Gross Revenue ($M)	0	0	0	227,500	390,000	363,354	349,193	273,057
Royalty ($M)	0	0	0	25,025	50,700	47,236	45,395	32,767
Export duty	0	0	0	49,000	84,000	77,000	72,800	56,000
Net Revenue ($M)	0	0	0	153,475	255,300	239,118	230,998	184,290
Intangible Cap EX ($M)	9,000	5,500	3,500	0	0	0	0	0
Tangible Cap EX ($M)	9,000	9,000	30,000	25,000	0	0	0	0
Operating Expense ($M)	0	0	0	11,000	13,000	12,500	11,800	11,000
DD&A Straight-Line ($M)	0	0	0	14,600	14,600	14,600	14,600	14,600
Total Applied deductions ($M)	9,000	14,500	18,000	43,600	27,600	27,100	26,400	25,600
Tax Loss Carry Forward ($M)	0	9,000	14,500	18,000	0	0	0	0
Taxable Income ($M)	-9,000	-14,500	-18,000	109,875	227,700	212,018	204,598	158,690
20% Income Tax ($M)	0	0	0	21,975	45,540	42,404	40,920	31,738
Net Cash Flow ($M)	-18,000	-14,500	-33,500	95,500	196,760	184,215	178,278	141,552
NCF GOV	0	0	0	96,000	180,240	166,640	159,115	120,505
NCF IOC	-18,000	-14,500	-33,500	95,500	196,760	184,215	178,278	141,552
DCF GOV	0	0	0	65569.29	111914.9	94063.76	81650.97	56216.38

	Total	Ratio
NPV GOV	589,987	42%
NPV IOC	803,093	58%

Appendix 5: Discounted Cash Flow Model: Kazakhstan case (Continuation)

Year	2027	2028	2029	2030	2031	2032	2033	
Periods	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Oil Production (MBBLS)	4,000	3,500	3,000	2,000	1,800	1,500	0	40,000
Oil Price ($/bbl)	69	71	72	73	74	76	77	
Gross Revenue ($M)	277,693	247,038	215,437	146,132	133,903	113,644	0	2,736,949
Royalty ($M)	33,323	27,174	21,544	13,152	12,051	10,228	0	318,595
Export duty	56,000	56,000	48,000	32,000	28,800	24,000	0	583,600
Net Revenue ($M)	188,370	163,864	145,893	100,980	93,052	79,416	0	1,834,754
Intangible Cap EX ($M)	0	0	0	0	0	0	0	18,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	73,000
Operating Expense ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	115,300
DD&A Straight-Line ($M)	0	0	0	0	0	0	0	73,000
Total Applied deductions ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	247,800
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	41,500
Taxable Income ($M)	178,370	153,964	136,093	91,480	84,552	71,116	0	1,586,954
20% Income Tax ($M)	35,674	30,793	27,219	18,296	16,910	14,223	0	325,691
Net Cash Flow ($M)	142,696	123,171	108,874	73,184	67,641	56,893	0	1,302,764
NCF GOV	124,997	113,967	96,762	63,448	57,762	48,451	0	1,227,886
NCF IOC	142,696	123,171	108,874	73,184	67,641	56,893	0	1,302,764
DCF GOV	53010.97	43939.17	33914.59	20216.43	16731.47	12758.68	0	589,987

Appendix 6: Discounted Cash Flow Model: Russian case

Year	2019	2020	2021	2022	2023	2024	2025	2026
	1	2	3	4	5	6	7	8
Oil Production (MBBLS)	0	0	0	3,500	6,000	5,500	5,200	4,000
Oil Price ($/bbl)	70	70	65	65	65	66	67	68
Gross Revenue ($M)	0	0	0	227,500	390,000	363,354	349,193	273,057
Royalty or MET($M)	0	0	0	67,252	115,288	105,681	99,917	76,859
Export duty	0	0	0	56,000	96,000	89,756	86,558	67,917
Net Revenue ($M)	0	0	0	104,248	178,712	167,917	162,718	128,281
Intangible Cap EX ($M)	9,000	5,500	3,500	0	0	0	0	0
Tangible Cap EX ($M)	9,000	9,000	30,000	25,000	0	0	0	0
Operating Expense ($M)	0	0	0	11,000	13,000	12,500	11,800	11,000
DD&A Straight-Line ($M)	0	0	0	14,600	14,600	14,600	14,600	14,600
Total Applied deductions ($M)	9,000	14,500	18,000	43,600	27,600	27,100	26,400	25,600
Tax Loss Carry Forward ($M)	0	9,000	14,500	18,000	0	0	0	0
Taxable Income ($M)	-9,000	-14,500	-18,000	60,648	151,112	140,817	136,318	102,681
20% Income Tax ($M)	0	0	0	12,130	30,222	28,163	27,264	20,536
Net Cash Flow ($M)	-18,000	-14,500	-33,500	56,119	135,489	127,253	123,655	96,745
NCF GOV	0	0	0	135,381	241,511	223,601	213,738	165,312
NCF IOC	-18,000	-14,500	-33,500	56,119	135,489	127,253	123,655	96,745
DCF GOV	0	0	0	92,467	149,959	126,217	109,681	77,119

	Total	Ratio
NPV GOV	800,324	60%
NPV IOC	523,135	40%

Appendix 6: Discounted Cash Flow Model: Russian case (Continuation)

Year	2027	2028	2029	2030	2031	2032	2033	
	9	10	11	12	13	14	15	
Oil Production (MBBLS)	4,000	3,500	3,000	2,000	1,800	1,500	0	40,000
Oil Price ($/bbl)	69	71	72	73	74	76	77	
Gross Revenue ($M)	277,693	247,038	215,437	146,132	133,903	113,644	0	2,736,949
Royalty or MET($M)	76,859	67,252	57,644	38,429	34,587	28,822	0	768,590
Export duty	69,308	61,861	54,131	36,840	33,871	28,843	0	681,085
Net Revenue ($M)	131,526	117,925	103,661	70,863	65,445	55,978	0	1,287,275
Intangible Cap EX ($M)	0	0	0	0	0	0	0	18,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	73,000
Operating Expense ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	115,300
DD&A Straight-Line ($M)	0	0	0	0	0	0	0	73,000
Total Applied deductions ($M)	10,000	9,900	9,800	9,500	8,500	8,300	0	247,800
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	41,500
Taxable Income ($M)	121,526	108,025	93,861	61,363	56,945	47,678	0	1,039,475
20% Income Tax ($M)	24,305	21,605	18,772	12,273	11,389	9,536	0	216,195
Net Cash Flow ($M)	97,221	86,420	75,089	49,090	45,556	38,143	0	864,780
NCF GOV	170,472	150,718	130,548	87,542	79,846	67,201	0	1,665,870
NCF IOC	97,221	86,420	75,089	49,090	45,556	38,143	0	864,780
DCF GOV	72,297	58,108	45,756	27,893	23,129	17,696	0	800,324

Appendix 7: Oil price forecast for 2019 – 2033.

Financial model Control	Unit	Source	Forecast 2019	Forecast 2020	Forecast 2021	Forecast 2022	Forecast 2023	Forecast 2024
Brent	**$/bbl**	**Fwd curve + 60LT**	**63.3**	**58.3**	**57.1**	**56.9**	**60.0**	**61.0**
change	*%*	Calculation	*(11.3%)*	*(7.8%)*	*(2.1%)*	*(0.3%)*	*5.4%*	*1.6%*
BP 2019-2023	$/bbl	Bloomberg / Stork / Assumption	70.0	70.0	65.0	65.0	65.0	66.1
EIU	$/bbl	NB / EIU / Assumption						
Bloomberg forward curve	$/bbl	Bloomberg fwd curve / Assumption	63.3	58.3	57.1	56.9	57.5	58.4
Bloomberg forward curve @ 60LT	$/bbl	Fwd curve + 60LT	63.3	58.3	57.1	56.9	60.0	61.0
Bloomberg forward curve @ 65LT	$/bbl	Fwd curve + 65LT	63.3	58.3	57.1	56.9	65.0	66.1
Bloomberg forward curve @ 70LT	$/bbl	Fwd curve + 70LT	63.3	58.3	57.1	56.9	70.0	71.1
Bloomberg consensus - mean	$/bbl	Bloomberg mean / Assumption	66.1	64.2	64.8	65.4	65.5	66.6
Bloomberg consensus - median	$/bbl	Bloomberg median / Assumption	65.5	64.1	65.0	65.0	65.0	66.1
Bloomberg consensus - high	$/bbl	Bloomberg high / Assumption	70.0	72.8	72.0	71.6	71.5	72.7
Bloomberg consensus - low	$/bbl	Bloomberg low / Assumption	62.0	54.0	60.0	60.0	60.0	61.0
Brent	**KZT/bbl**	**Calculation**	**23,985**	**22,296**	**21,910**	**21,421**	**22,134**	**23,112**
change	*%*	*Calculation*	*(2.4%)*	*(7.0%)*	*(1.7%)*	*(2.2%)*	*3.3%*	*4.4%*
EIU	KZT/bbl	Calculation	23,985	22,296	21,910	21,421	22,134	23,112
change	*%*	*Calculation*	*(2.4%)*	*(7.0%)*	*(1.7%)*	*(2.2%)*	*3.3%*	*4.4%*
BP	KZT/bbl	Calculation	26,544	27,300	25,350	25,350	25,350	25,765
change	*%*	*Calculation*	*8.0%*	*2.8%*	*(7.1%)*	*0.0%*	*0.0%*	*1.6%*
KZ inflation in USD	**$**	**Calculation**	**(4.3%)**	**4.3%**	**4.8%**	**7.5%**	**7.2%**	**1.6%**
EIU	KZT/bbl	Calculation	(4.3%)	4.3%	4.8%	7.5%	7.2%	1.6%
BP	KZT/bbl	Calculation	(4.6%)	1.1%	4.0%	4.0%	4.0%	4.0%

Appendix 7: Oil price forecast for 2019 – 2033 (Continuation).

Financial model Control	Unit	Source	Forecast 2025	Forecast 2026	Forecast 2027	Forecast 2028	Forecast 2029	Forecast 2030	Forecast 2031	Forecast 2032	Forecast 2033
Brent	**$/bbl**	**Fwd curve + 60LT**	**62.0**	**63.0**	**64.1**	**65.2**	**66.3**	**67.4**	**68.7**	**69.9**	**71.2**
change	*%*	Calculation	*1.6%*	*1.7%*	*1.7%*	*1.7%*	*1.7%*	*1.7%*	*1.8%*	*1.8%*	*1.8%*
BP 2019-2023	$/bbl	Bloomberg / Stork / Assumption	67.2	68.3	69.4	70.6	71.8	73.1	74.4	75.8	77.2
EIU	$/bbl	NB / EIU / Assumption									
Bloomberg forward curve	$/bbl	Bloomberg fwd curve / Assumption	59.4	60.3	61.4	62.4	63.5	64.6	65.8	67.0	68.2
Bloomberg forward curve @ 60LT	$/bbl	Fwd curve + 60LT	62.0	63.0	64.1	65.2	66.3	67.4	68.7	69.9	71.2
Bloomberg forward curve @ 65LT	$/bbl	Fwd curve + 65LT	67.2	68.3	69.4	70.6	71.8	73.1	74.4	75.8	77.2
Bloomberg forward curve @ 70LT	$/bbl	Fwd curve + 70LT	72.3	73.5	74.8	76.0	77.3	78.7	80.1	81.6	83.1
Bloomberg consensus - mean	$/bbl	Bloomberg mean / Assumption	67.7	68.8	70.0	71.1	72.4	73.6	75.0	76.3	77.7
Bloomberg consensus - median	$/bbl	Bloomberg median / Assumption	67.2	68.3	69.4	70.6	71.8	73.1	74.4	75.8	77.2
Bloomberg consensus - high	$/bbl	Bloomberg high / Assumption	73.9	75.1	76.4	77.6	79.0	80.4	81.8	83.3	84.9
Bloomberg consensus - low	$/bbl	Bloomberg low / Assumption	62.0	63.0	64.1	65.2	66.3	67.4	68.7	69.9	71.2
Brent	**KZT/bbl**	**Calculation**	**24,090**	**25,039**	**25,974**	**26,894**	**27,772**	**28,620**	**29,512**	**30,418**	**31,353**
change	*%*	*Calculation*	*4.2%*	*3.9%*	*3.7%*	*3.5%*	*3.3%*	*3.1%*	*3.1%*	*3.1%*	*3.1%*
EIU	KZT/bbl	Calculation	24,090	25,039	25,974	26,894	27,772	28,620	29,512	30,418	31,353
change	*%*	*Calculation*	*4.2%*	*3.9%*	*3.7%*	*3.5%*	*3.3%*	*3.1%*	*3.1%*	*3.1%*	*3.1%*
BP	KZT/bbl	Calculation	26,855	27,914	28,956	29,982	30,960	31,906	32,900	33,910	34,952
change	*%*	*Calculation*	*4.2%*	*3.9%*	*3.7%*	*3.5%*	*3.3%*	*3.1%*	*3.1%*	*3.1%*	*3.1%*
KZ inflation in USD	**$**	**Calculation**	**1.6%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.8%**	**1.8%**	**1.8%**
EIU	KZT/bbl	Calculation	1.6%	1.7%	1.7%	1.7%	1.7%	1.7%	1.8%	1.8%	1.8%
BP	KZT/bbl	Calculation	1.4%	1.7%	2.0%	2.1%	2.5%	2.7%	2.7%	2.8%	2.8%

Appendix 8: Russian Mineral Extraction Tax (Royalty) calculation.

Definition	Amount	Source
The rate of MET on crude oil is established as the base rate per tonne of extracted oil (RUB919 for 2018), multiplied by a coefficient reflecting movements in world oil prices (Cp) and reduced by indicator Em reflecting oil extraction factors.		Ernst &Young Oil and Gas tax guide 2018
1 tonne of oil	7.3bbl	http://tatcenter.ru/news/skolko-vse-taki-barrelej-v-tonne-nefti/
1 US$ as of the end of 2018	69.47 RUB	http://www.cbr.ru/eng/currency_base/daily/?date_req=01.01.2019
Coefficient reflecting movements in world oil prices (Cp)	10.9297	http://www.consultant.ru/law/hotdocs/56528.html/
Indicator reflecting oil extraction factors (Em)	-306	https://www.audit-it.ru/law/account/935569.html
Calculation:		**The Rate of MET:**
Total volume 40000/7.3*140.18=768 116		**140.1812912**

Appendix 9: Sensitivity analysis: Kazakhstan case - Scenario 1 (NDCF).

Non-Discounted cash flow: Low Oil production and Low Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Oil Production (MBBLS)	0	0	0	2,100	3,600	3,300	3,120
Oil Price ($/bbl)	25	25	25	25	25	25	25
Gross Revenue ($M)	0	0	0	52,500	90,000	82,500	78,000
Royalty ($M)	0	0	0	5,250	9,900	9,075	8,580
Export duty	0	0	0	0	0	0	0
Net Revenue ($M)	0	0	0	47,250	80,100	73,425	69,420
Intangible Cap EX ($M)	5,400	3,300	2,100	0	0	0	0
Tangible Cap EX ($M)	5,400	5,400	18,000	15,000	0	0	0
Operating Expense ($M)	0	0	0	6,600	7,800	7,500	7,080
DD&A Straight-Line ($M)	0	0	0	8,760	8,760	8,760	8,760
Total Applied deductions ($M)	5,400	8,700	10,800	26,160	16,560	16,260	15,840
Tax Loss Carry Forward ($M)	0	5,400	8,700	10,800	0	0	0
Taxable Income ($M)	-5,400	-8,700	-10,800	21,090	63,540	57,165	53,580
20% Income Tax ($M)	0	0	0	4,218	12,708	11,433	10,716
Net Cash Flow ($M)	-10,800	-8,700	-20,100	21,432	59,592	54,492	51,624
NCF GOV	0	0	0	9,468	22,608	20,508	19,296
NCF IOC	-10,800	-8,700	-20,100	21,432	59,592	54,492	51,624

Appendix 9: Sensitivity analysis: Kazakhstan case - Scenario 1 (NDCF Continuation).

Non-Discounted cash flow: Low Oil production and Low Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
Oil Production (MBBLS)	2,400	2,400	2,100	1,800	1,200	1,080	900	0	24,000
Oil Price ($/bbl)	25	25	25	25	25	25	25	25	
Gross Revenue ($M)	60,000	60,000	52,500	45,000	30,000	27,000	22,500	0	600,000
Royalty ($M)	6,000	6,000	5,250	4,050	2,700	2,430	1,800	0	61,035
Export duty	0	0	0	0	0	0	0	0	0
Net Revenue ($M)	54,000	54,000	47,250	40,950	27,300	24,570	20,700	0	538,965
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	10,800
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	43,800
Operating Expense ($M)	6,600	6,000	5,940	5,880	5,700	5,100	4,980	0	69,180
DD&A Straight-Line ($M)	8,760	0	0	0	0	0	0	0	43,800
Total Applied deductions ($M)	15,360	6,000	5,940	5,880	5,700	5,100	4,980	0	148,680
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	24,900
Taxable Income ($M)	38,640	48,000	41,310	35,070	21,600	19,470	15,720	0	390,285
20% Income Tax ($M)	7,728	9,600	8,262	7,014	4,320	3,894	3,144	0	83,037
Net Cash Flow ($M)	39,672	38,400	33,048	28,056	17,280	15,576	12,576	0	332,148
NCF GOV	13,728	15,600	13,512	11,064	7,020	6,324	4,944	0	144,072
NCF IOC	39,672	38,400	33,048	28,056	17,280	15,576	12,576	0	332,148
							Government Take Ratio		30%
							IOC Take Ratio		70%

Appendix 10: Sensitivity analysis: Kazakhstan case - Scenario 1 (DCF).

Discounted Cash Flow: Low Oil production and Low Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Periods	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Oil Production (MBBLS)	0	0	0	2,100	3,600	3,300	3,120
Oil Price ($/bbl)	25	25	25	25	25	25	25
Gross Revenue ($M)	0	0	0	52,500	90,000	82,500	78,000
Royalty ($M)	0	0	0	5,250	9,900	9,075	8,580
Export duty	0	0	0	0	0	0	0
Net Revenue ($M)	0	0	0	47,250	80,100	73,425	69,420
Intangible Cap EX ($M)	5,400	3,300	2,100	0	0	0	0
Tangible Cap EX ($M)	5,400	5,400	18,000	15,000	0	0	0
Operating Expense ($M)	0	0	0	6,600	7,800	7,500	7,080
DD&A Straight-Line ($M)	0	0	0	8,760	8,760	8,760	8,760
Total Applied deductions ($M)	5,400	8,700	10,800	26,160	16,560	16,260	15,840
Tax Loss Carry Forward ($M)	0	5,400	8,700	10,800	0	0	0
Taxable Income ($M)	-5,400	-8,700	-10,800	21,090	63,540	57,165	53,580
20% Income Tax ($M)	0	0	0	4,218	12,708	11,433	10,716
Net Cash Flow ($M)	-10,800	-8,700	-20,100	21,432	59,592	54,492	51,624
NCF GOV	0	0	0	9,468	22,608	20,508	19,296
NCF IOC	-10,800	-8,700	-20,100	21,432	59,592	54,492	51,624
DCF GOV	0	0	0	6,467	14,038	11,576	9,902

	Total	**Ratio**
NPV GOV	69,461	26%
NPV IOC	199,431	74%

Appendix 10: Sensitivity analysis: Kazakhstan case - Scenario 1 (DCF Continuation).

Discounted Cash Flow: Low Oil production and Low Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
Periods	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Oil Production (MBBLS)	2,400	2,400	2,100	1,800	1,200	1,080	900	0	24,000
Oil Price ($/bbl)	25	25	25	25	25	25	25	77	
Gross Revenue ($M)	60,000	60,000	52,500	45,000	30,000	27,000	22,500	0	600,000
Royalty ($M)	6,000	6,000	5,250	4,050	2,700	2,430	1,800	0	61,035
Export duty	0	0	0	0	0	0	0	0	0
Net Revenue ($M)	54,000	54,000	47,250	40,950	27,300	24,570	20,700	0	538,965
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	10,800
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	43,800
Operating Expense ($M)	6,600	6,000	5,940	5,880	5,700	5,100	4,980	0	69,180
DD&A Straight-Line ($M)	8,760	0	0	0	0	0	0	0	43,800
Total Applied deductions ($M)	15,360	6,000	5,940	5,880	5,700	5,100	4,980	0	148,680
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	24,900
Taxable Income ($M)	38,640	48,000	41,310	35,070	21,600	19,470	15,720	0	390,285
20% Income Tax ($M)	7,728	9,600	8,262	7,014	4,320	3,894	3,144	0	83,037
Net Cash Flow ($M)	39,672	38,400	33,048	28,056	17,280	15,576	12,576	0	332,148
NCF GOV	13,728	15,600	13,512	11,064	7,020	6,324	4,944	0	144,072
NCF IOC	39,672	38,400	33,048	28,056	17,280	15,576	12,576	0	332,148
DCF GOV	6,404	6,616	5,209	3,878	2,237	1,832	1,302	0	69,461

Appendix 11: Sensitivity analysis: Kazakhstan case - Scenario 2 (NDCF).

Non-Discounted cash flow: High Oil production and High Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Oil Production (MBBLS)	0	0	0	8,750	15,000	13,750	13,000
Oil Price ($/bbl)	100	100	100	100	100	100	100
Gross Revenue ($M)	0	0	0	875,000	1,500,000	1,375,000	1,300,000
Royalty ($M)	0	0	0	131,250	270,000	247,500	234,000
Export duty	0	0	0	166,250	285,000	261,250	247,000
Net Revenue ($M)	0	0	0	577,500	945,000	866,250	819,000
Intangible Cap EX ($M)	22,500	13,750	8,750	0	0	0	0
Tangible Cap EX ($M)	22,500	22,500	75,000	62,500	0	0	0
Operating Expense ($M)	0	0	0	27,500	32,500	31,250	29,500
DD&A Straight-Line ($M)	0	0	0	36,500	36,500	36,500	36,500
Total Applied deductions ($M)	22,500	36,250	45,000	109,000	69,000	67,750	66,000
Tax Loss Carry Forward ($M)	0	22,500	36,250	45,000	0	0	0
Taxable Income ($M)	-22,500	-36,250	-45,000	468,500	876,000	798,500	753,000
20% Income Tax ($M)	0	0	0	93,700	175,200	159,700	150,600
Net Cash Flow ($M)	-45,000	-36,250	-83,750	393,800	737,300	675,300	638,900
NCF GOV	0	0	0	391,200	730,200	668,450	631,600
NCF IOC	-45,000	-36,250	-83,750	393,800	737,300	675,300	638,900

Appendix 11: Sensitivity analysis: Kazakhstan case - Scenario 2 (NDCF Continuation).

Non-Discounted cash flow: High Oil production and High Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
Oil Production (MBBLS)	10,000	10,000	8,750	7,500	5,000	4,500	3,750	0	100,000
Oil Price ($/bbl)	100	100	100	100	100	100	100	100	
Gross Revenue ($M)	1,000,000	1,000,000	875,000	750,000	500,000	450,000	375,000	0	10,000,000
Royalty ($M)	180,000	180,000	131,250	112,500	75,000	67,500	56,250	0	1,685,250
Export duty	190,000	190,000	166,250	142,500	95,000	85,500	71,250	0	1,900,000
Net Revenue ($M)	630,000	630,000	577,500	495,000	330,000	297,000	247,500	0	6,414,750
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	45,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	182,500
Operating Expense ($M)	27,500	25,000	24,750	24,500	23,750	21,250	20,750	0	288,250
DD&A Straight-Line ($M)	36,500	0	0	0	0	0	0	0	182,500
Total Applied deductions ($M)	64,000	25,000	24,750	24,500	23,750	21,250	20,750	0	619,500
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	103,750
Taxable Income ($M)	566,000	605,000	552,750	470,500	306,250	275,750	226,750	0	5,795,250
20% Income Tax ($M)	113,200	121,000	110,550	94,100	61,250	55,150	45,350	0	1,179,800
Net Cash Flow ($M)	489,300	484,000	442,200	376,400	245,000	220,600	181,400	0	4,719,200
NCF GOV	483,200	491,000	408,050	349,100	231,250	208,150	172,850	0	4,765,050
NCF IOC	489,300	484,000	442,200	376,400	245,000	220,600	181,400	0	4,719,200
							Government Take Ratio		50%
							IOC Take Ratio		50%

Appendix 12: Sensitivity analysis: Kazakhstan case - Scenario 2 (DCF).

Discounted cash Flow: High Oil production and High Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Periods	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Oil Production (MBBLS)	0	0	0	8,750	15,000	13,750	13,000
Oil Price ($/bbl)	100	100	100	100	100	100	100
Gross Revenue ($M)	0	0	0	875,000	1,500,000	1,375,000	1,300,000
Royalty ($M)	0	0	0	131,250	270,000	247,500	234,000
Export duty	0	0	0	166,250	285,000	261,250	247,000
Net Revenue ($M)	0	0	0	577,500	945,000	866,250	819,000
Intangible Cap EX ($M)	22,500	13,750	8,750	0	0	0	0
Tangible Cap EX ($M)	22,500	22,500	75,000	62,500	0	0	0
Operating Expense ($M)	0	0	0	27,500	32,500	31,250	29,500
DD&A Straight-Line ($M)	0	0	0	36,500	36,500	36,500	36,500
Total Applied deductions ($M)	22,500	36,250	45,000	109,000	69,000	67,750	66,000
Tax Loss Carry Forward ($M)	0	22,500	36,250	45,000	0	0	0
Taxable Income ($M)	-22,500	-36,250	-45,000	468,500	876,000	798,500	753,000
20% Income Tax ($M)	0	0	0	93,700	175,200	159,700	150,600
Net Cash Flow ($M)	-45,000	-36,250	-83,750	393,800	737,300	675,300	638,900
NCF GOV	0	0	0	391,200	730,200	668,450	631,600
NCF IOC	-45,000	-36,250	-83,750	393,800	737,300	675,300	638,900
DCF GOV	0	0	0	267,195	453,397	377,323	324,111

	Total	**Ratio**
NPV GOV	2,314,845	44%
NPV IOC	2,978,147	56%

Appendix 12: Sensitivity analysis: Kazakhstan case - Scenario 2 (DCF Continuation).

Discounted cash Flow: High Oil production and High Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
Periods	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Oil Production (MBBLS)	10,000	10,000	8,750	7,500	5,000	4,500	3,750	0	100,000
Oil Price ($/bbl)	100	100	100	100	100	100	100	100	
Gross Revenue ($M)	1,000,000	1,000,000	875,000	750,000	500,000	450,000	375,000	0	10,000,000
Royalty ($M)	180,000	180,000	131,250	112,500	75,000	67,500	56,250	0	1,685,250
Export duty	190,000	190,000	166,250	142,500	95,000	85,500	71,250	0	1,900,000
Net Revenue ($M)	630,000	630,000	577,500	495,000	330,000	297,000	247,500	0	6,414,750
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	45,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	182,500
Operating Expense ($M)	27,500	25,000	24,750	24,500	23,750	21,250	20,750	0	288,250
DD&A Straight-Line ($M)	36,500	0	0	0	0	0	0	0	182,500
Total Applied deductions ($M)	64,000	25,000	24,750	24,500	23,750	21,250	20,750	0	619,500
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	103,750
Taxable Income ($M)	566,000	605,000	552,750	470,500	306,250	275,750	226,750	0	5,795,250
20% Income Tax ($M)	113,200	121,000	110,550	94,100	61,250	55,150	45,350	0	1,179,800
Net Cash Flow ($M)	489,300	484,000	442,200	376,400	245,000	220,600	181,400	0	4,719,200
NCF GOV	483,200	491,000	408,050	349,100	231,250	208,150	172,850	0	4,765,050
NCF IOC	489,300	484,000	442,200	376,400	245,000	220,600	181,400	0	4,719,200
DCF GOV	225,416	208,232	157,321	122,357	73,683	60,294	45,517	0	2,314,845

Appendix 13: Sensitivity analysis: Russian case - Scenario 1 (NDCF).

Non-Discounted cash flow: Low Oil production and Low Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Oil Production (MBBLS)	0	0	0	2,100	3,600	3,300	3,120
Oil Price ($/bbl)	25	25	25	25	25	25	25
Gross Revenue ($M)	0	0	0	52,500	90,000	82,500	78,000
Royalty or MET($M)	0	0	0	8,570	14,692	13,468	12,733
Export duty	0	0	0	8,400	14,400	13,200	12,480
Net Revenue ($M)	0	0	0	35,530	60,908	55,832	52,787
Intangible Cap EX ($M)	5,400	3,300	2,100	0	0	0	0
Tangible Cap EX ($M)	5,400	5,400	18,000	15,000	0	0	0
Operating Expense ($M)	0	0	0	6,600	7,800	7,500	7,080
DD&A Straight-Line ($M)	0	0	0	8,760	8,760	8,760	8,760
Total Applied deductions ($M)	5,400	8,700	10,800	26,160	16,560	16,260	15,840
Tax Loss Carry Forward ($M)	0	5,400	8,700	10,800	0	0	0
Taxable Income ($M)	-5,400	-8,700	-10,800	9,370	44,348	39,572	36,947
20% Income Tax ($M)	0	0	0	1,874	8,870	7,914	7,389
Net Cash Flow ($M)	-10,800	-8,700	-20,100	12,056	44,238	40,418	38,317
NCF GOV	0	0	0	18,844	37,962	34,582	32,603
NCF IOC	-10,800	-8,700	-20,100	12,056	44,238	40,418	38,317

Appendix 13: Sensitivity analysis: Russian case - Scenario 1 (NDCF Continuation).

Non-Discounted cash flow: Low Oil production and Low Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
Oil Production (MBBLS)	2,400	2,400	2,100	1,800	1,200	1,080	900	0	24,000
Oil Price ($/bbl)	25	25	25	25	25	25	25	25	
Gross Revenue ($M)	60,000	60,000	52,500	45,000	30,000	27,000	22,500	0	600,000
Royalty or MET($M)	9,795	9,795	8,570	7,346	4,897	4,408	3,673	0	97,947
Export duty	9,600	9,600	8,400	7,200	4,800	4,320	3,600	0	96,000
Net Revenue ($M)	40,605	40,605	35,530	30,454	20,303	18,272	15,227	0	406,053
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	10,800
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	43,800
Operating Expense ($M)	6,600	6,000	5,940	5,880	5,700	5,100	4,980	0	69,180
DD&A Straight-Line ($M)	8,760	0	0	0	0	0	0	0	43,800
Total Applied deductions ($M)	15,360	6,000	5,940	5,880	5,700	5,100	4,980	0	148,680
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	24,900
Taxable Income ($M)	25,245	34,605	29,590	24,574	14,603	13,172	10,247	0	257,373
20% Income Tax ($M)	5,049	6,921	5,918	4,915	2,921	2,634	2,049	0	56,455
Net Cash Flow ($M)	28,956	27,684	23,672	19,659	11,682	10,538	8,198	0	225,818
NCF GOV	24,444	26,316	22,888	19,461	12,618	11,362	9,322	0	250,402
NCF IOC	28,956	27,684	23,672	19,659	11,682	10,538	8,198	0	225,818
							Government Take Ratio		53%
							IOC Take Ratio		47%

Appendix 14: Sensitivity analysis: Russian case - Scenario 2 (NDCF).

Non-Discounted cash flow: High Oil production and High Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Oil Production (MBBLS)	0	0	0	8,750	15,000	13,750	13,000
Oil Price ($/bbl)	100	100	100	100	100	100	100
Gross Revenue ($M)	0	0	0	875,000	1,500,000	1,375,000	1,300,000
Royalty or MET($M)	0	0	0	343,132	588,226	539,207	509,796
Export duty	0	0	0	231,875	397,500	364,375	344,500
Net Revenue ($M)	0	0	0	299,993	514,274	471,418	445,704
Intangible Cap EX ($M)	22,500	13,750	8,750	0	0	0	0
Tangible Cap EX ($M)	22,500	22,500	75,000	62,500	0	0	0
Operating Expense ($M)	0	0	0	27,500	32,500	31,250	29,500
DD&A Straight-Line ($M)	0	0	0	36,500	36,500	36,500	36,500
Total Applied deductions ($M)	22,500	36,250	45,000	109,000	69,000	67,750	66,000
Tax Loss Carry Forward ($M)	0	22,500	36,250	45,000	0	0	0
Taxable Income ($M)	-22,500	-36,250	-45,000	190,993	445,274	403,668	379,704
20% Income Tax ($M)	0	0	0	38,199	89,055	80,734	75,941
Net Cash Flow ($M)	-45,000	-36,250	-83,750	171,795	392,719	359,434	340,263
NCF GOV	0	0	0	613,205	1,074,781	984,316	930,237
NCF IOC	-45,000	-36,250	-83,750	171,795	392,719	359,434	340,263

Appendix 14: Sensitivity analysis: Russian case - Scenario 2 (NDCF Continuation).

Non-Discounted cash flow: High Oil production and High Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
Oil Production (MBBLS)	10,000	10,000	8,750	7,500	5,000	4,500	3,750	0	100,000
Oil Price ($/bbl)	100	100	100	100	100	100	100	100	
Gross Revenue ($M)	1,000,000	1,000,000	875,000	750,000	500,000	450,000	375,000	0	10,000,000
Royalty or MET($M)	392,151	392,151	343,132	294,113	196,075	176,468	147,057	0	3,921,507
Export duty	265,000	265,000	231,875	198,750	132,500	119,250	99,375	0	2,650,000
Net Revenue ($M)	342,849	342,849	299,993	257,137	171,425	154,282	128,568	0	3,428,493
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	45,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	182,500
Operating Expense ($M)	27,500	25,000	24,750	24,500	23,750	21,250	20,750	0	288,250
DD&A Straight-Line ($M)	36,500	0	0	0	0	0	0	0	182,500
Total Applied deductions ($M)	64,000	25,000	24,750	24,500	23,750	21,250	20,750	0	619,500
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	103,750
Taxable Income ($M)	278,849	317,849	275,243	232,637	147,675	133,032	107,818	0	2,808,993
20% Income Tax ($M)	55,770	63,570	55,049	46,527	29,535	26,606	21,564	0	582,549
Net Cash Flow ($M)	259,579	254,279	220,195	186,110	118,140	106,426	86,255	0	2,330,195
NCF GOV	712,921	720,721	630,055	539,390	358,110	322,324	267,995	0	7,154,055
NCF IOC	259,579	254,279	220,195	186,110	118,140	106,426	86,255	0	2,330,195
							Government Take Ratio		75%
							IOC Take Ratio		25%

Appendix 15: Sensitivity analysis: Russian case - Scenario 1 (DCF).

Discounted Cash Flow: Low Oil production and Low Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
	1	**2**	**3**	**4**	**5**	**6**	**7**
Oil Production (MBBLS)	0	0	0	2,100	3,600	3,300	3,120
Oil Price ($/bbl)	25	25	25	25	25	25	25
Gross Revenue ($M)	0	0	0	52,500	90,000	82,500	78,000
Royalty or MET($M)	0	0	0	8,570	14,692	13,468	12,733
Export duty	0	0	0	8,400	14,400	13,200	12,480
Net Revenue ($M)	0	0	0	35,530	60,908	55,832	52,787
Intangible Cap EX ($M)	5,400	3,300	2,100	0	0	0	0
Tangible Cap EX ($M)	5,400	5,400	18,000	15,000	0	0	0
Operating Expense ($M)	0	0	0	6,600	7,800	7,500	7,080
DD&A Straight-Line ($M)	0	0	0	8,760	8,760	8,760	8,760
Total Applied deductions ($M)	5,400	8,700	10,800	26,160	16,560	16,260	15,840
Tax Loss Carry Forward ($M)	0	5,400	8,700	10,800	0	0	0
Taxable Income ($M)	-5,400	-8,700	-10,800	9,370	44,348	39,572	36,947
20% Income Tax ($M)	0	0	0	1,874	8,870	7,914	7,389
Net Cash Flow ($M)	-10,800	-8,700	-20,100	12,056	44,238	40,418	38,317
NCF GOV	0	0	0	18,844	37,962	34,582	32,603
NCF IOC	-10,800	-8,700	-20,100	12,056	44,238	40,418	38,317
DCF GOV	0	0	0	12,871	23,571	19,521	16,730
	Total	**Ratio**					
NPV GOV	120,669	48%					
NPV IOC	131,274	52%					

Appendix 15: Sensitivity analysis: Russian case - Scenario 1 (DCF Continuation).

Discounted Cash Flow: Low Oil production and Low Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Oil Production (MBBLS)	2,400	2,400	2,100	1,800	1,200	1,080	900	0	24,000
Oil Price ($/bbl)	25	25	25	25	25	25	25	25	
Gross Revenue ($M)	60,000	60,000	52,500	45,000	30,000	27,000	22,500	0	600,000
Royalty or MET($M)	9,795	9,795	8,570	7,346	4,897	4,408	3,673	0	97,947
Export duty	9,600	9,600	8,400	7,200	4,800	4,320	3,600	0	96,000
Net Revenue ($M)	40,605	40,605	35,530	30,454	20,303	18,272	15,227	0	406,053
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	10,800
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	43,800
Operating Expense ($M)	6,600	6,000	5,940	5,880	5,700	5,100	4,980	0	69,180
DD&A Straight-Line ($M)	8,760	0	0	0	0	0	0	0	43,800
Total Applied deductions ($M)	15,360	6,000	5,940	5,880	5,700	5,100	4,980	0	148,680
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	24,900
Taxable Income ($M)	25,245	34,605	29,590	24,574	14,603	13,172	10,247	0	257,373
20% Income Tax ($M)	5,049	6,921	5,918	4,915	2,921	2,634	2,049	0	56,455
Net Cash Flow ($M)	28,956	27,684	23,672	19,659	11,682	10,538	8,198	0	225,818
NCF GOV	24,444	26,316	22,888	19,461	12,618	11,362	9,322	0	250,402
NCF IOC	28,956	27,684	23,672	19,659	11,682	10,538	8,198	0	225,818
DCF GOV	11,403	11,160	8,824	6,821	4,020	3,291	2,455	0	120,669

Appendix 16: Sensitivity analysis: Russian case - Scenario 2 (DCF).

Discounted cash Flow: High Oil production and High Oil price scenario							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
	1	**2**	**3**	**4**	**5**	**6**	**7**
Oil Production (MBBLS)	0	0	0	8,750	15,000	13,750	13,000
Oil Price ($/bbl)	100	100	100	100	100	100	100
Gross Revenue ($M)	0	0	0	875,000	1,500,000	1,375,000	1,300,000
Royalty or MET($M)	0	0	0	343,132	588,226	539,207	509,796
Export duty	0	0	0	231,875	397,500	364,375	344,500
Net Revenue ($M)	0	0	0	299,993	514,274	471,418	445,704
Intangible Cap EX ($M)	22,500	13,750	8,750	0	0	0	0
Tangible Cap EX ($M)	22,500	22,500	75,000	62,500	0	0	0
Operating Expense ($M)	0	0	0	27,500	32,500	31,250	29,500
DD&A Straight-Line ($M)	0	0	0	36,500	36,500	36,500	36,500
Total Applied deductions ($M)	22,500	36,250	45,000	109,000	69,000	67,750	66,000
Tax Loss Carry Forward ($M)	0	22,500	36,250	45,000	0	0	0
Taxable Income ($M)	-22,500	-36,250	-45,000	190,993	445,274	403,668	379,704
20% Income Tax ($M)	0	0	0	38,199	89,055	80,734	75,941
Net Cash Flow ($M)	-45,000	-36,250	-83,750	171,795	392,719	359,434	340,263
NCF GOV	0	0	0	613,205	1,074,781	984,316	930,237
NCF IOC	-45,000	-36,250	-83,750	171,795	392,719	359,434	340,263
DCF GOV	0	0	0	418,828	667,354	555,621	477,359

	Total	**Ratio**
NPV GOV	3,467,409	71%
NPV IOC	1,444,086	29%

Appendix 16: Sensitivity analysis: Russian case - Scenario 2 (DCF Continuation).

Discounted cash Flow: High Oil production and High Oil price scenario									
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Oil Production (MBBLS)	10,000	10,000	8,750	7,500	5,000	4,500	3,750	0	100,000
Oil Price ($/bbl)	100	100	100	100	100	100	100	100	
Gross Revenue ($M)	1,000,000	1,000,000	875,000	750,000	500,000	450,000	375,000	0	10,000,000
Royalty or MET($M)	392,151	392,151	343,132	294,113	196,075	176,468	147,057	0	3,921,507
Export duty	265,000	265,000	231,875	198,750	132,500	119,250	99,375	0	2,650,000
Net Revenue ($M)	342,849	342,849	299,993	257,137	171,425	154,282	128,568	0	3,428,493
Intangible Cap EX ($M)	0	0	0	0	0	0	0	0	45,000
Tangible Cap EX ($M)	0	0	0	0	0	0	0	0	182,500
Operating Expense ($M)	27,500	25,000	24,750	24,500	23,750	21,250	20,750	0	288,250
DD&A Straight-Line ($M)	36,500	0	0	0	0	0	0	0	182,500
Total Applied deductions ($M)	64,000	25,000	24,750	24,500	23,750	21,250	20,750	0	619,500
Tax Loss Carry Forward ($M)	0	0	0	0	0	0	0	0	103,750
Taxable Income ($M)	278,849	317,849	275,243	232,637	147,675	133,032	107,818	0	2,808,993
20% Income Tax ($M)	55,770	63,570	55,049	46,527	29,535	26,606	21,564	0	582,549
Net Cash Flow ($M)	259,579	254,279	220,195	186,110	118,140	106,426	86,255	0	2,330,195
NCF GOV	712,921	720,721	630,055	539,390	358,110	322,324	267,995	0	7,154,055
NCF IOC	259,579	254,279	220,195	186,110	118,140	106,426	86,255	0	2,330,195
DCF GOV	332,583	305,656	242,914	189,053	114,105	93,366	70,572	0	3,467,409

국문 초록

투자결정 촉진을 위한 카자흐스탄의 석유 재정 체제 평가 연구

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석유 및 가스생산업은 카자흐스탄의 가장 중요한 에너지산업이다. 카자흐스탄은 개발한 석유 및 가스를 세계 여러 나라에 수출하고 있으며, 한국을 비롯한 여러 나라들이 카자흐스탄의 석유가스개발사업에 참여하고 있다. 자국의 석유 유전 개발과 관련된 재정 체제 (fiscal regime)에 대한 학술적 토의는 정부의 두 가지 주요 목표인 보유한 유전의 경제적 지대를 얻는 것과 국내산업에 대한 외국인 투자를 자극하는 것 사이의 균형을 어떻게 맞출 것인가에 주로 맞추어져 왔다. 카자흐스탄의 석유 유전에 대한 재정 체제는 그러나 약점과 개선 필요성이 여러 문헌에서 언급되었다.

본 논문은 이러한 필요성에 바탕을 두고 카자흐스탄의 석유관련 재정 체제가 투자자의 결정에 미치는 영향을 찾고 카자흐스탄의 재정 체제를 러시아 연방의 것과 비교하여 장단점을 확인하고 개선의 시사점을 제안하는데 연구의 목표를 둔다. 연구의 첫 번째 부분은 기술적 분석과 정성적 방법론으로 구성된다. 한국의 카자흐스탄 석유개발 경험이 있는 전문가들과 카자흐스탄 정부의 에너지부 전문가들을 대상으로 실시한 '프로젝트 평가지표 및 카자흐스탄 재정 체제에 대한 의사 결정자 태도' 설문조사를 바탕으로 그 결과를 분석하였다. 분석결과, 카자흐스탄의 현재 석유 재정 체제를 개선할 수 있는 주요 결과들이 도출되었다.

논문의 두 번째 부분은 Luo and Yan (2010)이 개발한 정량적 분석이다. 앞선 연구의 결과를 바탕으로 틀을 규정하고 정부 세수 (Government Take), 전기이행지수 (Front Loading index) 등을 변수로 고려하고 종합점수(Composite Score)를 산정하였다. 본 연구에서는 할인 및 비할인 현금 흐름 모델을 시뮬레이션하여 정부 세수 지표를 계산하였다. 또한 전기이행지수 (Front Loading Index)는 비할인 및 할인 된 정부 세수 (Government Take) 사이의 격차를 극복하기 위해 계산되었고, 종합 점수(composite score)는 선형 가중 함수를 이용하여 구하였다. 이들을 사용하여 카자흐스탄과 러시아의 석유 재정 체계를 비교 분석하였다.

본 연구의 결과는 카자흐스탄 석유 개발을 효과적으로 개선하는데 기여할 것이며 동시에 카자흐스탄의 석유 및 가스 분야에 투자하는 외국자본의 투자 환경 개선에서 적용될 수 있을 것이다.

주요어 : 카자흐스탄, 석유, 가스, 재정 체제, 현금흐름모델.

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