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慶應義塾大学大学院経営管理研究科修士課程

学位論文（　　2016　年度）

論文題名

Development of East Siberian oil fields and future prospects of Japan-Russia energy cooperation

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論 文 要 旨

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（論文題名）

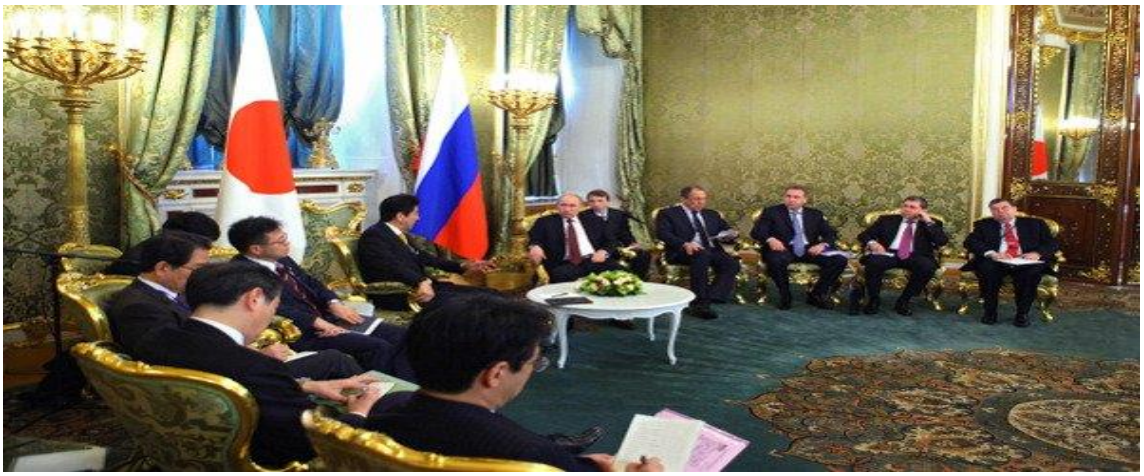
Development of East Siberian oil fields and future prospects of Japan-Russia energy cooperation

（内容の要旨）

This is a thesis that tries to explore the benefits for Japan and Japanese businesses from cooperation with Russia in the energy field, particularly, in crude oil sector. Although, the mutual need of cooperation and gains from it seem apparent, so far, the developments in the trade and economic sectors between the two countries have been modest. Unsolved territorial dispute is a major hindrance to full-fledged cooperation between businesses of two countries; nevertheless, solving the territorial dispute will not guarantee quick progress in trade. In that respect, all plausible gains that exist for Japan in case it cooperates with Russia, must be clearly outlined – first part of the diploma will be devoted to that. The rest of the thesis is devoted to looking at the barriers to the deepening of trade ties between the two counties. Most of the attention will be paid to structural and economic problems. This diploma purposefully avoids looking at the problem of Northern territories.　With both grandfather and father of the author having built their careers in the oil and gas sector of the USSR/Russian Federation, the author had the opportunity to understand the full potential of Japan-Russia energy cooperation. Being influenced by their vision, the author decided to clearly outline the benefits for Japanese oil business in cooperation with Russia, as the benefits that exist for the Russian side are quite clear.

A significant part of the thesis is concentrated on outlining and proving positive effects that increasing cooperation with Russian government and Russian oil companies can have on the Japanese oil industry. Most of the analysis will be qualitative and will involve analyzing the geopolitical situations in different parts of the world. Yet some of the analysis will be quantitative – the author will calculate the transportation costs as well as conduct regression analysis trying to establish positive strong relationship between volume of the crude oil imported from Russia to Japan and volume of petroleum products (gasoline, naphtha, fuel oil etc.) exported from Japan to other countries in the region. In the end, the reader would be led to a conclusion that developing economic and trade relations between the two countries would lead to concrete positive results not only for Russia, but also for Japan as it will improve the competitiveness of Japanese oil industry, help Japan achieve its energy independence and guarantee Japanese companies prioritized and beneficial involvement in other strategic sectors of the Russia's Far East.

Finally, the author will concentrate on problems inside Russia, concerning the country's administrative and legislative system. Outlining the problems and figuring out the way to solve them suggesting first steps that the Russian government could take to improve bilateral trade relations with Japan.



Development of East Siberian oil fields and future prospects of Japan-Russia energy cooperation

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List of terms and names

Kozmino – a port in the Far East of Russia, from which East Siberian crude oil delivered by pipeline or railway gets exported to countries in Asia Pacific region including China

ESPO pipeline – a pipeline that stretches from East Siberia to the Far East. The pipeline was completed in 2012 by crude oil transportation company Transneft. The purpose of the pipeline is to deliver crude oil extracted from East Siberia oil fields to port Kozmino

ESPO blend – special blend of crude oil that gets extracted in the oil fields of East Siberia and passes through ESPO pipeline. The crude oil is of a very high quality and has a very low Sulphur content

Taishet – town in East Siberia, starting point of ESPO pipeline

Skovorodino – station in the middle of ESPO pipeline. From Skovorodino starts off a separate pipeline that delivers ESPO crude oil directly to China

Rosneft – the biggest oil company in Russia, that accounts for 40% of all produced in Russia. The company is state owned, yet 20% share of the company is owned by British Petroleum

Transneft – is a Russian state-owned transport monopoly and the largest pipeline company in the world. JSC "Transneft" is operating over 70 thousand kilometres of trunk pipelines

Lukoil – second biggest oil company in Russia. One of the few oil companies in Russia that remains privately owned

Gazpromneft – a third fourth largest crude oil producer and third largest refiner in Russia. Gazpromneft is a subsidiary of gas giant Gazprom

TNK BP – was a major oil Russian oil company headquartered in Moscow. It was 3rd largest oil producer with substantial assets in West Siberia. In 2013 it was acquired by Rosneft. BP (British Petroleum) was one of the main shareholders of the company

RusHydro – Russian hydroelectricity company; world's second-largest hydroelectric power producers and in the country's largest power-generating company rld's second-largest hydroelectric power producer and is the country's largest power-generat

INPEX – Japanese oil company, that is mainly involved in upstream activities in different regions of the world. The company purchases rights to oil fields around the world and then gets involved in exploration, extraction and production of crude oil.

JOGMEC – (Japan Oil, Gas and Metals National Corporation) government organization that helps Japanese companies invest in various natural resource projects around the world. It provides geological expertise, financial and technological support to all Japanese companies that invest in hydrocarbon or metals projects, which have strategic significance for the Japanese economy.

Sinopec – (China Petrochemical Company) one of the main oil companies in People's Republic of China. The company is state owned.

CNPC – the biggest oil and gas company in China. CNPC is also state owned

ONGC – (Oil and natural gas corporation limited), Indian multinational oil and gas company. The company is under administrative control of the Ministry of Petroleum and Natural Gas

IOC – (India Oil corporation) India's largest commercial enterprise, established to meet energy demands of India

West Siberia – region in Russia where most of crude oil is being produced. The region has many strategically important cities like Novosibirsk, Tomsk, Krasnoyarsk, Omsk, Tumen etc. that have always played a significant role in country's industrial and scientific life.

East Siberia – region in Russia with substantial natural resource potential that has not yet been explored.

Irkutsk- one of the key cities in East Siberia

Krasnoyarsk Krai, Irkutskaya Oblast, Sakha Republic – administrative entities in the East Siberia region

Central Russia –part of Russia that is located between the European borders of the country (in the West) and the Ural Mountains (in the East)

CIS (Commonwealth of Independent States) – regional organization formed after the dissolution of the Soviet Union. The organization includes all Former Union Republics

The strait of Hormuz – strait that links Persian Gulf to the Arabian Sea, located between Iran and Saudi Arabia. Most of the crude oil that is being produced in the region (Saudi Arabia, UAE, etc.) and exported abroad goes through this strait. At the narrowest bit, the strait has a width of 54 km

Bab-el-Mandeb strait – strait located between Yemen and Eritrea linking Red Sea and Arabian Sea. Substantial amount of oil

Enhanced oil recovery (abbreviated **EOR**) is the implementation of various techniques for increasing the amount of crude oil that can be extracted from an oil field.

NOC – (National Oil Company) oil company, majority share of which is owned by the government. Usually NOC refers to oil companies of major oil producing countries like Russia, Saudi Arabia, Brazil etc.

IOC – (International Oil Company) refers to 7-8 largest publicly owned oil and gas companies: BP plc, Chevron Corporation, ExxonMobil Royal Dutch Shell plc, Total SA, Eni and Conoco Philips

Tcf – (trillion cubic feet), unit of measurement used for natural gas

Barrel – unit of measurement used for crude oil

Problem Awareness

Despite geographical closeness and complementarity of the two economies, Japan-Russia trade relations have been developing at a very slow pace and with both sides being weary and suspicious of strengthening strong trade ties between each other. Geopolitical issues, unresolved problem of Northern Territories and Russia's difficult investment environment are considered one of the key barriers preventing the full-scale development and strengthening of Japan-Russia trade relations and regional partnerships. In 1960s energy trade, has allowed Japan and Soviet Union to establish first trade deals; nowadays too energy sector (crude oil and gas) is one of the most promising sectors, cooperation in which could contribute to building strong ties and establishing interdependence between the two countries. In a way, energy cooperation can be considered an opening door to the development of strong Japan-Russia trade relations. There are four potential fields of Japan-Russia energy cooperation that will be looked at and analysed throughout this paper:

- Short term: increasing the amount of crude oil imported from Russia
- Mid/Long term: investing into crude oil projects of Eastern Siberia and the Far East (maybe even buying share of Russia's state owned oil companies)
- Technological: developing and customizing drilling, EOL, technological expertise and monitoring equipment for the Russian oil and gas companies(JOGMEC, 2016)(JOGMEC, 2016)

When it comes to a country's energy policy, energy security and hence geopolitics tends to be tightly involved. Therefore, development of Japan-Russia energy relations will be analysed in not only the context of economic benefits to both sides, but also in the context of regional and geopolitical implications these potential ties will have for both sides. The dependence of Japan's crude oil supply from the Middle East states (Saudi Arabia, UAE, Qatar and Kuwait) amounts to around 80%(Ministry of Economy, 2013)(Ministry of Economy, 2013) which is a staggering number considering how unstable this particular region is and how important is crude oil to any country's economy. Increasing crude oil imports from Russia will help Japan to reduce its overreliance on Middle East crude oil and will have many other economic benefits, which will be closely discussed in this work.

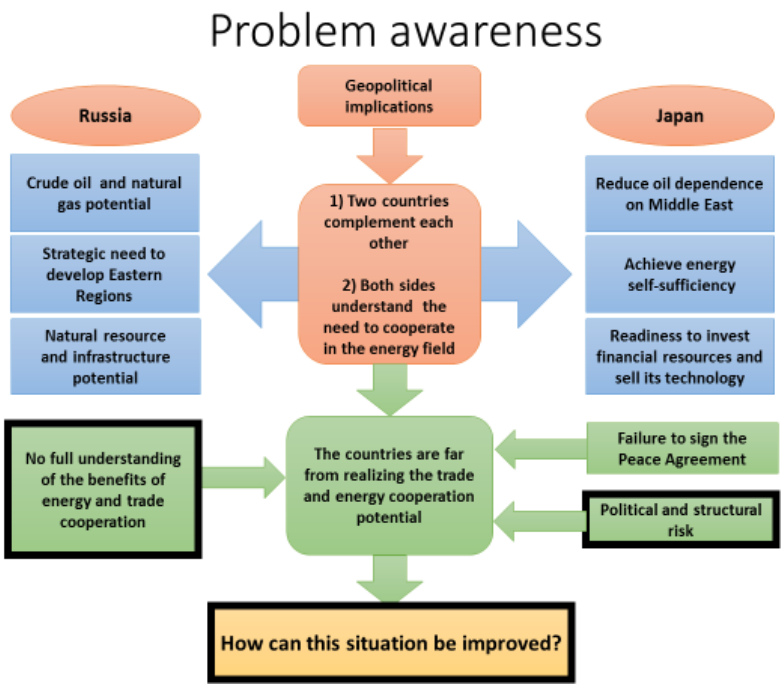
Strengthening of China-Russia energy, trade and political ties might not have any direct negative economic effects on Japan, but it will strengthen Chinese hegemony in the Asia Pacific region and thus inevitably weaken Japanese position in it. Consequently, rights and authority of Japanese firms and government will be weakened. With Russia behind its back, China will be act decisively in the region, aggressively protecting its interests and borders. China's potential monopolization of Russia's crude oil and natural gas exports(Mitrova, 2016)(Mitrova, 2016) in the region will represent another big threat to Japan's interest since it will separate Japanese energy market from Russian sources of energy. Even though such developments are very unlikely to take place, involvement of Chinese oil majors in Russia's major oil projects

in East Siberia and the Far East, is quite alarming and implies that there is no time to lose.

On the other hand, Russian government is reluctant to increase its dependence on the Chinese buyer. Tough oil and gas negotiations, problems with payments reveals China's strong desire to get Russia's most strategically important assets for a very cheap price. In other words, Chinese government and business regards Russia, not as a strategic partner with whom it can achieve mutually beneficial relations, but rather as a cash cow that is ready to be milked. This stimulates the Russian side to actively look for other partners in the Asia Pacific region with whom it can actively cooperate in energy, technology and infrastructure fields(Mitrova, 2016).

Despite economic, geopolitical and regional benefits energy and trade cooperation promises both countries, the actual development of intercountry relations has been taking place very slowly and very little progress has been achieved implying that certain barriers/problems exist on both sides that prevent the full-scale cooperation. I believe that inability to identify and address these problems accordingly has been the main stopping factor that prevented the increase of Japanese investments into Russia that contributed to the closeness of the Russian market to the foreign investors

Figure 1



Aim of the research

The aim of the research is to establish short term and long term economic benefits for both Japan and Russia in developing cooperation in the energy field. In fact, more stress will be given to the Japanese side as the benefits to Russia from receiving Foreign Direct Investment from Japan are quite clear.

The first part of diploma will be devoted to understanding main points of Japan's energy policy. The aims that Japanese government sets and their implementation will be analysed. Furthermore, JOGMEC approach to deepening energy cooperation with oil producing countries will be carefully examined to understand the mechanism that Japanese firms use to invest into oil/natural gas producing countries. This will provide the base for my analysis i.e. I will prove that plans of investment into Russia`s oil sector and benefits to be gained from these investments are coherent with the Japanese government's official view on energy policy and stable energy supply.

The second part of this work will be devoted to analysing gains and losses Japanese economy would have from increasing crude oil imports from Russia. Presently Russia accounts for 8-9% of all Japanese crude oil imported from abroad(経済産業省, 2016). I will try to determine how much can you raise this figure (10%, 15%, 20%, and 25%) and what economic benefits will follow at each step. To implement this analysis, several facts and conditions need to be established:

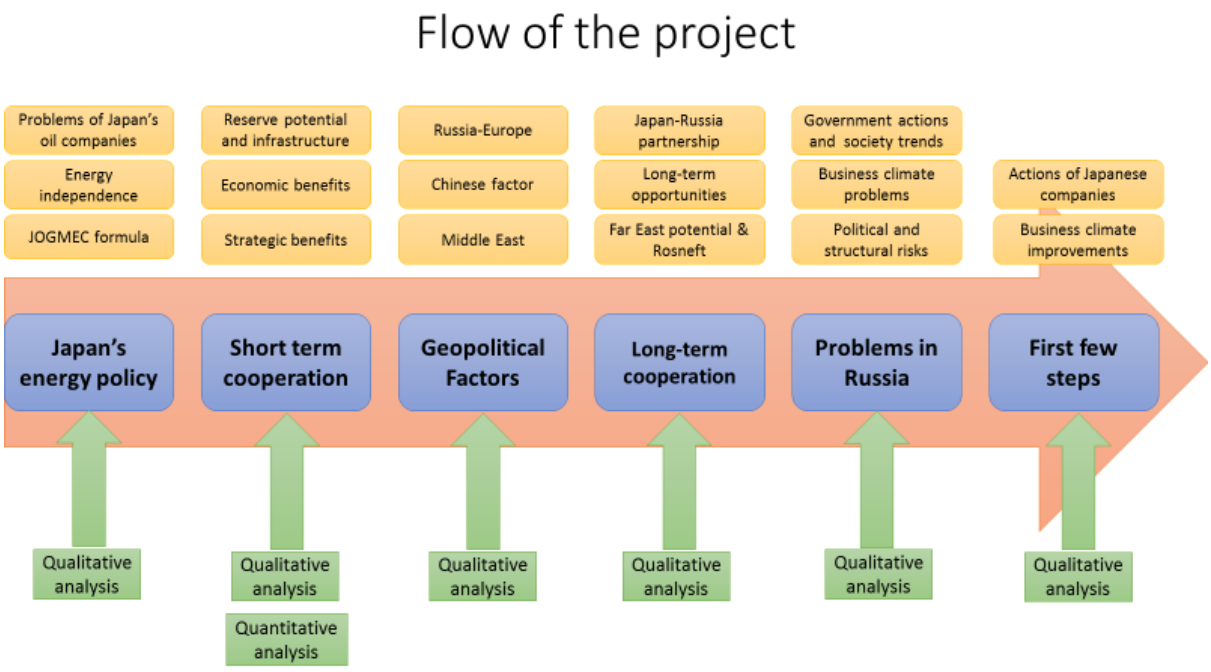
- Are there enough crude oil deposits in Russia, mainly East Siberia and Far East, to sustain the current level of exports of crude oil to Japan?
- Are there enough crude oil deposits in Russia, mainly East Siberia and Far East, to increase exports of crude oil to Japan? What is the maximum plausible level of the increase?
- Does the infrastructure in East Siberia and Far East allow the Russian side to increase crude oil exports to Japan?
- What are the prospects for the infrastructure development in the Far East and East Siberia?

The second part will be followed by the regression analysis. The fourth part of the work will mainly concentrate on the geopolitical issues. Grasping the main trends and comprehending their nature is crucial to understanding the importance of Japan-Russia energy and trade cooperation. Special attention will be paid to developments in China and Middle East. China is a new economic behemoth that continues to expand its influence all over the world, striving to get hold of as many resources as it can possibly get. Middle East, is a region where the conflict of interests and ambitions of different global powers, regional players and religious groups, has brought it to an extremely dangerous state. It would not be exaggeration to say that Middle East is about to explode. To both Russia and Japan these issues are extremely sensitive since they affect the national security and economic stability of two countries. Being able to cooperate and have trust relations will allow both countries to effectively address these issues, since this cooperation will be

mutually beneficial. Only after figuring out the geopolitical realities of our time, it makes sense to move on to deepening Japan-Russia energy cooperation. Looking at Russia as a place where short term investments and quick profits can be made will not improve Japan-Russia trade ties, since most of privately managed oil and exploration companies will be reluctant to commit to investments. These investors regard projects in Russia as ones that don't guarantee any long term and their general view of the country can be generalised as territory of high political risk, where no rules are decided and the judicial system is flawed. (Tsuneo Akaha et al., 2016) (Tsuneo Akaha et al., 2016)

This brings me to the fifth part of the diploma that will be mainly concerned with looking at long term prospects of Japan-Russia energy cooperation. This part will be devoted to discerning economic viability and potential benefits of participation of Japanese crude oil companies in East Siberia and Far East crude oil/natural gas projects as investors and developers. Furthermore, potential benefits of cooperating Russia's NOC Rosneft and other crude oil companies will be looked at. Unlike analysis of increasing crude oil imports from Russia, this part will be more qualitative than quantitative study. A lot of it will be looking at specifics of doing business and investing in Russia and explaining the country's national policy regarding the Far East and Siberian regions. Long term benefits of cooperation with Russia in the Far East region will be listed and interpreted.

Figure 2



The sixth part, will be devoted to analysing the major barriers to rapid development of Japan-Russia energy cooperation. The main limitations and concerns regarding investments into Russia will be listed. From this list the main concerns for the Japanese oil companies will be chosen and carefully studied. Special attention will be devoted to looking at what policies are being currently implemented by the Russian government to

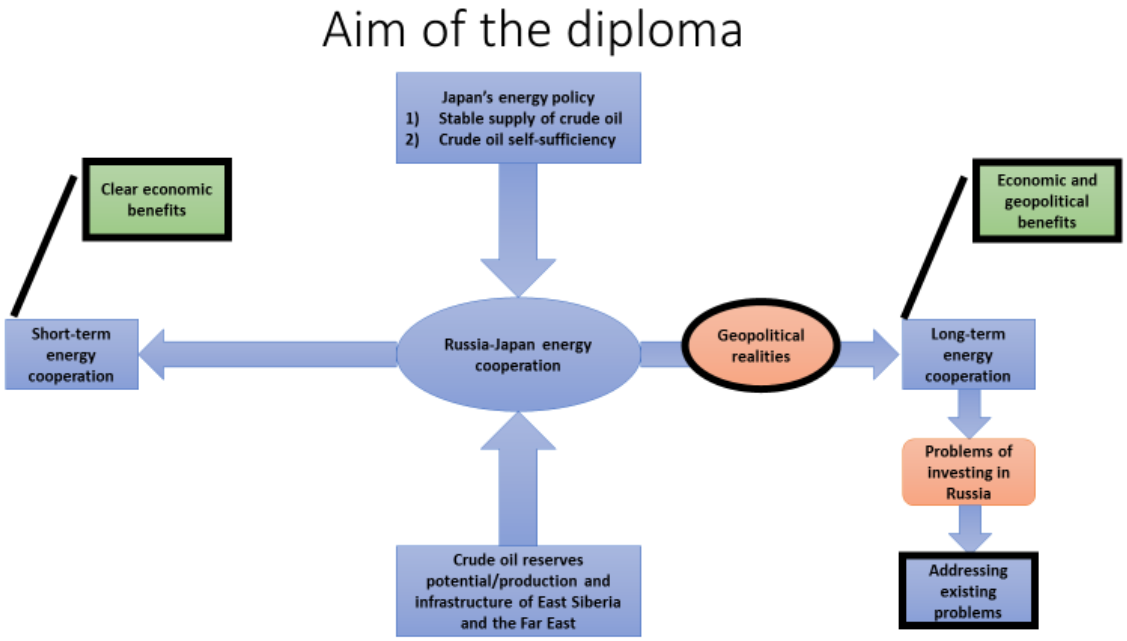
tackle these problems and what are the main limitations of these policies. Finally, I will talk about first few steps that can be made by both sides to start building strong trade and economic ties based on mutual trust.

By dividing diploma into six separate parts I intend to have a complex and balanced view of the problem. Nowadays there are a lot of talks on potential of Japan-Russia energy cooperation and many meetings that discuss the same problems all over again. However, these talks remain only talks and no real progress is being achieved. Many analysts link this to the problem of Northern Territories that has not been resolved yet is the only stopping factor to full-fledged cooperation. Nevertheless in my opinion this answer is half-hearted and only partially reveals the true state of affairs. The reasons are:

- Simply increasing crude oil imports from Russia does not put Japan in any sort of political dependence from Moscow, since its beneficial to both sides and does not require any long-term commitment or in any way undermines Japan's geopolitical interests.
- Solving the problem of Northern Territories will not mean that Russia will suddenly become an attractive place for Japanese investors and Russia's investment climate will greatly change for the best. (日本経済新聞, 2016b) (日本経済新聞, 2016)

Thus, even though resolving the problem of Northern Territories and signing the Peace Treaty would greatly contribute to improving trade relation between the two countries, it does not stand at the heart of the problem. Therefore, when talking about short term and long term prospects of Japan-Russia energy cooperation, the problem of the Four Islands will be only touched upon, avoiding any serious discussion. Most of the attention will be devoted to economic and geopolitical aspects of the problem.

Figure 3


Aim of the diploma
Japan's energy policy
1) Stable supply of crude oil
2) Crude oil self-sufficiency
Clear economic benefits
Economic and geopolitical benefits
Short-term energy cooperation
Russia-Japan energy cooperation
Geopolitical realities
Long-term energy cooperation
Problems of investing in Russia
Addressing existing problems
Crude oil reserves potential/production and infrastructure of East Siberia and the Far East

Part 1: Japan's energy policy

Outlook

In the post war period and during high level of economic growth (60's, 70's) Japan's energy consumption was steadily increasing. Industrial growth, population growth and GDP growth were all contributing factors for rising energy consumption. As the demand for energy increased country's dependence on combustion of hydrocarbons also went up. In 1950's International Oil Companies (also known as Oil Majors) controlled the supply of crude oil to Japan. However, in 1960s their grip on Persian Gulf countries started to loosen and as a result Japan's hydrocarbon supply dependence shifted from International Oil Companies to National Oil companies controlled by the governments Middle East monarchies. Despite the negative effects of First and Second Oil shocks and Japanese government's attempts to diversify country's energy supply with atomic and hydroelectric energy, Japan continued to depend on hydrocarbon imports, most of which came from the Persian Gulf. Especially after the Great East Japan earthquake and the closing down of atomic stations in the country, Japan's dependence on crude oil and liquefied natural gas imports has become even stronger. In fact, 66% of country's sources of energy come from crude oil and natural gas (if you include coal the figure becomes 88%). If natural gas imports are balanced between countries in different regions of the world (Malaysia, Australia, Indonesia, Qatar, Russia etc.) then 80% of Japan's crude oil imports come from the same region – Middle East. However most of the crude oil that reaches Japan does not get combusted as a primary energy source; most of the crude oil gets refined into petrochemical products, some of which get exported abroad.

Nevertheless, it would be wrong to assume that energy consumption in Japan is steadily increasing. In fact, if you look at the period 1974-2014 you will see that despite country's GDP rising by 2.4 times, energy consumption has only increased by modest 20%(経済産業省, 2016). The main factors that contribute to the decrease in energy consumption are falling population and decrease of energy consumption by industrial sector. **To wrap up, the energy consumption in Japan will not be experiencing any particular changes in the near future, it will stay the same or will be slowly decreasing, and therefore there is no need for the Japanese government to take any measures that will target growing demand in the country.**

Japan's key strategic concerns when it comes to the country's energy policy are the following

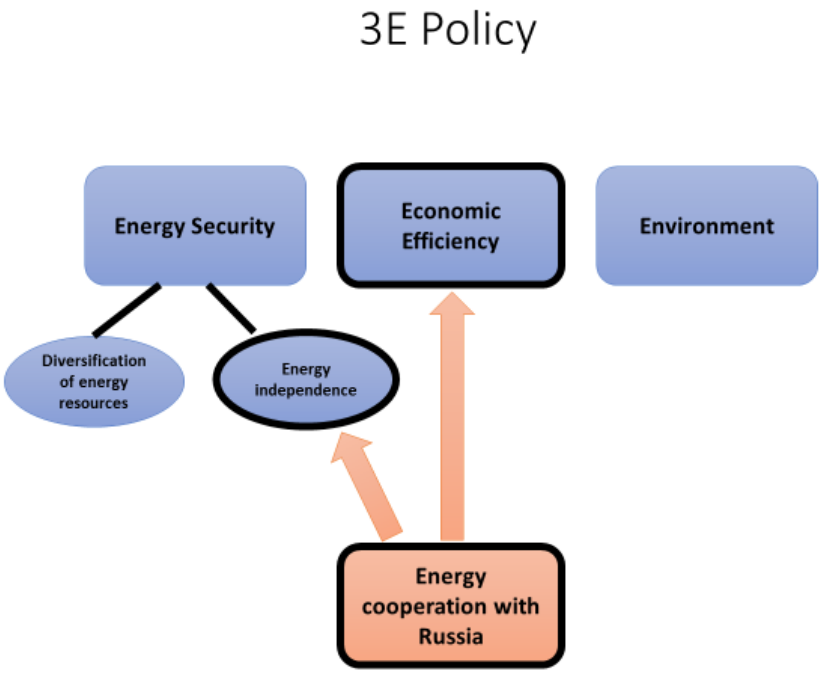
- Energy independence
- Diversification of energy resources

These two points can also be reflected in the country's **3E policy** announced by the Ministry of Economy, Trade and Industry(内閣府, 2016). The 3E stands for Energy Security, Economic Efficiency and Environment.

Great deal of energy and effort was spent trying to achieve these two goals: **hydrogen combustion, renewable energy, methane hydrate etc., but in the end of day atomic energy was the only economically viable solution to many of the problems**. Currently, the operation on most of the atomic power plants is stopped and the country continues to heavily rely on the combustible sources of energy: crude oil, natural gas, coal and LPG.

The diploma thesis is concerned with the theme of Japan-Russia partnership in the energy field. Therefore, I will try to prove that short-term cooperation between the two countries will have a positive effect on **economic efficiency of Japan's energy sector** and long-term cooperation between the two countries will have a positive effect on both **economic efficiency** and **energy independence of Japan from the outside world. In other words, cooperation with the Russian government and the Russian oil/natural gas companies can help Japan fulfil some of its main strategic goals in the energy sectors outlined by the 3E policy.**

Figure 4



Challenges of Japanese crude oil companies

No access to upstream activities (Challenge 1)

In recent years, Japanese crude oil market has been going through very difficult times. After the World War II Japanese oil companies were put in a position where they could only participate in the downstream activities. This has always been a strong restraining factor for the Japanese oil companies since they could not produce their own crude oil and were always in a price-taker position (rather than price-maker). The

country's crude oil supply fell under complete dependence from the OPEC countries, often acting on their own accord.

These developments meant that Japanese companies had no other choice but to invest and compete in downstream sector creating high quality petrochemical and petroleum products (gasoline, plastics etc.). Japan's inability to participate in the upstream sector of crude oil production, negatively affected the profitability of Japanese oil companies. Despite high infrastructure investments required, higher profitability is guaranteed in the upstream sector. Therefore, price to equity ratio (PER) in the downstream tends to be lower than in the upstream.

Nevertheless, effective manufacturing techniques led to high competitiveness of Japanese oil companies since they were producing high quality petroleum products and there was growing domestic demand. Recently, however, Japanese oil companies started going through very difficult times, because competition in quality and cost efficiency in the downstream sector became very tough. Oil producing countries started to rapidly develop their own petrochemical/plastic industries and creating high quality petrochemical products for a cheaper price. Cost competitiveness of their products can be explained by the availability of cheap hydrocarbons, something Japanese oil companies cannot physically afford. This had a very negative effect on the Japanese refining business, which was not so highly profitable to start with and ended up facing growing competition from cheaper products made in oil producing countries. The falling ROA of Japanese oil companies is an indicator that times are getting tough and profitability is falling. Even though the oil refining industry is outperforming in South East Asia, the trend is very different within Japan. In fact, the country's refining capacity has decreased by 20% over the last 7-8 years (Lu Wang, 2016). Extra restrictions imposed by the Japanese government, including:

- Low level of Sulphur content
- Mandatory cracking to crude oil distillation ratio

Have negatively affected the profitability of refining companies and forced the market to shrink. Facing such tough times Japanese oil companies started to merge to survive the competition from overseas (Lu Wang, 2016).

Energy independence (Challenge 2)

Japan does not have sufficient natural reserves of hydrocarbons i.e. it is a resource poor country. Therefore, Japan is dependent on imports for 94% of its primary energy supply. This puts the country in a very vulnerable position, since in case of force majeure or crisis (like oil crisis in 1970s) the country can be left without energy(JOGMEC, 2016).

According to the Ministry of Economy, Trade and Industry one of the most possible and economically viable

ways Japan can expand its energy independence is buying the rights to extract oil and increasing investment into upstream activities in oil producing countries. In other words, by trying to secure oil reserves in different parts of the World, Japanese companies ensure that they participate in every stage of oil production from drilling to refining. This will put Japanese oil companies in a position where they import their own crude oil into Japan, without buying it from the foreign governments. Obviously, Japanese companies cannot participate in these activities on their own and require a full-scale support from the Japanese government, otherwise they will not be able to compete with International Oil Majors (Shell, BP etc.) or national oil companies of countries like China or India. Such support is provided via an organization called JOGMEC (Japan Oil, Gas and Metals National Corporation). Around 50 companies inside Japan are members of this organization. JOGMEC receives money from METI (Ministry of Economy, Trade and Industry) and redirects it to strategically important projects around the world ensuring that Japanese oil, metal companies as well as Sogo Shosha get all the financial, technological and infrastructure support they need. In 2015 JOGMEC invested 89.5 billion JPY in different mining and extraction projects around the world, out this sum 41 billion JPY was invested into crude oil and natural gas projects. JBIC, Japan Bank for International Corporations, participates in many of these projects, by providing the necessary loans. The scheme by which JOGMEC achieves this will be later discussed in greater detail.

At present 24% of crude oil that Japan imports from abroad is being extracted by the Japanese oil companies (Inpex, Japex etc.) in the oil fields, rights and interests to which they have acquired beforehand. In other words, this is the crude oil (raw product) that has been produced by Japanese companies i.e. by Japan. By 2030 the aim is to bring this figure to 40%(JOGMEC, 2016).

Upstream involvement

Getting involved in the upstream sector and having no crude oil resources of its own, is a very big challenge. Compared with downstream activities, it is a very high risk and high return enterprise where it is very difficult to tell for sure if the crude oil reserves are substantial enough to economically justify the drilling and geological expertise. Furthermore, Japanese companies are forced to deal with **oil nationalism** of different oil producing countries. **Oil nationalism implies a tough negotiating position and unwillingness to strike a deal at a prize that would satisfy both the buyer and the seller**.

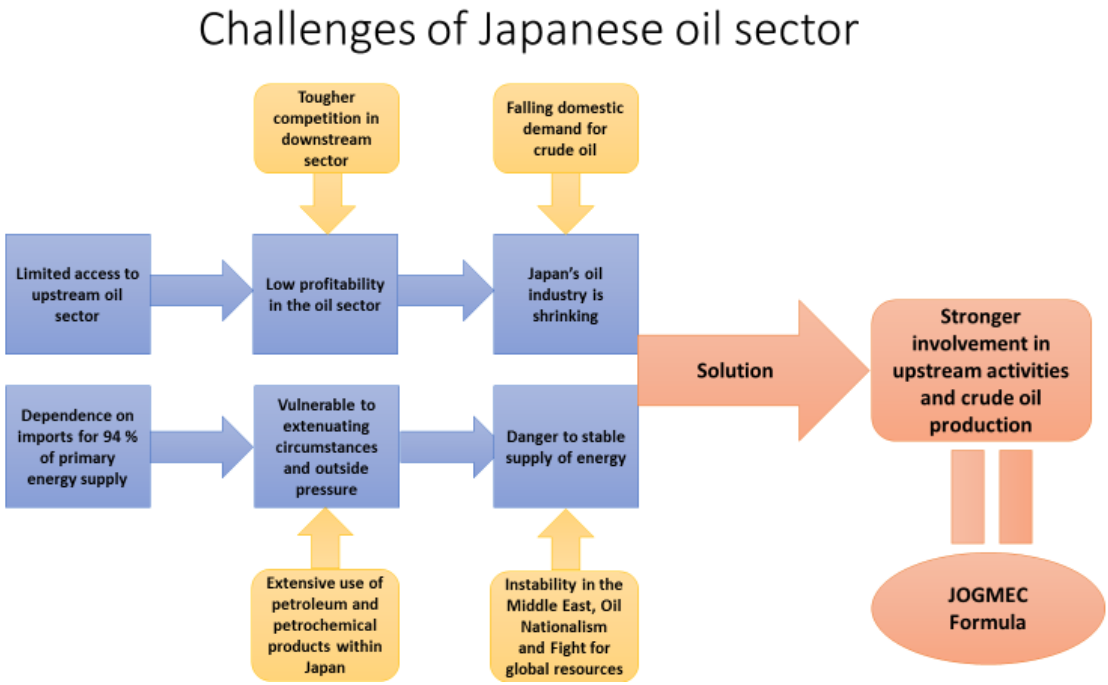
There are 3 main stages in the upstream activity:

- **Stage 1**: through sets of artificial earthquakes observe soil's physical structure and make probe excavation to decide whether the crude oil reserves and the quality of crude oil make the full-scale drilling and excavation of oil in the region economically viable
- **Stage 2:** commercial development of the project creating infrastructure, industrial platform and pipelines

❖ **Stage 3:** start of the actual production of crude oil

Evidently to participate in these types of activities huge amount of investments is required – insurmountable for most of Japanese oil companies. This is when Japanese government gets involved. The scheme works the following way: 1) METI provides finances to JOGMEC 2) JOGMEC uses its financial and technological resources to support Japanese private oil companies and sogo shosha 3) Japanese private oil companies and sogo shosha invest into projects overseas. In other words, JOGMEC acts as an intermediary between the Japanese government, private oil companies and engineering companies. Although JOGMEC provides financing for the oil projects, the decisions where to carry out geological expertise are made by the crude oil companies: oil companies provide suggestions of where to invest and in most of the cases JOGMEC follows them.

Figure 5



According the Japan's Energy Whitepaper, to achieve stable supply of energy and energy independence Japan needs to place more emphasis on developing strong energy cooperation with countries like United States, Canada, Russia and several countries on the African continent(経済産業省, 2016). At the same time, strong ties with Middle Eastern partners must be kept to ensure that interests of Japanese companies are protected. By competing with Chinese and Indian national oil companies, Japanese oil companies supported by JOGMEC will try to acquire as much exploration rights in different parts of the world as possible. On the other hand, there is strong determination to stop the financing of the shale oil projects in United States and Canada, since their economic viability has been strongly hindered by the long period of low oil prices. Even though JOGMEC continues to commit to development of a more refined technology that would increase efficiency and hence lower the price of shale oil production, the strategic decision is to refrain from long

term investments into shale oil production for the time being.

JOGMEC formula

Since the role of JOGMEC in ensuring Japan's energy independence in long term is so significant, it is important to understand the business model this organization uses to support different upstream initiatives around the world. There are four main functions that JOGMEC manages to fulfil: **financial support**, **technological support**, **information provision** and **network building(**JOGMEC, 2016**).**

Financial support. Financial support is provided at each stage of the project and encompasses all sorts of upstream activities from preliminary stage to production stage. Risk money provided by JOGMEC ensures acquisition of exploration and extraction rights as well as timely investments at each stage of the project (acquisition of assets and prospecting).

Technological support. This is another extremely important function of JOGMEC that differentiates it from an investment fund and provides it with a significant competitive advantage in domestic and overseas markets. The uniqueness of JOGMEC's position is guaranteed by two factors:

- Company's access to Japanese engineering firms specializing in oil/natural gas production equipment, which is considered to be one of the best in the world
- Company's ability to combine technological know-how of Japanese engineering firms into a packaged solution carefully adjusted to the needs of different customers

Ability to leverage Japan's superiority in engineering sector in a very efficient way, allowed JOGMEC to strengthen its position inside Japan as well as provide its customers around the world (especially in oil producing countries) with a high value added service: risk money and engineering – something that neither Indian, nor Chinese oil companies can do. In fact, it would not be an exaggeration to say that it is the capacity of JOGMEC to offer tailored technological solutions in upstream and downstream sectors that makes its business model work and differentiates it from other players in the market. To sum up, the competitive advantage in the form of engineering solutions allows it to build strong ties with the governments and local partners in the oil producing states and this facilitates the acquisition of crude oil exploration and extraction rights. The technological support is also provided to the Japanese oil companies at each stage of the upstream activity. Engineering solutions that include geological expertise, monitoring of oil storage, cost reduction, enhanced oil recovery (EOR), improvements in drilling and operation effectiveness, ocean development etc. are particularly in high demand in the oil producing countries (JOGMEC, 2016).

Network Building. JOGMEC having managed numerous projects in different parts of the world managed to establish strong ties with the local oil producers and governments. By providing full range service and

committing itself to strategically important and complex projects in different countries, JOGMEC has gained trust from the local partners. On the other hand, JOGMEC has strong ties with the Japanese government and Japanese engineering firms. Furthermore 50 oil, natural gas and mining companies within Japan are members of JOGMEC. Company's strong and reliable network inside and outside Japan allows to form partnerships and organize projects that would guarantee effective execution and high results (JOGMEC, 2016). Educating local personnel and showing them how to use the Japanese technology can also be considered a part of network building since it puts the oil producers into technological dependence from the Japanese engineering companies. As a result, it is expected that Japanese oil and engineering companies will be given preferential treatment when it comes to acquisition of different oil assets and extraction rights in a particular oil producing country.

Information provision. JOGMEC's data and geological expertise specialists make the company irreplaceable to the Japanese government. All the data that has been collected at the place gets analysed and the risks of investing into certain projects quantified. This is being backed up by the geological expertise at the place. This ability to collect and coherently analyse all the possible data allows JOGMEC to make very accurate decisions on whether a certain project is economically viable or not.

Figure 6 (Source: (JOGMEC, 2016)(JOGMEC, 2016))

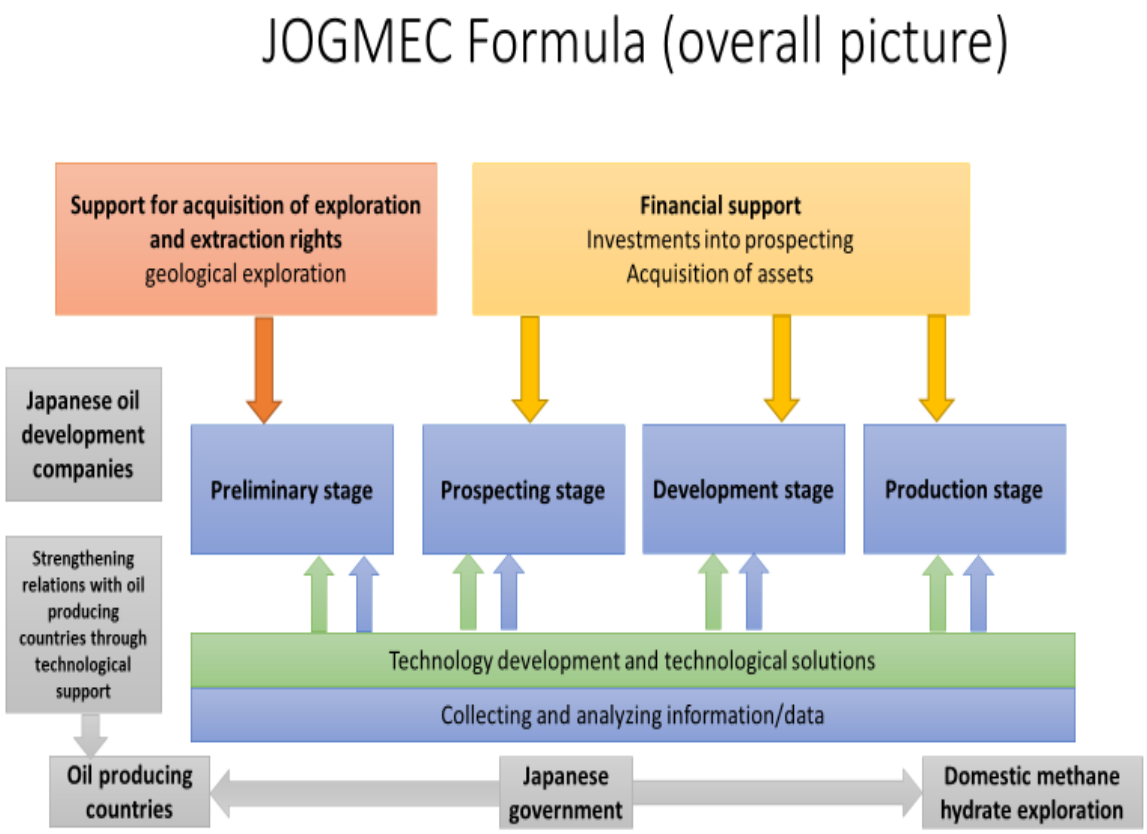
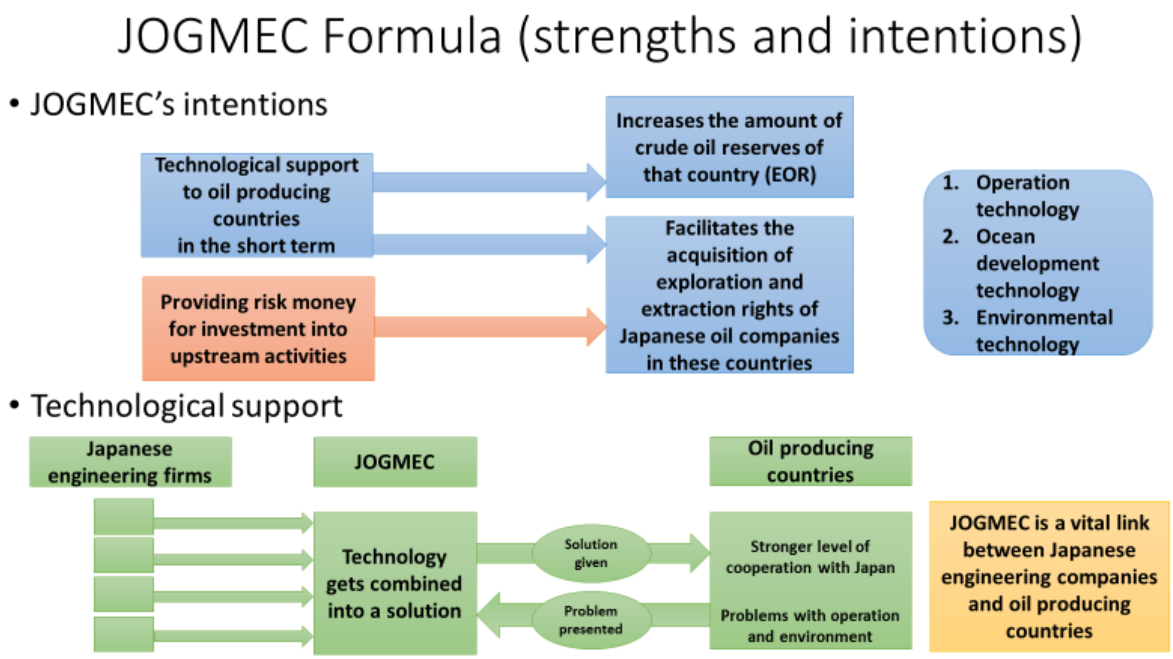


Figure 7 (Source: (JOGMEC, 2016))



To sum up, role of JOGMEC is so crucial to Japan's energy policy that it is simply impossible to imagine Japan achieving energy independence without it. The set of competencies that the company has, make it vital to all the players in Japan's energy market. JOGMEC's business model allows Japan to make the most of its technological superiority when it comes to competing with other major oil companies for acquisition of rights to develop oil fields.

Even though JOGMEC operations are wide spread around the world, there are areas where JOGMEC is particularly active: Middle East, United States and Canada. The level of technological cooperation with these countries is particularly high: the range of technological solutions offered is very big and the number of joint development projects is also very high. Having said that, technological cooperation with the Russian partners is limited to EOR (enhanced oil recovery). **Despite two countries being geographically close to each other and Russia having several strategically important crude oil and natural gas projects in East Siberia, Arctic and the Far East - involvement of JOGMEC is very limited. Evidently, both sides need to recognize all the benefits of cooperation with each other and readjust their positions.**

Outlook on the global crude oil market

Strategic importance of crude oil market implies that macroeconomic factors will always be influencing it. The limited growth of Chinese economy, general stagnation trends around the world imply that the demand for oil is not expected to increase any time soon. At the same time, rapid development of shale oil in United States and the volume of US oil production surpassing Saudi Arabia and Russia resulted in an oversupply of

crude oil in the market. This all led to sharp decrease in crude oil prices, negatively affecting profits of IOCs and NOCs(智子, 2015). Thus, the infrastructure and project investments started to fall (JOGMEC, 2016). The situation is particularly painful for oil producing countries like Russia and Saudi Arabia, where the strength of national currencies and country's budgets heavily depend on Brent prices. **As a result, NOCs of oil producing countries started selling their shares in order to get the necessary financing to help them live through these difficult times and avoid giving up on strategically important projects(日本経済新聞, 2016a).**

Even though Chinese and Indian economies are expected to grow, production competition between OPEC and non-OPEC countries is slowly coming to an end with competitors reaching agreement to freeze production, the oil prices are expected to remain low (40-60 USD per barrel) for a while. This will have a very negative effect on the shale oil industry, since presently shale oil business can be economically viable if the Brent price is 70-80 USD per barrel.

This is a unique situation, since the oil producing countries are suffering from budget deficits and their NOCs desperately need new sources of financing i.e. the negotiating position of oil producing countries has been badly weakened. The governments will be ready to sell stocks of their national oil majors at prices that they would have never accepted before. In plain English, if you are a looking to increase your cooperation with oil producing countries by buying the shares of their NOCs at the cheapest possible price, now it is the best time to strike a deal. This explains why NOCs of India and China, countries that don't have substantial crude oil reserves, have been heavily investing into OPEC and non-OPEC countries. **Japan also realizes the uniqueness of the moment and therefore intends to compete with NOCs of India and China to get its share of the "crude oil pie".**

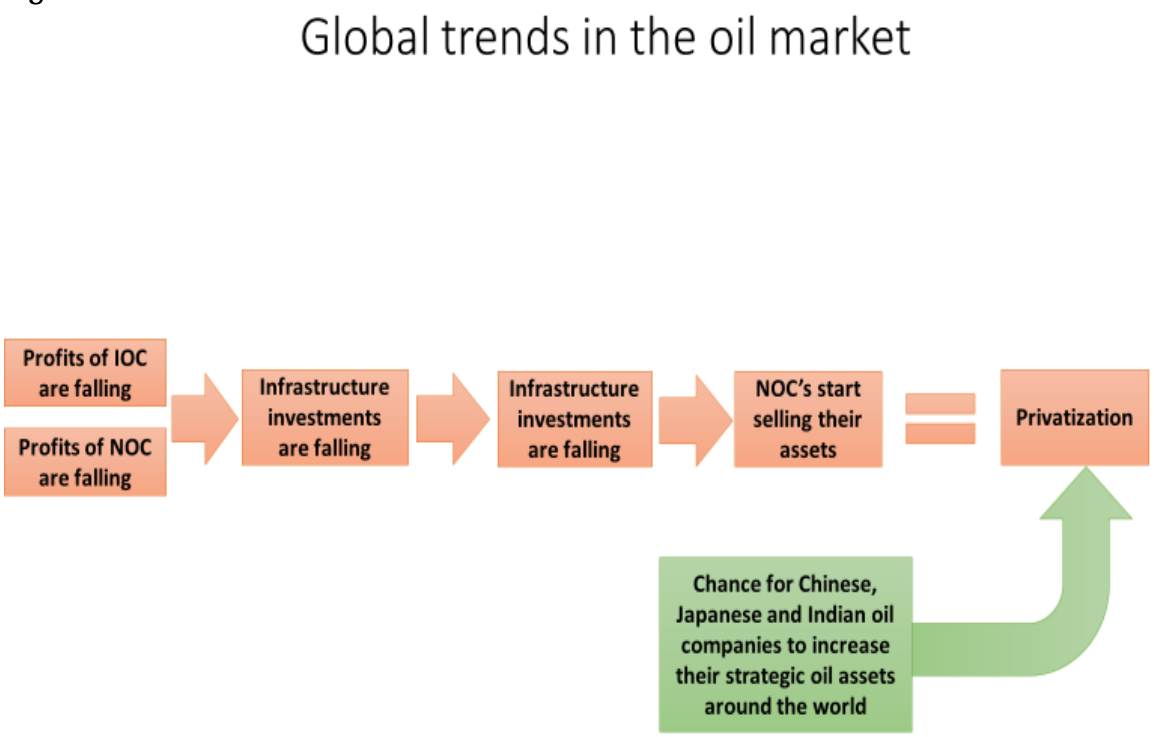
In Japan buying the shares of OPEC and non-OPEC NOC's falls under jurisdiction of JOGMEC. The company provides necessary finances to the Japanese crude oil companies and sogo shosha, which will in turn make the necessary acquisitions.

Overutilization of oil fields in West Siberia, lack of investments and technological support from the West because of sanctions, and introduction of crude oil import tax has negatively affected Russia's oil industry. Thus, Russia's NOC Rosneft has found itself in a very difficult financial situation and considers selling 20% of its shares. Rosneft does not exclude the possibility that it could end up being a foreign investor. To Rosneft it is essential that the foreign investor understands and shares the strategic goals of the company as well as willing to cooperate in different projects over a long period of time. So far Chinese CNPC and India's ONGC are considered potential buyers, but the Russian side remains open to other bidders. In fact, recent article in Nikkei has hinted that JOGMEC might be considering buying 10% of Rosneft shares(日本経済新聞, 2016a). Even though the next day JOGMEC denied making such proposals, certain interest is being paid to future cooperation with Rosneft. **Needless to say, that both sides are still far from reaching any agreement and are merely showing interest in each other, but the complementarity of Rosneft and JOGMEC has potential**

to turn into a very strong cooperation promising big synergies and benefits to both sides in the future(Rosneft, 2014)(Rosneft, 2014)

**In the end, Rosneft has sold 20% of its shares to Glencore plc. and Qatar's sovereign wealth fund in December 2016 for only 11 billion USD (Elena Mazneva, 2016) – a relatively cheap price. This once again proves that currently Rosneft desperately needs money and is very flexible in price negotiations. Among the potential buyers were the Japanese Sogo Shosha.*

Figure 8



Conclusion

Japan has a well-defined strategy of how to use the current global situation in the global crude oil market in the best possible way. The main pillars of the strategy are

- Strengthening technological cooperation with oil producing countries
- Purchasing oil exploration and extraction rights
- Investing into different oil projects around the world
- Buying shares of NOCs of oil producing countries that are going through difficult financial times

JOGMEC plays a key role in implementation of these aims. It uses the strengths of Japan (Japanese engineering superiority and financing power) in the most effective way to promote country's interest and help Japan achieve energy independence. Russian Federation is a country that has rich natural resource

base, especially hydrocarbons. Furthermore, the country shares sea border with Japan and country's economy is now going through a very difficult state. These features make Russia a very suitable target for Japanese energy investments. In fact, there remains little doubt that cooperation with Russia in developing crude oil fields in East Siberia could strongly contribute to Japan's energy independence. And yet projects in Middle East countries, United States and Canada continue to be prioritized over investments into Russia(Sechin, 2015).

From now on I will try to analyse what gains or losses would follow if Japan increases the crude oil imports from Russia.

Part 2: Benefits of short term cooperation

Before moving on to benefits that Japan could have from increasing crude oil imports from Russia, it first makes sense to understand:

- How much crude oil reserves (potential crude oil reserves) does Russia have?
- What is the Russia's crude oil production capacity? Is the current production capacity expected to increase or decrease in the future?
- How developed is the infrastructure and crude oil transportation system?

Thus, before talking about gains and losses Japanese economy would get if it increases crude oil imports from Russia, it first makes sense to establish whether this increase is possible or not.

Russia's crude oil reserves

There is a lot of uncertainty when it comes to measuring crude oil reserves of a certain country. There are several reasons for such uncertainty. The first reason is the complexity of the whole procedures i.e. it is physically difficult to measure how many discovered and undiscovered oil reserves a certain country. The second reason is the reluctance of some countries to disclose information on the mineral reserves, as this information has strategic importance and in some cases considered a state secret. This feature can be seen in post-Soviet countries or in countries where state economy is dominant. The third reason is the recent discovery of new reserves of crude oil (Arctic) and unconventional sources of crude (shale oil). Therefore, we can see that it is very difficult, almost impossible to tell how many oil reserves do one country really have, since new discoveries and politics influence keep on constantly changing these figures (Balmasov, 2016).

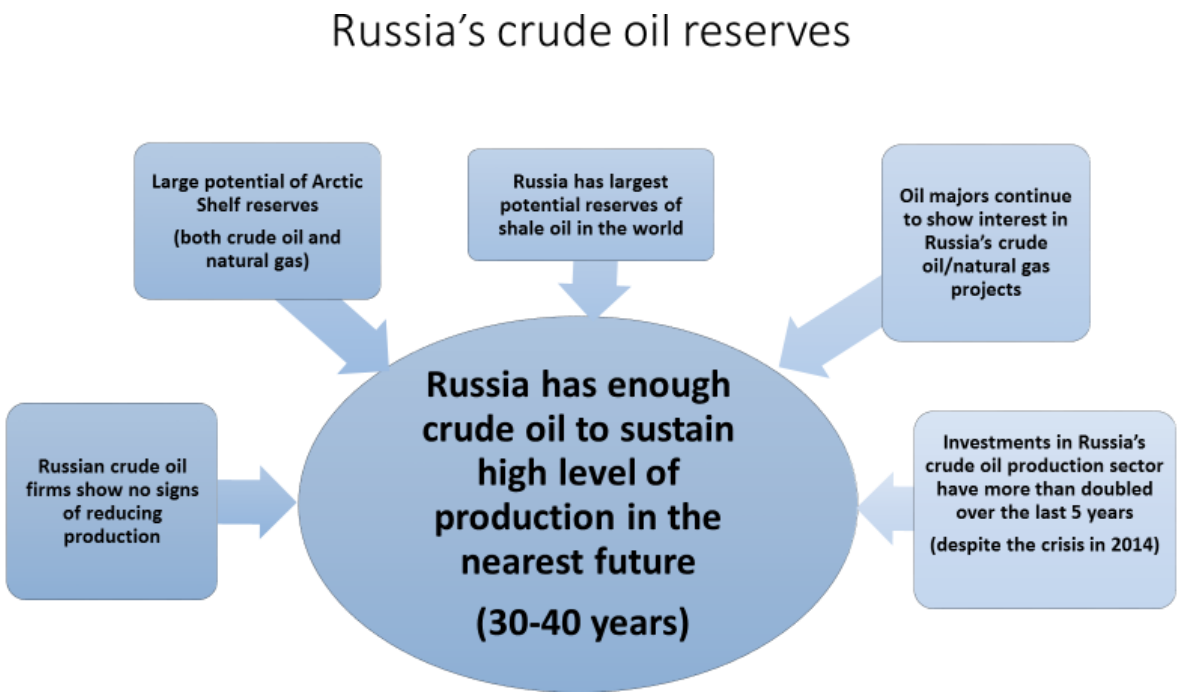
The situation is particularly difficult in Russia's case since the information on crude oil and natural gas reserves is considered a state secret, which leaves us with no choice but to rely on foreign sources. Unfortunately, these sources cannot be considered very reliable since there is no way they could get an accurate geological expertise without coming to Russia and carrying out the measurements. Since crude oil market is very competitive with different countries fighting for foreign direct investment, there might also exist an intention to deliberately underestimate Russia's oil reserves, to diminish investment attractiveness of Russia's oil sector.

According to the most conservative measurements Russia only possesses 6-7% of World's crude oil reserves, amounting to 80 thousand million barrels. This puts Russia on the seventh place in the world ranking Venezuela, Saudi Arabia, Canada, Iran, Kuwait, and UAE. Since Russia produces almost the same amount of

crude oil as Saudi Arabia 10.4 million barrels per day (眞澄, 2016), it is expected that Russia's crude oil reserves will expire in 23 years, whilst crude oil reserves of Saudi Arabia will only expire in 63 years. The numbers seem quite troubling, because Russia appears not to have as many crude oil reserves as it claims it has. Moreover, as time will pass Russia will probably start cutting on its production, which can eventually lead to Russia's oil companies not fulfilling the contracts they signed with domestic and foreign partners. The situation appears to be apocalyptic, but how reliable are the sources informing us that Russia only has 6-7% of World's oil reserves (JPEC, 2015a)? – Maybe not as reliable as one would think. First, these figures do not include the new crude oil reserve discoveries made on the Russian Arctic shelf. It is estimated that around 87 thousand million barrels worth of crude oil can be found beneath Kara Sea in Russia's Arctic region: an amount equal to crude oil reserves of UAE (Khudainatov, 2012). Taking account of these reserves and adding them to known reserves brings Russia from 7th place all the way up to 3rd place. On top of that Russia has one of the largest shale oil reserves in the world, which have not even been discovered yet – this further strengthens Russia's position and brings it to the 2nd place just behind Venezuela (Yegorov, 2016).

If Russia's crude oil reserves only allowed the country to sustain present level of production for only 23 years, the situation in the country's crude oil market would be quite different from what it is now. On top of that, since Russian crude oil companies show no sign of decreasing production and international oil majors continue to actively invest in East Siberian and Arctic projects, there remains little doubt about the actual scarcity of country's resources, since otherwise why would there be any interest in a country crude oil resources of which will expire in 23 years – hardly a lifespan of a crude oil project, especially if it is an investment intensive project in the Arctic region. Investments in Russia's crude oil production sector have more than doubled over the last 5 years, despite the crisis in 2014. This all leads us to conclude that Russia will be able to sustain similar levels of production for 45-50 years i.e. **there is enough crude oil reserves to maintain present level of exports to Japan and maybe even increase it**.

Figure 9



Crude oil reserves of East Siberia and Far East

What about East Siberia and the Far East, – regions that are geographically close to Japan - how sufficient are the crude oil reserves in these areas, strategically important to both Russia and Japan? In East Siberia region, only (Krasnoyarsk Krai, Irkutskaya Oblast, and Sakha Republic) total discovered crude oil reserves amount to 9 billion tons (65 billion barrels) of oil, and natural gas reserves - 7 trillion cubic meters (250 Tcf) of natural gas. East Siberia and the Far East contain significant portion of Russia`s undiscovered hydrocarbon resources-estimated to be 17.6% for oil and 28.7% for gas. **Therefore, there are plenty of hydrocarbon resources in the region (Federation, 2016, M. Belonin, 2006)**.

On top of these resources, there are several pipeline projects like Zapolyarye-Purpe-Samotlor pipeline, Samotlor-Taishet pipeline, Vankor-Purpe pipeline and Kuyumba-Taishet pipeline that connect (or will soon connect) the rich oil reserves of West Siberia, East Siberia and Arctic region allowing the Russian side to flexibly reallocate crude oil resources from West to East (and reverse) depending on demand. This implies that at least half of Russia's crude oil reserves becomes available for the Asian market.

To conclude, there are enough crude oil resources in East Siberia and the Far East for the Russian oil companies to maintain the same level of crude oil exports to Japan and even increase it depending on circumstances. In fact, the costly construction of new pipelines that link West Siberia's and Arctic region's crude oil resources to East Siberia's crude oil resources not only increases the amount of crude oil available for export to Asian market, but also highlights Russia's intention to gradually change the focus of attention

from West to East. **Since many resources in the region have not yet been exploited (M. Belonin, 2006) this leaves plenty of room for investments into exploration and extraction projects.**

Production

Production in East Siberia and the Far East has risen over the last 15 years implying that there are enough crude oil resources in these two regions. If in 2000 these regions accounted for only 2-3% of all crude oil and condensate produced within the country, by 2015 the figure has risen to 15% i.e. increased 5 times. During the same period, crude oil production in Russia has risen by only 60%, therefore the rates at which production in East Siberia and the Far East is increasing are much higher than in the country signifying the level of attention that the Russian government and business give to this region (Motomura, 2014).

As a matter of fact, the increase of crude oil production in the region continues to take place and is far from slowing down. From 2008 to 2016 the crude oil production in the two regions has risen from 200,000 to 1,400,000 barrels per day, despite the financial crisis in 2008 and the drastic fall of ruble in 2014-2015. **As new oil fields are being discovered and new infrastructure is being built the crude oil production continues to increase in order to fulfil the growing demand in Asia Pacific region, especially in China.**

Infrastructure

When Soviet Union started a large-scale export of hydrocarbon resources, the Western direction (Europe) was given top priority since most of the buyers of Russia's crude oil and natural gas were situated in the West. Therefore, most of infrastructure designed to export crude oil and natural gas including pipelines, storage systems and refineries were built or directed to Eastern, Central and Western Europe. The pipelines connected oil fields of Volga and West Siberia regions to the final consumer in the West and they passed through the territory of Ukraine and Belarus – back then both states were part of the Soviet Union. This explains why many natural gas and crude oil storage facilities were built in Western part of Russia (Central Russia) or the neighbouring CIS states. The same refers to refinery complexes and ports of shipment (Tuapse, Saint Petersburg, Murmansk, Odessa, Nikolayev etc.).

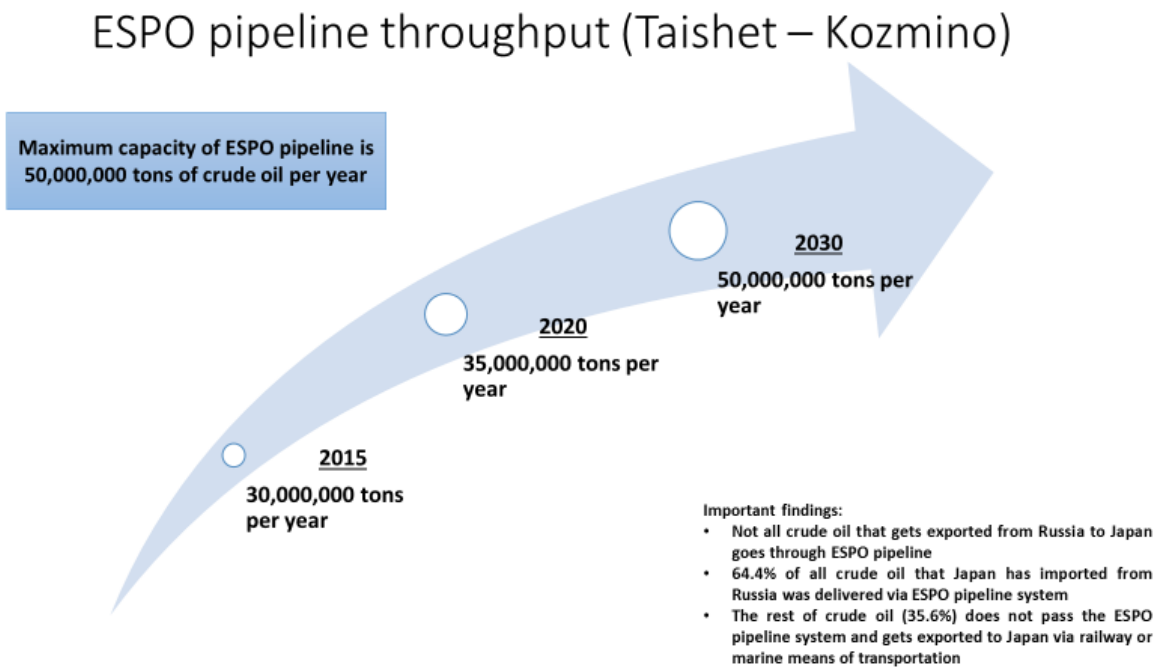
As a matter of fact, the shift to Asia has started to take place recently. If we look at year 2000, 3,470,000 barrels per day was getting exported to Europe whilst not even signs of export activity were seen in the Asian direction. If we look at year 2015, the situation in the Asian direction has drastically change, with Russia exporting **1,400,000 barrels** of crude oil per day**.** However, such changes in the Eastern direction did not take place at the expense of exports to Europe, in fact exports to the West have risen to **4,410,000 barrels per day**, pointing to the fact that European market continues to account for the majority share in Russia's crude oil exports (JPEC, 2015b).

Nevertheless, the main reason why such a substantial increase in crude oil exports to Asia became possible is the major investment into oil infrastructure of East Siberia and the Far East.

ESPO (East Siberia - Pacific Ocean) pipeline is a key to understanding how Russia increased its crude oil exports to Asia. The mere size of the pipeline (4900 km) is staggering and shows how committed is Russia's big business to developing Far East and its infrastructure. The project was completed and is currently operated by Russia's major pipeline construction company JSC "Transneft". The construction of project started in 2009 and was completed in 2014 and included not only the pipeline, but also the new port Kozmino (in the Southern part of Primorskiy krai). The cost of the project was around 14 billion USD and big part of the financing came from the Development Bank of China (DBC) that provided 10 billion USD worth of loans to the Russian side. Most of the oil filling the ESPO pipeline comes from Vankor, Verkhnechon and Talakan oil fields. **As a matter of fact, making sure that ESPO pipeline is always filled with crude oil is one of the major concerns of Rosneft and other major Russian oil companies. For this reason, the company is putting a lot of effort into developing new oil fields in East Siberia, Arctic region and West Siberia and ensuring that these new crude oil resources get transferred to ESPO pipeline via other pipelines.** Ergo the construction of Purpe-Samotlor, Vankor-Purpe, Samotlor-Taishet pipelines. In fact, this partially explains Rosneft's extremely expensive acquisition of TNK BP in 2012 (55 billion USD) – the company was seeking full control of crude oil resources in the West Siberia and Arctic to direct some of them to the Asian market (Motomura, 2014).

Special attention must be given to the construction of the pipeline, because quite a lot of serious geopolitical decisions were made back then. There were two major opposing views on how should construction of ESPO pipeline proceed. One of the views was that pipeline must directly link Russia to China, who will be the final consumer of East Siberian crude oil. The main government and business people supporting this point of view were thinking along these lines: "Since Chinese economy is growing at such fast rates they will definitely consume all the crude oil we can possibly export from this region, so why spend more money and "pull" the pipeline all the way to the Pacific coast". The opposing view was for constructing a longer pipeline that would reach the Pacific Ocean, so that from there it would be exported to all the countries in the Asia Pacific region including China. Their position was that building a pipeline linked only to China would put the Russian side in an extremely weak position when it comes to price negotiations, as well as make Russian economy over-dependent on Chinese economic growth, that is not expected to last forever. Fortunately, the latter point of view prevailed and ESPO pipeline was constructed. **Back then Russia made a strategic decision not to commit all of its crude oil resources to the growth of the Chinese economy and make sure that it is in position to build strong energy ties with other players in the region(国別情勢研究会, 2014).**

Figure 10



Few words need to be said regarding the structure of ESPO pipeline. The pipeline is divided into two sections: ESPO-1 and ESPO-2. ESPO-1 starts from Taishet and reaches Skovorodino. From Skovorodino starts off one more pipeline (not related to ESPO) that goes directly to Chinese Daqing. ESPO-2 connects Skovorodino with Kozmino port in Nakhodka. From Kozmino the crude oil gets shipped to consumers in Asia Pacific Region: China, Japan and South Korea. Around 31% of all crude oil that gets shipped from Kozmino goes to Japan. Rather than talking about ESPO in general, it is better to concentrate on ESPO-2, since it is directly linked to Japanese crude oil imports. In 2015 around **30 million tons** (9,104,000 tons of which was shipped to Japan) of crude oil was transported to port Kozmino via ESPO-2 pipeline. By 2020 the figure is expected to reach **35 million tons** and by 2030 – **50 million tons**.

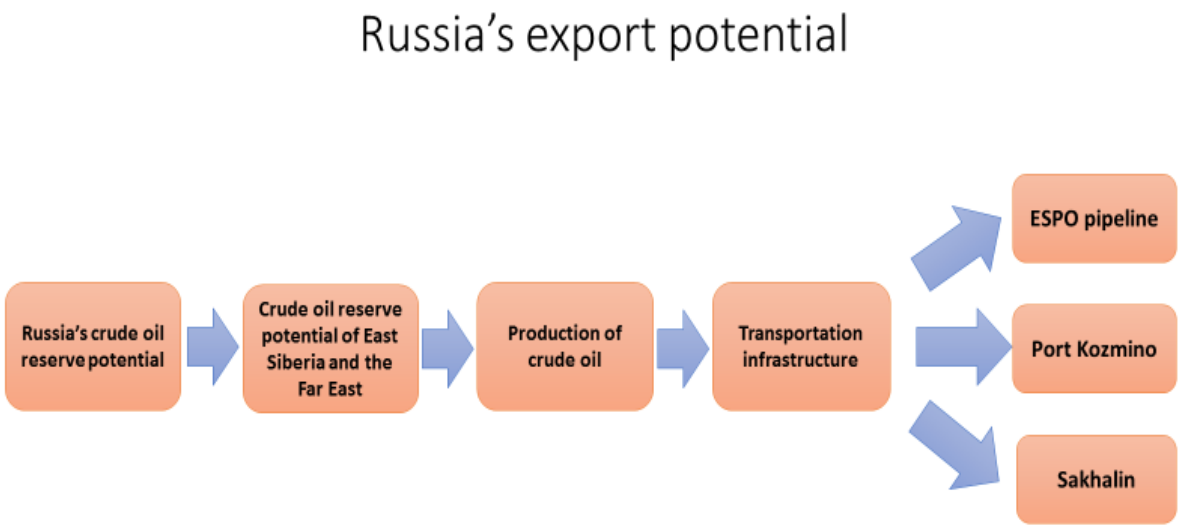
Kozmino port is a key port from which Russia's crude oil gets exported to countries in Asia Pacific region. The port is operated by JSC "Transneft". There are several Russian crude oil companies that export crude oil via port Kozmino: Rosneft, Surgutneftegaz, Irkutsk oil, Lukoil and Gazpromneft. The current capacity ok Kozmino port is 30 million tons of crude oil per year. In the nearest future, the capacity of the port is predicted to rise to 36.5 million tons. In the calculations, we will assume that by 2030 the capacity of port Kozmino will allow it to dispatch **50 million tons** of crude oil to the buyers in the Asia Pacific region (JPEC, 2015b).

Crude oil imported from Kozmino makes up around **64 %** of Japan's all crude oil imports from Russia. The rest of the crude oil, **4.5 million tons** (**36%)** comes from Sakhalin-I and Sakhalin-II projects where Japanese companies (Mitsubishi Shoji, Mitsui Bussan, Itochu, Marubeni and INPEX) have long term investments. Having said that, Sakhalin-III project, which is in the development stage will even further increase Russia's

crude oil export potential to Japan. Crude oil deposits of Sakhalin-III project exceed **700 million tons** – an amount that can satisfy Japanese oil demand for **3.5 years**. As stated bt Russian officials Sakhalin's crude oil output can reach **18.8 million tons** per year.

In the previous sections I tried to establish if Russia's hydrocarbon reserves, production capacity and transportation infrastructure allow it to further increase its sales of crude oil to Japan and hence reduce Japan's dependence on the Middle East. **So far it seems that Russia's crude oil reserve potential, growing production capacity and developing infrastructure provide evidence for us to believe in possibility of such developments.** Once having increased the level of exports to Japan, Russian side will be able to keep this level for at least 30-40 years.

Figure 11



Crude oil imports from Russia vs Crude oil dependence on the Middle East

I will now try to make some simple calculations and see how plausible are the plans to increase crude oil imports from Russia and to what extent can increasing these crude oil imports lower Japan's dependence from the crude oil coming from the Persian Gulf. Several scenarios will be observed: first set of scenarios will assume that Japan's crude oil imports stay at the same level, the second set will assume that Japan will be slowly moving towards energy independence i.e. buying the extraction and exploration rights of crude oil fields and producing its own crude oil (真澄, 2010) (眞澄, 2012).

Conditions

- 2014 data is used
- Annual data (export and import) is used
- Level of Japan's crude oil imports remains the same by 2030
- Unless mentioned the percentages remain the same
- Most of calculation will be in metric tons
- Increase in share of crude oil imports from Russia will automatically imply decrease in share of crude oil imports from the Gulf States
- Gulf State: Saudi Arabia, Qatar, UAE, Kuwait, Iraq and Iran
- Few scenarios are offered

<u>Givens</u>

- Japan's total imports of crude oil = **168.2 million tons**
- Japan's imports of crude oil from Russia = **14.1 million tons**
- Russia's share in Japan's crude oil imports = **8.3%**
- Gulf States' share in Japan's crude oil imports = **80%**
- Japan's imports of crude oil via ESPO pipeline = **9.1 million tons (65%)**
- Japan's imports of crude oil (Sakhalin + other) = **5 million tons (35%)**
- % of ESPO crude oil that gets exported to Japan = **30.3%**

<u>Scenario 1 (Japan's ESPO share = 30.3%, Sakhalin imports stay the same)</u>

- Year 2020
    - ESPO output = **35 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **10.6 million tons (65%)**
    - Japan's imports of crude oil from Russia = **10.6 + 5 = 15.6 million tons**
    - Russia's share in Japan's crude oil imports = **9.3% (+1%)**
    - Gulf States' share in Japan's crude oil imports = **79% (-1%)**

- Year 2030
    - ESPO output = **50 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **15.2 million tons**
    - Japan's imports of crude oil from Russia = **15.2 + 5 = 20.2 million tons**
    - Russia's share in Japan's crude oil imports = **12.1% (+3.8%)**
    - Gulf States' share in Japan's crude oil imports = **76.2% (-3.8%)**

<u>Scenario 2 (Japan's ESPO share = 40%, Sakhalin imports stay the same)</u>

- Year 2020
    - ESPO output = **35 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **14 million tons (65%)**
    - Japan's imports of crude oil from Russia = **14 + 5 = 19 million tons**
    - Russia's share in Japan's crude oil imports = **11.3% (+3%)**
    - Gulf States' share in Japan's crude oil imports = **79% (-3%)**

- Year 2030
    - ESPO output = **50 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **20 million tons**
    - Japan's imports of crude oil from Russia = **20 + 5 = 25 million tons**
    - Russia's share in Japan's crude oil imports = **14.8% (+6.5%)**
    - Gulf States' share in Japan's crude oil imports = **73.5% (-6.5%)**

Scenario 3 (Japan's ESPO share = 50%, Sakhalin imports stay the same)

- Year 2020
    - ESPO output = **35 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **17.5 million tons (65%)**
    - Japan's imports of crude oil from Russia = **17.5 + 5 = 22.5 million tons**
    - Russia's share in Japan's crude oil imports = **13.4% (+5.1%)**
    - Gulf States' share in Japan's crude oil imports = **74.9% (-5.1%)**

- Year 2030
    - ESPO output = **50 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **25 million tons**
    - Japan's imports of crude oil from Russia = **25 + 5 = 30 million tons**
    - Russia's share in Japan's crude oil imports = **17.8% (+9.5%)**
    - Gulf States' share in Japan's crude oil imports = **70.5% (-9.5%)**

Scenario 4 (Japan's ESPO share = 50%, Sakhalin imports rise: 6 million tons in 2020 and 8 million tons in 2030)

- Year 2020
    - ESPO output = **35 million tons**
    - Japan's imports of crude oil via ESPO pipeline = **17.5 million tons (65%)**
    - Japan's imports of crude oil from Russia = **17.5 + 6 = 23.5 million tons**
    - Russia's share in Japan's crude oil imports = **14.0% (+5.7%)**

- Gulf States' share in Japan's crude oil imports = **74.3% (-5.7%)**

- Year 2030
  - ESPO output = **50 million tons**
  - Japan's imports of crude oil via ESPO pipeline = **25 million tons**
  - Japan's imports of crude oil from Russia = **25 + 8 = 33 million tons**
  - Russia's share in Japan's crude oil imports = **19.6% (+11.3%)**
  - Gulf States' share in Japan's crude oil imports = **68.7% (-11.3%)**

These were scenarios where the level of crude oil imports stayed the same throughout the whole period until 2030. Currently Japan supplies 27.7% of all the crude oil it consumes. As mentioned before, this implies that Japanese companies, supported by the government, buy the exploration rights in different oil producing countries and extract the crude oil themselves – just like that Japan is slowly becoming crude oil/energy independent. By 2030 the aim of Japanese government, represented by JOGMEC, is to self-supply 40% (経済産業省, 2016) of all the crude oil the country consumes. I assume that the government will succeed in achieving this aim and hence adjust the conditions by adding few extra points.

Condition adjustments

- The demand for crude oil will not change throughout the whole time until 2030
- The greater the amount of crude oil Japan self-supplies, the less are the crude oil imports from the Middle East
- In 2014 Japan produced 25% of all the crude oil it consumed (imports = **168.2 million tons**)
- By 2020 Japan will produce 30% of all the crude oil it will consume (imports = **157 million tons**)
- By 2030 Japan will produce 40% of all the crude oil it will consume (imports = **134.6 million tons**)

Givens adjustments

- In 2020 Gulf States' share in Japan's crude oil imports = **75%**
- In 2030 Gulf States' share in Japan's crude oil imports = **65%**

Scenario 5 (Japan's ESPO share = 50%, Sakhalin imports rises: 6 million tons in 2020 and 8 million tons in 2030)

- Year 2020
  - ESPO output = **35 million tons**
  - Japan's imports of crude oil via ESPO pipeline = **17.5 million tons (65%)**

- Japan's imports of crude oil from Russia = **17.5 + 6 = 23.5 million tons**
- Russia's share in Japan's crude oil imports = **15.0% (+6.7%)**
- Gulf States' share in Japan's crude oil imports = **68.3% (-11.7%)**

➢ Year 2030

- ESPO output = **50 million tons**
- Japan's imports of crude oil via ESPO pipeline = **25 million tons**
- Japan's imports of crude oil from Russia = **25 + 8 = 33 million tons**
- Russia's share in Japan's crude oil imports = **24.5% (+16.2%)**
- Gulf States' share in Japan's crude oil imports = **53.7% (-26.3%)**

After having done all the calculations we can see that increasing crude oil imports from Russia can have a positive effect on reducing Japan's crude oil/energy dependence on the Middle East. The degree of this reduction varies from **3.8% to 26.3% (year 2030)** depending on circumstances such as dynamics of energy cooperation between Russia and Japan, and the extent to which Japan can achieve its crude oil self-sufficiency. Thus, Russia's share of crude oil imports to Japan can rise to 12.1% ~ 19.6% (year 2030).

Increasing crude oil imports from Russia can help Japan reduce its crude oil dependence from the Middle East – a very robust argument for strengthening Japan-Russia energy cooperation that will guarantee substantial **economic, geopolitical and even safety benefits to both Japan and Russia.** The geopolitical and safety aspects will be discussed in detail in Parts 4,5, so I will concentrate mainly on economic gains for now. Even though the focus will be on Japan, few words will be said about Russia's interests in bolstering up trade ties.

Economic and strategic benefits of increasing crude oil imports from Russia

Transportation costs. Russia's geographical position particularly that of port Kozmino and Sakhalin Island, makes it a very desirable country for Japanese oil and transportation companies to import hydrocarbons from. There is only 750 km between port Kozmino and the coast of Japan, whilst 12000 km separate Japan from the Persian Gulf states(泉, 2016). As you can imagine this difference in travelling distances directly affects the transportation costs. It takes only **0.9 USD** to transport one barrel of crude oil from Russia to Japan, while the same amount of crude oil will cost **3.89~5.56 USD** to be exported from the Middle East(眞澄, 2010). If you multiply the cost per barrel by the number of barrels Japan imports, the difference will appear to be staggering.

Table 1

Russia's share	tons	barrels	difference	amount saved (minimum,USD)	amount saved (maximum, USD)	amount saved (average, USD)
8.3%	14,131,797	96,096,219.60	0	0	0	0
9.3%	15,834,423	107,674,077.38	11,577,857.78	34,617,794.77	53,952,817.27	44,285,306.02
11.3%	19,239,675	130,829,792.95	34,733,573.35	103,853,384.31	161,858,451.81	132,855,918.06
12.1%	20,601,776	140,092,079.18	43,995,859.58	131,547,620.13	205,020,705.62	168,284,162.88
13.4%	22,815,190	155,143,294.29	59,047,074.69	176,550,753.33	275,159,368.07	225,855,060.70
14.0%	23,836,766	162,090,008.96	65,993,789.36	197,321,430.20	307,531,058.44	252,426,244.32
14.8%	25,198,867	171,352,295.19	75,256,075.59	225,015,666.02	350,693,312.25	287,854,489.13
17.8%	30,306,745	206,085,868.54	109,989,648.94	328,869,050.33	512,551,764.06	420,710,407.19
19.6%	33,371,472	226,926,012.55	130,829,792.95	391,181,080.92	609,666,835.14	500,423,958.03

Above are simple calculations of how much can Japanese side save on transportation costs by increasing the share of crude oil imported from Russia and reducing the share of crude oil imported from the Middle East. Few scenarios based on different shares of Russia's crude oil imports discussed above are being considered: **8.4%, 9.3%, 11.3%, 12.1%, 13.4%, 14.0%, 14.8%, 17.8%, and 19.6%**. In the calculations, the following assumptions were made:

- 1 metric ton of crude oil = 6.8 barrels of crude oil
- The transportation costs do not change throughout the whole time
- The minimum amount saved is when the transportation cost from the Middle East is 3.89 USD
- The maximum amount saved is when the transportation cost from the Middle East is 5.56 USD
- Throughout the whole time the amount of crude oil imported stays the same i.e. 168 million tons

The reason the last assumption was made is that in its attempt to achieve self-sufficiency in crude oil supply Japanese side will be buying crude oil exploration and development rights around the world. Since there is no information about which part of the world will the exploration and extraction take place, I cannot make assumptions on transportation costs.

Nevertheless, from the table above we can see that Japan can on average save from **44.3 million USD to 500.4 million USD per annum** depending on the Russia's share in crude oil imports. This a substantial amount of money that the Japanese companies can effectively invest in other strategic projects.

Effective utilization of ships. Since the distance between Kozmino and the Western coast of Japan is small (less than 600 km), the operating rate of oil tankers will go up implying that a certain number of these transportation vessels will remain free and can be utilized in other areas**,** for example**,** transportation of crude oil that Japanese upstream companies extract in different parts of the world. Therefore, by increasing

crude oil imports from Russia and decreasing crude oil imports from the Middle East, Japanese companies will be creating more opportunities for effective utilization of their transportation vessels(眞澄, 2010).

Safety issues. Substantial distance between Japan and Gulf States also implies that there are several safety issues for the Japanese oil tankers along the way. The main risks originate from Somali pirates, Yemen rebels, Malacca strait pirates and the current situation in the South China Sea involving the growth of Chinese military. Despite many actions being taken by the United Nations to stop piracy in different parts of the world, the problem is far from being solved. The actions taken to destroy piracy lead to nothing as the financial lure of an easy baksheesh and availability of cheap weapons means that there will always be the danger of piracy in certain parts of the world. The only way to deal with this problem is to have some military ships escorting the tankers and preventing the pirates from attacking the freight vessels. Thus, extra defence costs arise, but even then complete safety of the vehicles and the crew cannot be guaranteed. The Yemen war only aggravated the issue as more weapons started to circulate in the region.

The situation in the South China Sea calls for extra attention as the surging of Chinese military activity and the construction of military bases on the new islands reveals the desire of the Chinese government to strengthen its presence in the region and eventually expel the US Pacific Fleet. Since the South China Sea lies on the way of the Japanese oil tankers that travel from the Middle East to Japan, the potential future dominance of Chinese military in this region might potentially create problems to the Japanese economy and represent a serious threat to Japanese crude oil supplies. This will put the Japanese government and business in a very weak negotiating position with China. There is no doubt that China will use this position to dictate its rules to further weaken Japan's economic and technological superiority.

Nevertheless, the sea route from Russia to Japan has neither the threats of pirate activity, nor the increasing influence of the Chinese military, since Chinese government does not see Russia as a threat to its strategic interests. Thus, safety issue is another big advantage of Russian crude oil imports over the Middle East crude oil imports.

Stronger negotiating position. The Gulf States controlling 80% of all Japanese crude oil imports de facto puts Japanese side in a weak position when it comes to price negotiation. Especially since all these countries are members of OPEC, their actions tend to be coordinated and Japan ends up being a price taker rather than a price maker (JPEC, 2015b). On top of that high temperature throughout the whole year and high productivity of oil rigs, i.e. lots of oil can be extracted per one oil rig, puts the Gulf States in a position when they can freeze the crude oil production whenever they feel like it without really damaging their export potential – this is called being a swing producer. In fact, the ability of OPEC countries to easily freeze the oil production has allowed them to initiate the Oil Crisis in the 70s.

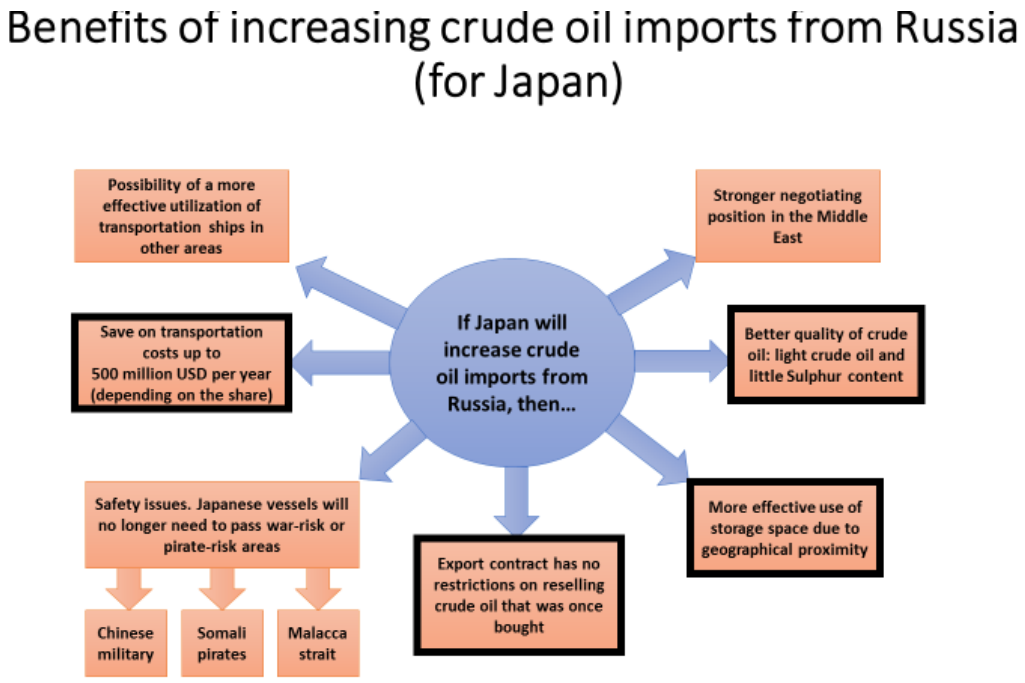
Despite having a developed crude oil export infrastructure and producing almost the same amount of oil as Saudi Arabia, Russia does not have advantages of Gulf States when it comes to price negotiation. **The**

specific features of Russia's crude oil market make it impossible for Russia to become a price maker that dictates the rules of the market. The main reason is that Russia is not (and will never be) a swing producer of crude oil due to low temperatures and low productivity of crude oil rigs. The oil companies can simply not afford to freeze production as the crude oil in the well will simply freeze leading to big losses. Furthermore, unlike OPEC countries that have big National Oil companies and can act uniformly as the Monarchies tells them to, Russian oil companies are not tightly controlled by the Russian government and will be very reluctant to reduce or freeze oil production as it will lead to substantial profit reductions. **In fact, Russian oil companies will try to sell as much crude oil as possible and will be willing to make long term contracts with the buyers, which partially explains why Asian market attracts the Russian oil companies (Sechin, 2015).**

To sum up, increasing crude oil imports from Russia and decreasing the crude oil dependence on the Middle East, will result in stronger negotiating position of Japanese companies when dealing with the Gulf States. When the OPEC countries will realise that Japan does not depend on their crude oil as much as they thought it did and that there are alternative producers of crude oil (i.e. Russia) that could deliver the hydrocarbons on better terms, they will be less reluctant to raise the price or dictate their own rules. On the other hand, Japanese government and businesses have no need to worry about increasing their crude oil dependence on Russia, since the country is not a swing producer and there are different crude oil companies (private and state owned), each wanting to sell as much of their product as possible and sign long term export contracts, providing Japan with a stable supply of hydrocarbons. Thus, both Japan and Russia will become mutually dependent, with no one having a significant advantage over another. **In fact, it was mainly thanks to crude oil exports from Kozmino that allowed Japan to reduce its crude oil dependence from the Middle East from 89% in 2009 to the present 80%.**

Furthermore, Russia's weak position in price negotiation with China (Mitrova, 2016), will make it easier for the Japanese side to strike a deal with companies like Rosneft, Lukoil, and Gazpromneft, which would be beneficial to both sides. Even in the best-case scenario, Russia's share of crude oil imports will be around **20%**, which is the same amount the Japan imports from United Arab Emirates and **10%** less than the amount imported from Saudi Arabia – Japan will not become excessively dependent on the Russian government. **Thus, Japanese oil companies, both upstream and downstream, will be the ultimate winners in this situation, since their negotiating position in Middle East will become stronger.**

Figure 12



Quality of crude oil. There are 4 types of crude oil that get shipped from Russia to Japan: **ESPO**, Vityaz, Sokol and Sakhalin blends. These types of crude oil have relatively low sulphur content (0.3-0.6%) and high API gravity (34-35), implying that the quality of the blend is very high. This is an important factor especially for refiners who intend to produce lighter products. Dubai blend has much lower API gravity (31) and a much higher sulphur content (2%), meaning that it loses in quality to the Far Eastern blends. ESPO blend managed to become a staple for refiners in China, Japan and South Korea due to its high quality. This does explain why ESPO is traded at a higher premium compared to Dubai, especially after rising demand from China. However, if Japanese companies were to negotiate a long-term import contract, there is a high chance that they will get a good discount that would offset the premium difference. Indeed, if we look at an average price per ton that a country importing crude oil from Russia pays, we can see that China pays 60 USD less than Japan. In my opinion such a difference is caused by a high proportion of long term oil export contracts recently signed between Russia and China. Nevertheless, even high ESPO premiums will not offset high costs of transportation from the Middle East (JPEC, 2015a).

Economic benefits of increasing crude oil imports from Russia (Regression)

As was mentioned in the first part of the diploma, over the recent years Japan's refining industry has undergone a serious decline. From 2008 country's refining capacity, has dropped by 20%, mainly due falling domestic demand, tighter government regulation and intensifying international competition in petrochemical sectors (China, Gulf States etc.). Needless to say, that for a country like Japan that does not have any hydrocarbon resources of its own, it is extremely hard to compete in production of petrochemicals

with countries that have cheap access to these resources. Although Japan's refining industry might be very high class and efficient, the transportation costs and storage costs will have a negative effect on the competitiveness (price) of the petroleum products that the country produces. As the products lose their international competitiveness and the domestic demand falls the decline of the industry becomes irreversible.

In my humble opinion, access to crude oil and oil industry are guarantee country's economic and geopolitical stability. I would even go as far as saying that petrochemical industry represents a circulatory system of any economy since so many industries depend on it. Therefore, even if the process seems inevitable, serious and persistent actions must be taken to ensure that Japan's oil industry continues to exist and even thrives. This brings me to the central proposal of my thesis: **by increasing crude oil imports from Russia, Japanese refining industry can increase its competitiveness and hence minimize the shrinkage rate.**

Having listed different benefits of increasing crude oil imports from Russia, I will now try to conduct regression analysis through which I intend to find out what factors influence Japan's exports of petroleum products. Through this analysis, I intend to establish whether there is any relationship between the volume of crude oil imports from Russia (to Japan) and volume of petroleum product exports from Japan. My hypothesis (alternative hypothesis) is that there is a significant relation between these two factors, **in other words, the more Japan imports crude oil from Russia the more petroleum products it can export abroad i.e. Japan's petroleum products become more competitive. Here is the main argumentation behind the hypothesis**:

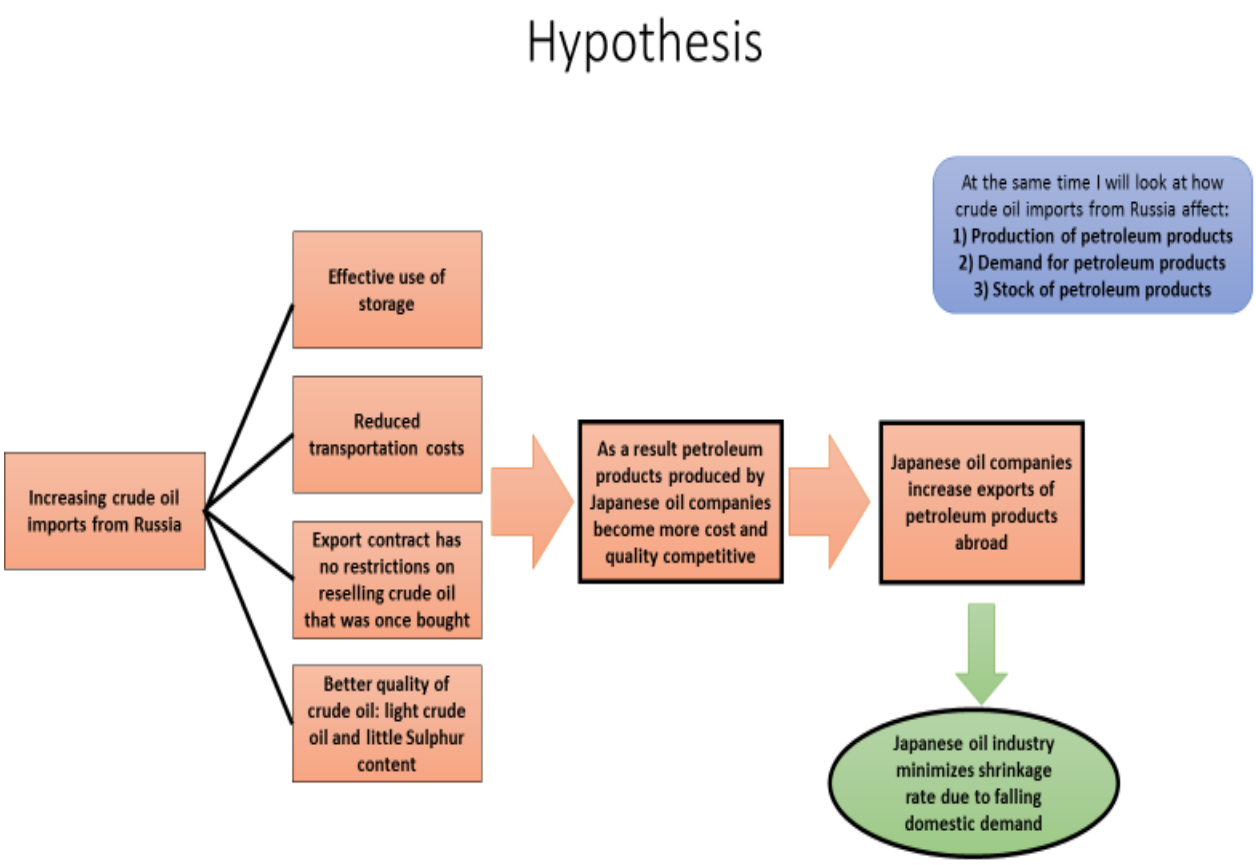
- High quality of ESPO blend allows Japanese refineries to produce petroleum products that have significant demand abroad
- Low transportation costs make petroleum products produced in Japan more competitive
- The geographical proximity of Kozmino port implies that there is less need to plan for storage of crude oil in advance. This would reduce the storage costs as well as improve the operation rate of refineries
- Import contracts signed with the Russian oil companies, unlike the contracts signed in the Middle East, do not forbid to resell the crude oil that has once been imported. This means that a company that has bought too much crude oil can always resell it to other players in the domestic/international oil market. At the same time the company that has not bought enough crude oil can always buy it from the competitor. This will allow Japanese companies to further improve their operating rates and reduce storage costs, so there would be minimum waste in the production cycle.

To test this hypothesis, I will need to conduct several other tests, because proving significance of relation between crude oil imports from Russia and Japan's export of petroleum products is not enough. I will also need to look at the relationship between Japan's exports of petroleum products and crude oil imports from

other oil producing countries: Saudi Arabia, Kuwait, UAE, Qatar, Brunei, Indonesia, Malaysia, Iraq and Iran.

I will conduct several regression analyses using Excel and SPSS. Even though the centre of my attention would be relationship between Japan's crude oil imports from Russia and petroleum product exports from Japan to other countries, I will include different independent variables in my analysis. All this will be done to get a better picture of the recent developments in Japan's oil market.

Figure 13



Part 3: Regression analysis

Regression setting

Sources of data

There are two main sources of the data used in the regression analysis. All the information on petroleum products (production, imports, exports, end stock, demand) I got from **Petroleum Association of Japan (PAJ)**. The units of measurement used are thousand kilolitres (kl). The rest of information I got from **Nikkei Needs database**. Since the data downloaded from Nikkei Needs is quite big and various, I will mention the units and types of data as I conduct each regression analysis.

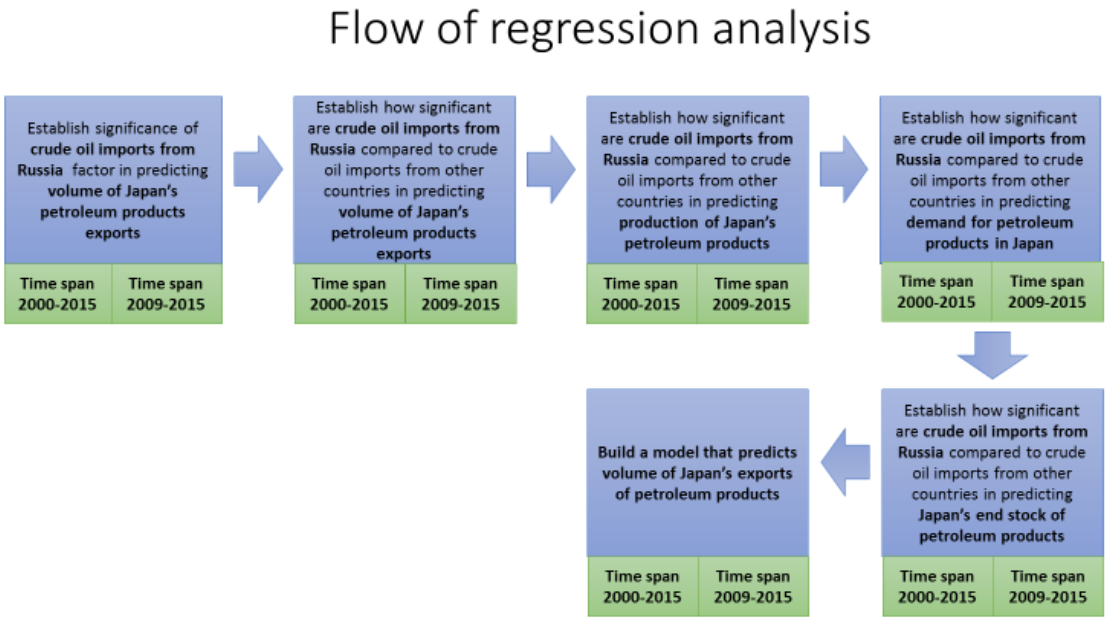
Timespan

Two timespans will be used in my regression analysis: **2000-2015** and **2009-2015**. The first measurement will be conducted in 2000-2015 timespan, to get access to bigger data and hence get more accurate results. After that I will use 2009-2015 (post Lehman shock) data to make sure that the results won't get skewed in one way or another by the Lehman shock and to have a better understanding of the most recent developments. All the data will be **time series data broken up into months**.

Software used

SPSS software will be used to conduct regression analysis**.** Techniques and tables used will depend on the complexity of the analysis required. Also, **NumExcel** and **Excel Stat** will be used to conduct an Augmented Dickey-Fuller test for stationarity as well as other tests relevant for the time series regression. I will also use **AMOS** software for structural equation modelling to prove that there have been structural changes between 2000-2008 and 2009-2015 periods.

Figure 14



Explaining why the two timespans were used

Reasoning

Before moving on to regression analysis, I would like to first clearly explain why I decided to use two timespans and not settle for only one (2000-2015). The main reason for such decision is the following: I strongly believe that there has been a structural change in the Japanese oil market between periods **2000-2008** and **2009-2015.** In other words, the Japanese oil market has undergone a structural transformation after the Lehman Shock and has become very different from what it was in early and mid-2000's. Therefore, it makes sense to analyse 2009-2015 period separately.

Chow test

To prove this hypothesis, I will conduct two types of tests proving that periods 2000-2008 and 2009-2015 don't fit. I will test four separate models, in every model there will be a different dependent variable: **Exports of Petroleum Products, Production of Petroleum Products, Demand for Petroleum Products and Stock of Petroleum Products**. Each model will have the same number of independent variables – crude oil imports from Brunei, Malaysia, Indonesia, Russia, Saudi Arabia, Kuwait, Qatar, UAE, Iran, Iraq ('000 kilolitres) and Crude oil produced by Japanese companies ('000 kilolitres). At first, I will conduct **Chow test** in SPSS and see if the coefficients in the linear regression for two timespans (**2000-2008; 2009-2015**) are equal. Chow test will be conducted four times for four separate models. The test will proceed in the following way:

- Carry out a regression for 2000-2015
- Split up the data using 2009-2015 dummy variable
- Carry out regression, where the dummy variable is used
- Use the residual values to calculate the F-statistic
- Based on the value of F-statistic decide whether I can accept or reject the null hypothesis

Null hypothesis states that there is no structural change, so rejecting the null hypothesis would mean that there is structural change.

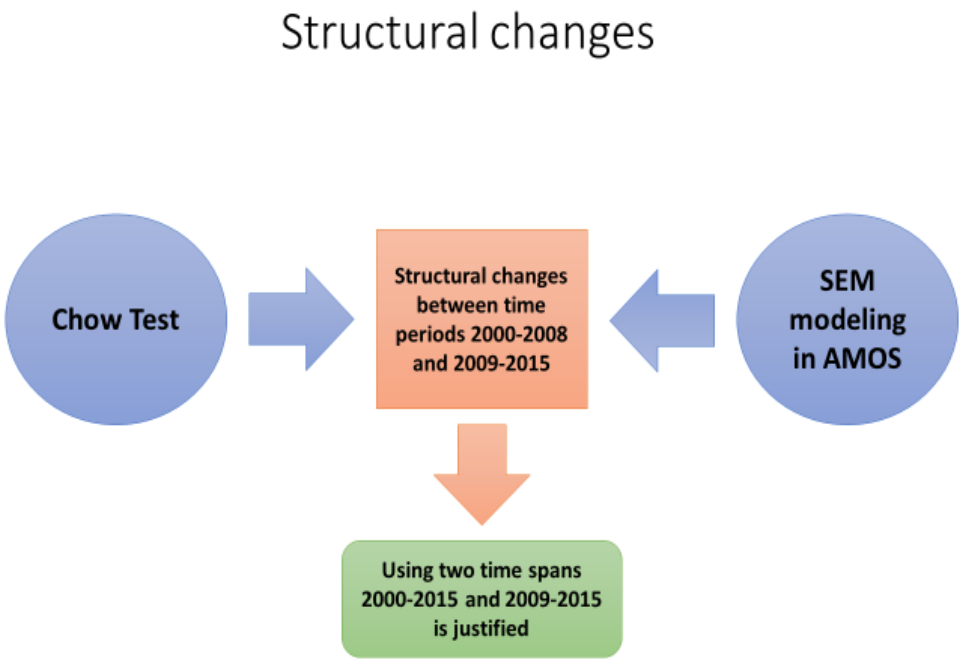
Setting the test (Structural Equation Modelling in AMOS)

I will use AMOS to construct absolutely the same model as described in the section above. I will then create two groups for the two separate time periods **2000-2008** and **2009-20015.** Using these groups, I will create two separate models: **homogeneous** and **heterogeneous.** Homogeneous model will have parameter restrictions: each coefficient of 2000-2008 group should be equal to corresponding coefficient of 2009-2015 group (the coefficient is the correlation coefficient in the regression model). The heterogeneous model will have no such restriction. Having built these two models, I will compare them and see whether they are compatible or not. On top of that I will refer to CMIN, GFI, NFI, CFI and RMSEA indicators to clarify which of the two models represents a better fit.

Results of both tests

The results of both Chow tests and SEM showed that there is a structural change between 2000-2008 and 2009-2015 periods and that the two models are incompatible. For Chow test all the four models gave the same results i.e. I ended up rejecting the null hypothesis, since observed F-value was higher than the critical F-value. In AMOS, all four times the homogeneous model ended up being incompatible with heterogenous model, with the latter representing a better fit. All the tables are in the **Attached Materials** section.

Figure 15



Regression 1 (simple linear regression)

This part will be devoted to understanding how significant are the crude oil imports from Russia in relation to the petroleum products that Japan exports. I expect that "volume crude oil imports from Russia" would be a significant variable in predicting "volume of petroleum products that Japan exports"

Dependent variable: Japan's exports of petroleum products ('000 kilolitres)
Independent variable: Crude oil imports from Russia ('000 kilolitres)

Timespan: 2000-2015

Table 2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.638[a]	.407	.404	510.525970

a. Predictors: (Constant), Russia_imports

Table 3

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33969210.65	1	33969210.65	130.332	.000[b]
	Residual	49520985.64	190	260636.767		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), Russia_imports

Table 4

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1533.998	52.901		28.998	.000
	Russia_imports	.795	.070	.638	11.416	.000

a. Dependent Variable: ExportPetroleumProductsTotal

Outcome (2000-2015)

Export Petroleum Products Total = 1534.511 + 0.795 **Y2009_Russia + Ɛi**

This time **adjusted R^2 value (0.404)** is very high compared to previous regression. Furthermore, high **F value (132.1**) and high **t value (11.49)** tells me that there is a significant relation between dependent and independent variables. In fact, the relation is even more significant than in a shorter span (2009-2015). **Thus, for every kilolitre of crude oil Japan imports from Russia, Japan exports 0.793 kilolitres of petroleum products.**

Time span: 2009 – 2015

Table 5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.230[a]	.053	.041	389.518549

a. Predictors: (Constant), Y2009_Russia

Table 6

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	694560.736	1	694560.736	4.578	.035[b]
	Residual	12441425.42	82	151724.700		
	Total	13135986.16	83			

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

b. Predictors: (Constant), Y2009_Russia

Table 7

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2178.886	105.063		20.739	.000
	Y2009_Russia	.205	.096	.230	2.140	.035

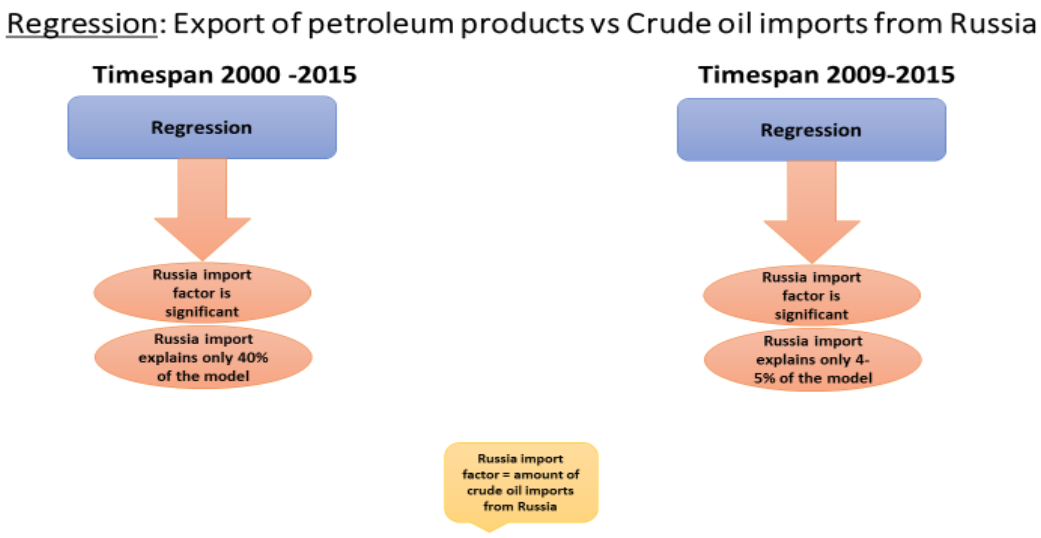
a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

Outcome (2009-2015)

Y2009_Export Petroleum Products Total = 2178.886+ 0.205 **Y2009_Russia + Ɛi**

F value = **4.578**, tells me that the overall model is significant. Furthermore, there appears to be a significant relation between the amount of crude oil imports from Russia and the amount of Japan's petroleum products' exports. Since the **t value** is **2.14** the result is significant at **5% significance** value. Needless to say, that crude oil imports from Russia on their own cannot explain or account for Japan's export of petroleum products, thus adjusted $\mathbf{R^2}$ is only **0.041%.** Nevertheless, the significance of crude oil imports from Russia is the main finding of the first regression. **For every kilolitre of crude oil Japan imports from Russia, Japan exports 0.205 kilolitres of petroleum products.**

Figure 16


Regression: Export of petroleum products vs Crude oil imports from Russia
Timespan 2000 -2015
Regression
Russia import factor is significant
Russia import explains only 40% of the model
Timespan 2009-2015
Regression
Russia import factor is significant
Russia import explains only 4-5% of the model
Russia import factor = amount of crude oil imports from Russia

Regression 2 (multiple regression; Russia vs Oil producing companies)

Since Russia is not the only country that exports crude oil to Japan, in fact, Russia's share of Japan's crude oil imports is merely 8.4%, it makes sense to include more variables into the regression that would represent crude oil imports from other oil producing countries: Saudi Arabia, UAE, Kuwait, Qatar, Indonesia, Malaysia, Brunei, Iran and Iraq. It would be logical to expect that the new variables will have similar and even stronger effects on Japan's ability to export petroleum products, because they also export crude oil to Japan and the shares` of some of these players in Japan's crude oil imports exceed Russia's. Nevertheless, I believe that even though some of the new "import variables" might be significant in relation to Japan's ability to export petroleum products, this will not negatively affect the degree of significance of "crude oil imports from Russia" variable i.e. "Russia_Import" factor will remain significant despite adding other variables to the regression.

Dependent variable: Japan's exports of petroleum products ('000 kilolitres)
Independent variable: Crude oil imports from Brunei, Malaysia, Indonesia, Russia, Saudi Arabia, Kuwait, Qatar, UAE, Iran, Iraq ('000 kilolitres)

Time span: 2000 – 2015

Full regression

Table 8

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.775[a]	.600	.578	429.481396

a. Predictors: (Constant), Iraq_imports, Malaysia_imports, Qatar_imports, Brunei_imports, Saudi Arabia, Kuwait_imports, Indonesia_imports, Iran_imports, UAE_imports, Russia_imports

Table 9

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50103973.49	10	5010397.349	27.163	.000[b]
	Residual	33386222.81	181	184454.270		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), Iraq_imports, Malaysia_imports, Qatar_imports, Brunei_imports, Saudi Arabia, Kuwait_imports, Indonesia_imports, Iran_imports, UAE_imports, Russia_imports

Table 10

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1787.831	334.622		5.343	.000
	Brunei_imports	-1.936	.555	-.203	-3.490	.001
	Malaysia_imports	-1.382	.466	-.148	-2.967	.003
	Indonesia_imports	-.776	.177	-.255	-4.395	.000
	Russia_imports	.389	.089	.312	4.386	.000
	Saudi Arabia	.048	.046	.055	1.042	.299
	Kuwait_imports	-.107	.094	-.061	-1.140	.256
	Qatar_imports	.282	.086	.166	3.269	.001
	UAE_imports	.052	.056	.061	.937	.350
	Iran_imports	-.114	.052	-.154	-2.173	.031
	Iraq_imports	.162	.124	.065	1.311	.192

a. Dependent Variable: ExportPetroleumProductsTotal

Table 11

Correlations

		ExportPetroleumProductsTotal	Brunei_imports	Malaysia_imports	Indonesia_imports	Russia_imports	Saudi Arabia	Kuwait_imports	Qatar_imports	UAE_imports	Iran_imports	Iraq_imports
Pearson Correlation	ExportPetroleumProductsTotal	1.000	-.516	-.350	-.562	.638	.079	-.317	.017	-.409	-.543	.242
	Brunei_imports	-.516	1.000	.202	.423	-.424	.113	.335	.152	.458	.485	-.113
	Malaysia_imports	-.350	.202	1.000	.263	-.237	-.087	.137	.068	.110	.161	-.008
	Indonesia_imports	-.562	.423	.263	1.000	-.463	.003	.309	.173	.426	.386	-.218
	Russia_imports	.638	-.424	-.237	-.463	1.000	.026	-.316	-.137	-.542	-.683	.246
	Saudi Arabia	.079	.113	-.087	.003	.026	1.000	.201	.264	.255	.126	-.012
	Kuwait_imports	-.317	.335	.137	.309	-.316	.201	1.000	.249	.298	.345	-.119
	Qatar_imports	.017	.152	.068	.173	-.137	.264	.249	1.000	.162	.211	.035
	UAE_imports	-.409	.458	.110	.426	-.542	.255	.298	.162	1.000	.575	-.250
	Iran_imports	-.543	.485	.161	.386	-.683	.126	.345	.211	.575	1.000	-.154
	Iraq_imports	.242	-.113	-.008	-.218	.246	-.012	-.119	.035	-.250	-.154	1.000
Sig. (1-tailed)	ExportPetroleumProductsTotal	.	.000	.000	.000	.000	.139	.000	.408	.000	.000	.000
	Brunei_imports	.000	.	.002	.000	.000	.059	.000	.018	.000	.000	.060
	Malaysia_imports	.000	.002	.	.000	.000	.115	.029	.175	.064	.013	.459
	Indonesia_imports	.000	.000	.000	.	.000	.486	.000	.008	.000	.000	.001
	Russia_imports	.000	.000	.000	.000	.	.361	.000	.029	.000	.000	.000
	Saudi Arabia	.139	.059	.115	.486	.361	.	.003	.000	.000	.041	.434
	Kuwait_imports	.000	.000	.029	.000	.000	.003	.	.000	.000	.000	.050
	Qatar_imports	.408	.018	.175	.008	.029	.000	.000	.	.012	.002	.313
	UAE_imports	.000	.000	.064	.000	.000	.000	.000	.012	.	.000	.000
	Iran_imports	.000	.000	.013	.000	.000	.041	.000	.002	.000	.	.016
	Iraq_imports	.000	.060	.459	.001	.000	.434	.050	.313	.000	.016	.
N	ExportPetroleumProductsTotal	192	192	192	192	192	192	192	192	192	192	192
	Brunei_imports	192	192	192	192	192	192	192	192	192	192	192
	Malaysia_imports	192	192	192	192	192	192	192	192	192	192	192
	Indonesia_imports	192	192	192	192	192	192	192	192	192	192	192
	Russia_imports	192	192	192	192	192	192	192	192	192	192	192
	Saudi Arabia	192	192	192	192	192	192	192	192	192	192	192
	Kuwait_imports	192	192	192	192	192	192	192	192	192	192	192
	Qatar_imports	192	192	192	192	192	192	192	192	192	192	192
	UAE_imports	192	192	192	192	192	192	192	192	192	192	192
	Iran_imports	192	192	192	192	192	192	192	192	192	192	192
	Iraq_imports	192	192	192	192	192	192	192	192	192	192	192

Outcome (2000 -2015)

This time the model is significant as **F value = 27.16** is very high. Furthermore, crude oil imports from **Qatar, Russia, Iran Brunei, and Malaysia** appear to be significant. I will now use the method of backward elimination to clean up the model from insignificant independent variables.

Regression after backward elimination:

Table 12

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.767[a]	.589	.576	430.663044

a. Predictors: (Constant), Iran_imports, Malaysia_imports, Qatar_imports, Indonesia_imports, Brunei_imports, Russia_imports

Table 13

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49178124.59	6	8196354.099	44.192	.000[b]
	Residual	34312071.70	185	185470.658		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), Iran_imports, Malaysia_imports, Qatar_imports, Indonesia_imports, Brunei_imports, Russia_imports

Table 14

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2122.969	217.718		9.751	.000
	Brunei_imports	-1.869	.541	-.196	-3.454	.001
	Malaysia_imports	-1.436	.463	-.154	-3.103	.002
	Indonesia_imports	-.809	.171	-.266	-4.718	.000
	Russia_imports	.410	.085	.329	4.820	.000
	Qatar_imports	.299	.083	.176	3.628	.000
	Iran_imports	-.098	.050	-.133	-1.945	.053

a. Dependent Variable: ExportPetroleumProductsTotal

Outcome (2000 -2015) continued

Export Petroleum Products Total = 2122.97 – 1.869 **Brunei_imports** – 1.436 **Malaysia_imports** – 0.809 **Indonesia_imports** + 0.41 **Russia_imports +** 0.299 **Qatar_imports** – 0.098 Iran_imports **+ Ɛi**

(Factors that are not highlighted have no statistical significance)

This time the model appears to be even more statistically significant with **F value = 44.2**. There are no instances of strong correlation between the independent variables. All the independent variables appear to be statistically significant except for **Iran_imports** that is only marginally significant. Yet again there are independent variable that negatively correlate with the dependent variable. These variables are: **Brunei_imports, Malaysia_imports** and **Indonesia_imports.** The fact that all these countries are in the

same region (South East Asia) once again suggests that the more crude oil Japan imports from this region the less becomes its ability to export petroleum products abroad. This time there are two independent variables that have significant positive effect on the dependent variable: **Russia_imports** and **Qatar_imports.** Out of the two factors **Russia_imports** factor is the most significant one with **t value = 4.82** (Qatar_imports factor has t value = 3.6). Therefore, I can conclude that crude oil imports from Russia have a significant effect on Japan's export of petroleum products when using a longer time interval – this is a serious finding. In fact, since full-scale crude oil exports from Russia to Japan have only started in 2006/2007 this can suggest that in a very short period **Russia_imports** factor managed to become an important predictor of Japan's export of petroleum products. **This suggests that due to some reasons or other the crude oil imports from Russia unlike crude oil imports from other countries positively affect Japan's ability to export petroleum products by making them more cost and quality competitive.**

Adjusted R^2 value = 0.576 is very high, which suggests variance in imports of crude oil from oil producing countries can explain 57.6% of variance in exports of petroleum products from Japan.

Time span: 2009 – 2015

Full Regression

Table 15

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.447[a]	.200	.090	379.527039

a. Predictors: (Constant), Y2009_Iraq, Y2009_Russia, Y2009_Indonesia, Y2009_Kuwait, Y2009_Malaysia, Y2009_UAE, Y2009_Brunei, Y2009_Qatar, Y2009_Iran, Y2009_Saudi Arabia

Table 16

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2621009.722	10	262100.972	1.820	.072[b]
	Residual	10514976.44	73	144040.773		
	Total	13135986.16	83			

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

b. Predictors: (Constant), Y2009_Iraq, Y2009_Russia, Y2009_Indonesia, Y2009_Kuwait, Y2009_Malaysia, Y2009_UAE, Y2009_Brunei, Y2009_Qatar, Y2009_Iran, Y2009_Saudi Arabia

Table 17

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2448.552	538.601		4.546	.000
	Y2009_Brunei	-.014	.925	-.002	-.015	.988
	Y2009_Malaysia	-.627	.740	-.099	-.848	.399
	Y2009_Indonesia	-.719	.296	-.297	-2.430	.018
	Y2009_Russia	.213	.107	.239	1.987	.051
	Y2009_Saudi Arabia	-.087	.093	-.126	-.934	.353
	Y2009_Kuwait	.038	.149	.032	.259	.797
	Y2009_Qatar	.074	.106	.086	.700	.486
	Y2009_UAE	.087	.106	.097	.819	.415
	Y2009_Iran	.001	.094	.001	.008	.993
	Y2009_Iraq	.187	.200	.119	.934	.354

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

Outcome (2009 -2015)

Unfortunately, the **low F value (1.820)** tells us that the regression model is not significant at 5% level. Nevertheless **Russia_imports** variable **(t value = 1.987)** and **Y2009_Indonesia (t value = -2.430)** variable seem to be the only variables that have statistical significance i.e. despite including imports from other major oil producing countries especially from the Persian Gulf, there seems to be no country whose oil imports positively affect the ability of Japan to export petroleum products, except Russia, since **Y2009_Indonesia** variable despite its significance only has a negative effect. This is a very important finding, as it shows uniqueness of crude oil imports from Russia in comparison to other countries. Nevertheless, since the model on its own is not significant it would make sense to improve it by using backward elimination method. Will remove: **Y2009_Iran, Y2009_Iraq, Y2009_Malaysia, Y2009_Kuwait, Y2009_Brunei and Y2009_UAE.**

Regression after backward elimination:

Table 18

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.424[a]	.180	.138	369.323629

a. Predictors: (Constant), Y2009_Qatar, Y2009_Russia, Y2009_Indonesia, Y2009_Saudi Arabia

Table 19

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2360390.680	4	590097.670	4.326	.003[b]
	Residual	10775595.48	79	136399.943		
	Total	13135986.16	83			

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

b. Predictors: (Constant), Y2009_Qatar, Y2009_Russia, Y2009_Indonesia, Y2009_Saudi Arabia

Table 20

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2760.366	401.415		6.877	.000
	Y2009_Indonesia	-.797	.258	-.329	-3.083	.003
	Y2009_Russia	.228	.093	.255	2.443	.017
	Y2009_Saudi Arabia	-.074	.079	-.107	-.940	.350
	Y2009_Qatar	.093	.096	.108	.964	.338

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

Table 21

Correlations

		Y2009_ExportPetroleumProductsTotal	Y2009_Indonesia	Y2009_Russia	Y2009_Saudi Arabia	Y2009_Qatar
Pearson Correlation	Y2009_ExportPetroleumProductsTotal	1.000	-.337	.230	-.132	-.034
	Y2009_Indonesia	-.337	1.000	-.003	.274	.204
	Y2009_Russia	.230	-.003	1.000	.098	-.141
	Y2009_Saudi Arabia	-.132	.274	.098	1.000	.371
	Y2009_Qatar	-.034	.204	-.141	.371	1.000
Sig. (1-tailed)	Y2009_ExportPetroleumProductsTotal	.	.001	.018	.116	.378
	Y2009_Indonesia	.001	.	.490	.006	.031
	Y2009_Russia	.018	.490	.	.186	.100
	Y2009_Saudi Arabia	.116	.006	.186	.	.000
	Y2009_Qatar	.378	.031	.100	.000	.
N	Y2009_ExportPetroleumProductsTotal	84	84	84	84	84
	Y2009_Indonesia	84	84	84	84	84
	Y2009_Russia	84	84	84	84	84
	Y2009_Saudi Arabia	84	84	84	84	84
	Y2009_Qatar	84	84	84	84	84

Outcome (2009 -2015) continued

Y2009_Export Petroleum Products Total = 2760 – 0.797 (**Y2009_Indonesia)** + 0.228 (**Russia_imports) -** 0.074 (Y2009_SaudiArabia) + 0.093 (Y2009_Qatar) **+ Ɛi**

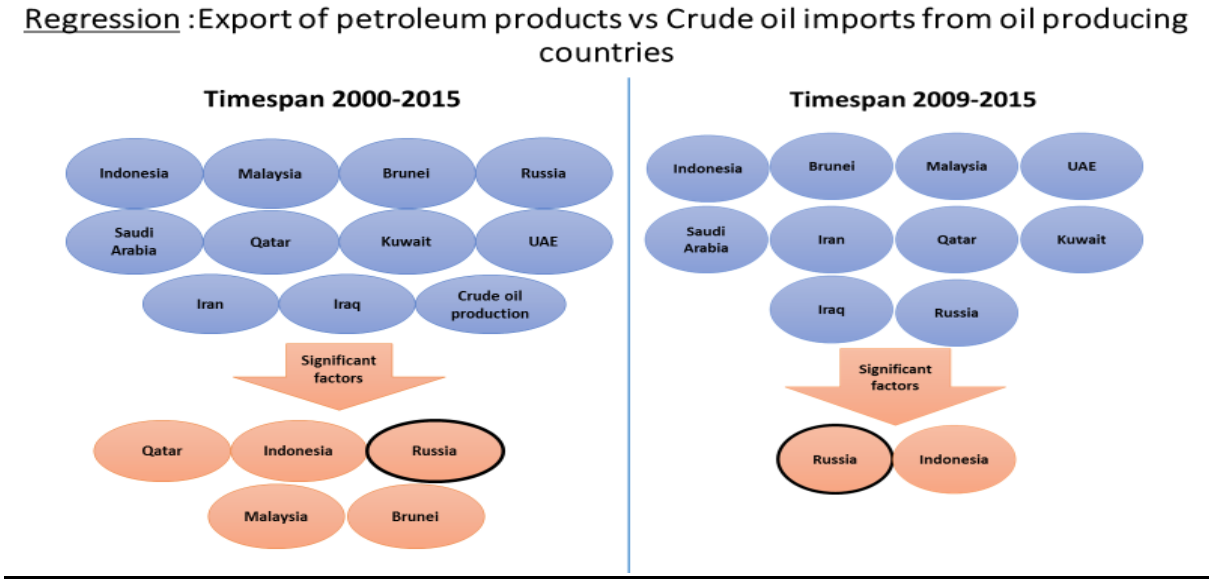
There is not significant correlation between any of the independent variables

This time we managed to get a significant regression model, because **F value = 4.326.** Nevertheless, if we

look at the significance level of the independent variables, still only **Russia_imports (t value = 2.443)** and **Y2009_Indonesia (t value = -3.083)** are statistically significant. **For every kilolitre of crude oil Japan imports from Russia, Japan exports 0.228 kilolitres of petroleum products and for every kilolitre of crude oil that Japan imports from Indonesia, Japan exports -0.798 kilolitres of petroleum products** i.e. the bigger the amount of crude oil it imports from Indonesia the less becomes its ability to export petroleum products. This is a very interesting finding, because it can imply that parameters of Indonesian crude oil make it difficult to produce petroleum products that are fit for export, but would be rather used in the domestic market. Alternatively, it can suggest that the more oil tankers are involved in the import of crude oil from Indonesia the less is the availability of tankers that can export petroleum tankers to the third countries. Especially since Australia and Singapore are the main export destinations of petroleum products made in Japan – this does seem plausible. However, because different category of tankers is used for crude oil and petroleum products transportation, the tanker logistics argument on its own is insufficient in explaining the negative correlation between crude oil imports from Indonesia and Japan's export of petroleum products.

Furthermore, it appears that neither crude oil imports from Saudi Arabia, nor crude oil imports from Qatar have any significant effect on the amount of petroleum products that Japan exports. In fact, after running a regression with only **Y2009_Indonesia** and **Y2009_Russia** as independent variable I got the most significant regression model compared with the previous cases, with **F value = 8.05**. This is an unexpected result since 80% of crude oil, necessary material for petroleum products, gets imported to Japan from the Middle East region. Could it be that it is not economically viable to export petroleum products made from the crude oil imported from this region? To get a better picture on the actual state of things, I will conduct regression analyses for production, demand, end stock of petroleum products in Japan.

Figure 17



Regression 3 (multiple regression; production of petroleum products)

The next series of regressions instead of using Japan's export of petroleum products, I will use **domestic demand, production and end stock of petroleum products in Japan**. The same independent variables will be used. The two timespans will also be used in the same order – I will first look at a broader picture (2000-2015) and then observe relatively recent developments (2009-2015) in the crude oil market. These new regressions will allow me to further understand the situation in Japan's oil market. I expect that this time crude oil imports from Russia will have little significance especially when it comes to production and demand of petroleum products, since Russia's share in Japan's crude oil imports has been close to 0% until recent years. Even though the current share is 8.4%, this is still nothing compared to the shares of the Gulf States.

This time I will add a new independent variable that will account for the crude oil produced by Japanese companies outside Japan after purchasing exploration and extraction rights. The intent behind adding this variable is to see if buying exploration rights and producing crude oil has any significant effect on the amount of petroleum products Japan can physically produce.

Dependent variable: Production of petroleum products in Japan ('000 kilolitres)

Independent variable: Crude oil imports from Brunei, Malaysia, Indonesia, Russia, Saudi Arabia, Kuwait, Qatar, UAE, Iran, Iraq ('000 kilolitres), Crude oil produced by Japanese companies ('000 kilolitres)

Timespan (2000 – 2015)

Full Regression:

Table 22

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.909[a]	.826	.816	828.018626

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Table 23

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	586758306.6	11	53341664.23	77.801	.000[b]
	Residual	123410672.0	180	685614.844		
	Total	710168978.6	191			

a. Dependent Variable: ProductionPetroleumProducts

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Table 24

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5115.379	660.279		7.747	.000
	Brunei_imports	.476	1.080	.017	.441	.660
	Malaysia_imports	.318	.926	.012	.343	.732
	Indonesia_imports	1.597	.347	.180	4.598	.000
	Russia_imports	.447	.171	.123	2.608	.010
	Saudi Arabia	.288	.095	.113	3.022	.003
	Kuwait_imports	1.066	.183	.207	5.818	.000
	Qatar_imports	.638	.174	.129	3.658	.000
	UAE_imports	.570	.108	.228	5.303	.000
	Iran_imports	.952	.115	.443	8.255	.000
	Iraq_imports	.157	.241	.022	.653	.514
	CrudeOilProduction	26.046	7.343	.165	3.547	.000

a. Dependent Variable: ProductionPetroleumProducts

Outcome (2000 -2015)

Production Petroleum Products Total = 5115.38 + 0.476 Brunei_imports + 0.318 Malaysia_imports + 1.597 **Indonesia_imports** + 0.447 **Russia_imports** + 0.288 **SaudiArabia_imports** + 1.066 **Kuwait_imports** + 0.638 **Qatar_imports** + 0.570 **UAE_imports** + 0.952 **Iran_imports** + 0.157 Iraq_imports + 26.046 **Crude oil production + Ɛi**

This time I get a statistically significant model with **F = 77.8.** Even though **Russia_imports** variable is significant **(t = 2.608)** at 1% significance value, implying that it can be used to predict the production of petroleum products in Japan, there are other independent variables such as **Indonesia_imports, Qatar_imports, UAE_imports, Iran_imports, SaudiArabia_imports and Kuwait_imports** that are more significant and hence may play a more serious role in predicting the production of petroleum products in Japan. This is an expected result since most of the crude oil that the Japanese economy consumes comes from the Middle East and Indonesia. **Crude oil production** independent variable is significant **(t value = 3.547)**. The size of the coefficient appearing in the regression equation (26.046) implies that compared with other independent significant variables, **it has the strongest effect** on the production of petroleum products. For every kilolitre of crude oil Japan manages to produce itself, **26.046 kilolitres** of petroleum products are being produced. This might also suggest that Japan's oil industry is unevenly skewed to the downstream side i.e. the upstream sector is so underdeveloped compared to the downstream sector, that in a way it is easier to produce high volumes of petroleum products from the imported crude oil, than produce high volumes of the original raw material, since it requires buying exploration, production rights etc.

After performing backside elimination, I managed and getting rid of statistically insignificant variables, the

model becomes even more significant **(F value = 108.1, R^2 = 81.2%)**

The adjusted **R^2 = 0.812** is very high, implying that 81.2% of variations of the dependent variable can be predicted by variations in the independent variables used. There appears to be no cases of serious correlation between the independent variables used.

Now I will conduct a similar regression but for a recent timespan to see whether the state of affairs has somehow changed over the recent years.

Timespan (2009 - 2015)

Full Regression:

Table 25

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.878[a]	.771	.736	697.099603

a. Predictors: (Constant), Y2009_CrudeOilProduction, Y2009_Indonesia, Y2009_UAE, Y2009_Brunei, Y2009_Kuwait, Y2009_Malaysia, Y2009_Russia, Y2009_Qatar, Y2009_Iraq, Y2009_Saudi Arabia, Y2009_Iran

Table 26

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	117786056.3	11	10707823.30	22.035	.000[b]
	Residual	34988245.64	72	485947.856		
	Total	152774302.0	83			

a. Dependent Variable: Y2009_ProductionPetroleumProducts

b. Predictors: (Constant), Y2009_CrudeOilProduction, Y2009_Indonesia, Y2009_UAE, Y2009_Brunei, Y2009_Kuwait, Y2009_Malaysia, Y2009_Russia, Y2009_Qatar, Y2009_Iraq, Y2009_Saudi Arabia, Y2009_Iran

Table 27

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4969.250	1020.353		4.870	.000
	Y2009_Brunei	-.896	1.699	-.034	-.527	.600
	Y2009_Malaysia	-3.863	1.372	-.178	-2.815	.006
	Y2009_Indonesia	.798	.559	.097	1.429	.157
	Y2009_Russia	.895	.207	.294	4.320	.000
	Y2009_Saudi Arabia	.338	.176	.143	1.918	.059
	Y2009_Kuwait	.884	.277	.216	3.194	.002
	Y2009_Qatar	.521	.198	.179	2.635	.010
	Y2009_UAE	.461	.195	.151	2.371	.020
	Y2009_Iran	.313	.238	.132	1.315	.193
	Y2009_Iraq	.848	.372	.158	2.282	.025
	Y2009_CrudeOilProduction	50.930	11.918	.473	4.273	.000

a. Dependent Variable: Y2009_ProductionPetroleumProducts

Outcome (2009 -2015)

Y2009_Production Petroleum Products Total = 4969.25 - 0.896 (Y2009_Brunei) – 3.863 (**Y2009_Malaysia)** + 0.798 (Y2009_Indonesia) + 0.895 (**Russia_imports)** + 0.338 (Y2009_SaudiArabia) + 0.884 (**Y2009_Kuwait)** + 0.521 (**Y2009_Qatar)** + 0.461 (**Y2009_UAE)** + 0.313 (Y2009_Iran) + 0.848 (**Y2009_Iraq)** + 50.93 (**Y2009_Crude oil production) + Ɛi**

There are some significant differences in this model compared to the previous one. The model on overall remains statistically significant with **F-value = 22.035**. Furthermore, the **R^2 value** is also quite high **73.6%**. The picture is very different when we look at t-values of the independent variables. First, **Y2009_Russia** turns out to be the most statistically significant factor affecting the Production of petroleum products in Japan, its **t-value = 4.32**. Not only did Russia_imports t-value go significantly up compared to the previous regression, but also the coefficient has almost doubled **(from 0.447 to 0.895),** implying that the impact of Russia's crude oil imports has also doubled. Furthermore, imports from **Y2009_SaudiArabia, Y2009_Iran and Y2009_Indonesia** stopped being significant factors in predicting the production of petroleum products in Japan. Instead you get **Y2009_Malaysia** and **Y2009_Iraq** becoming significant predictors of Japan's petroleum production volume.

The results are indeed very surprising, they suggest that recently crude oil imports from Russia started playing an important role in Japan's oil industry. This also implies that over the recent years Russia has established a stable supply of crude oil to the Japanese market. The crude oil imported from Russia ends up being used not only to make petroleum products to be exported abroad (relatively small scale enterprise) but also in the overall production of petroleum products (refining) – an enterprise of a much bigger scale. **Another big finding is that coefficient of "Crude oil production" factor (crude oil produced by Japanese companies outside Japan) has almost doubled compared to the previous regression.** One of the main potential explanation of this phenomena is that recently Japanese companies have worked very hard and invested a lot of money to increase their upstream activities i.e. expand their crude oil production. Thus, this independent variable started to have a stronger effect on the refining industry, as more crude oil produced by Japanese companies, as opposed to crude oil simply imported from abroad, started reaching the Japanese refineries.

I will now eliminate the statistically insignificant factors using backward elimination technique:

Table 28

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865[a]	.749	.726	710.560803

a. Predictors: (Constant), Y2009_CrudeOilProduction, Y2009_UAE, Y2009_Malaysia, Y2009_Kuwait, Y2009_Russia, Y2009_Qatar, Y2009_Iraq

Table 29

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	114402156.3	7	16343165.18	32.369	.000[b]
	Residual	38372145.72	76	504896.654		
	Total	152774302.0	83			

a. Dependent Variable: Y2009_ProductionPetroleumProducts

b. Predictors: (Constant), Y2009_CrudeOilProduction, Y2009_UAE, Y2009_Malaysia, Y2009_Kuwait, Y2009_Russia, Y2009_Qatar, Y2009_Iraq

Table 30

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5609.266	924.393		6.068	.000
	Y2009_Malaysia	-3.359	1.318	-.155	-2.548	.013
	Y2009_Russia	.978	.201	.321	4.857	.000
	Y2009_Kuwait	.989	.269	.242	3.670	.000
	Y2009_Qatar	.615	.196	.211	3.132	.002
	Y2009_UAE	.602	.190	.197	3.165	.002
	Y2009_Iraq	.759	.363	.141	2.089	.040
	Y2009_CrudeOilProduction	66.735	8.304	.620	8.037	.000

a. Dependent Variable: Y2009_ProductionPetroleumProducts

Table 31

Correlations

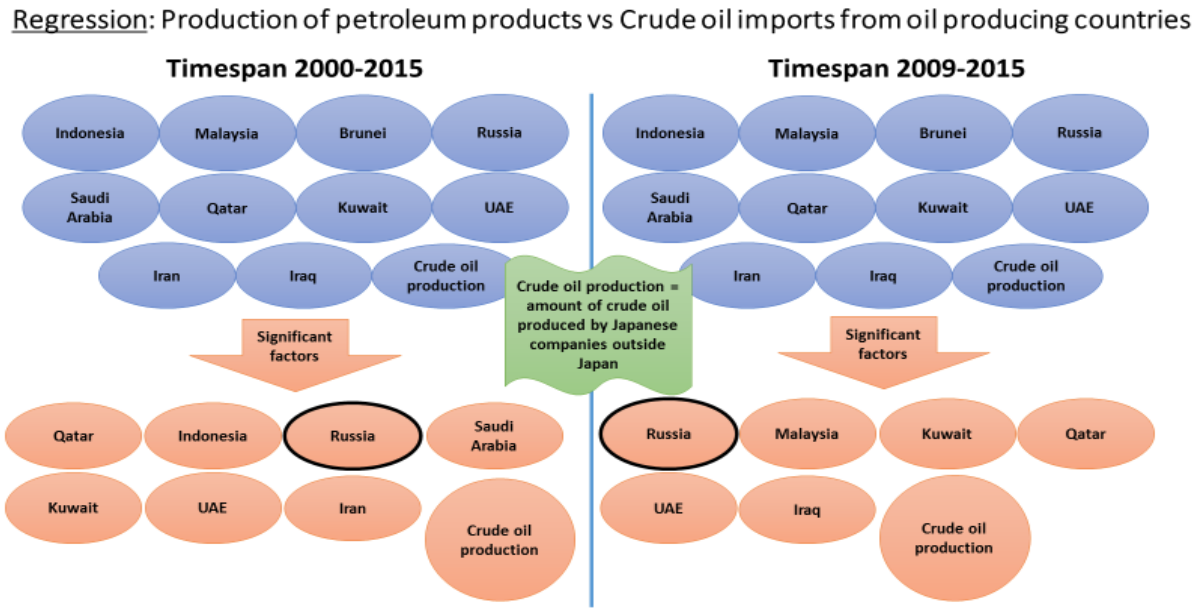
		Y2009_ProductionPetroleumProducts	Y2009_Malaysia	Y2009_Russia	Y2009_Kuwait	Y2009_Qatar	Y2009_UAE	Y2009_Iraq	Y2009_CrudeOilProduction
Pearson Correlation	Y2009_ProductionPetroleumProducts	1.000	-.138	.060	.460	.524	.156	.208	.687
	Y2009_Malaysia	-.138	1.000	-.090	.071	.159	.066	.108	-.054
	Y2009_Russia	.060	-.090	1.000	-.005	-.141	.089	-.016	-.418
	Y2009_Kuwait	.460	.071	-.005	1.000	.305	-.003	-.152	.305
	Y2009_Qatar	.524	.159	-.141	.305	1.000	.057	.173	.441
	Y2009_UAE	.156	.066	.089	-.003	.057	1.000	-.314	-.043
	Y2009_Iraq	.208	.108	-.016	-.152	.173	-.314	1.000	.243
	Y2009_CrudeOilProduction	.687	-.054	-.418	.305	.441	-.043	.243	1.000
Sig. (1-tailed)	Y2009_ProductionPetroleumProducts	.	.105	.293	.000	.000	.078	.029	.000
	Y2009_Malaysia	.105	.	.209	.261	.074	.274	.163	.312
	Y2009_Russia	.293	.209	.	.480	.100	.210	.442	.000
	Y2009_Kuwait	.000	.261	.480	.	.002	.489	.084	.002
	Y2009_Qatar	.000	.074	.100	.002	.	.302	.058	.000
	Y2009_UAE	.078	.274	.210	.489	.302	.	.002	.349
	Y2009_Iraq	.029	.163	.442	.084	.058	.002	.	.013
	Y2009_CrudeOilProduction	.000	.312	.000	.002	.000	.349	.013	.
N	Y2009_ProductionPetroleumProducts	84	84	84	84	84	84	84	84
	Y2009_Malaysia	84	84	84	84	84	84	84	84
	Y2009_Russia	84	84	84	84	84	84	84	84
	Y2009_Kuwait	84	84	84	84	84	84	84	84
	Y2009_Qatar	84	84	84	84	84	84	84	84
	Y2009_UAE	84	84	84	84	84	84	84	84
	Y2009_Iraq	84	84	84	84	84	84	84	84
	Y2009_CrudeOilProduction	84	84	84	84	84	84	84	84

Outcome (2009 -2015) continued

This time the model became even more significant **F value = 32.369.** The t-value of the "Crude oil production" has significantly risen, from **4.106 to 8.037.** Such a significant change after deleting **Y2009_SaudiArabia, Y2009_Iran, Y2009_Indonesia and Y2009_Brunei** can potentially imply that Japanese upstream companies have been systematically buying the extraction rights in some of these countries, consequently reducing the share of crude oil imports from these countries. As a result, the imports from these oil producing countries will no longer have the same effect on Japan's domestic production of petroleum products.

This time I decided to compute Pearson correlation coefficients and found out that there is some negative correlation between **Y2009_Russia** and **Y2009_Crude oil production** factors – there is no such correlation between **Crude oil production factor** and other factors representing imports from oil producing countries. **Even though I am in no position to make any assertive statements, my personal guess would be that this can potentially be explained by the fact that Japanese upstream and downstream companies chose not to invest into Russia's oil sector or purchase any exploration or extraction rights in Russia.** Completely opposite is the situation in the Middle East, since Japanese companies, where Japanese companies actively participate in the upstream projects. Positive correlations between the crude oil produced by Japanese oil companies and the amount of crude oil imports from the Persian Gulf countries support my hypothesis. **This is an important finding that will be used in the next part of my thesis**

Figure 18



Regression 4 (multiple regression; demand for petroleum products)

Having established how the imports from different oil producing countries influence Japan's export and production of petroleum products, it would now be logical to look at how the same factors affect Japan's demand for petroleum products. Due to the falling population and slow economic growth the demand for petroleum products has been gradually falling. Needless to say, that this trend has negative implications for the refining industry that started to shrink. Having this in mind, it would be interesting to see how the imports of crude oil from different oil producing countries have been affected by the falling demand.

Dependent variable: Demand for petroleum products in Japan ('000 kilolitres)
Independent variable: Crude oil imports from Brunei, Malaysia, Indonesia, Russia, Saudi Arabia, Kuwait, Qatar, UAE, Iran, Iraq ('000 kilolitres), Crude oil produced by Japanese companies ('000 kilolitres)

Timespan (2000 - 2015)

Full regression:

Table 32

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.869[a]	.755	.740	1343.558353

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Table 33

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1000771408	11	90979218.89	50.400	.000[b]
	Residual	324926828.7	180	1805149.048		
	Total	1325698237	191			

a. Dependent Variable: DemandPetroleumProductsTotal

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Table 34

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4165.613	1071.381		3.888	.000
	Brunei_imports	4.512	1.752	.119	2.576	.011
	Malaysia_imports	1.162	1.502	.031	.774	.440
	Indonesia_imports	3.471	.564	.286	6.160	.000
	Russia_imports	.665	.278	.134	2.393	.018
	Saudi Arabia	.271	.155	.078	1.748	.082
	Kuwait_imports	1.273	.297	.181	4.283	.000
	Qatar_imports	.029	.283	.004	.102	.919
	UAE_imports	.493	.174	.144	2.823	.005
	Iran_imports	1.124	.187	.382	6.004	.000
	Iraq_imports	-.229	.391	-.023	-.587	.558
	CrudeOilProduction	44.297	11.915	.205	3.718	.000

a. Dependent Variable: DemandPetroleumProductsTotal

Outcome 2000-2015:

Demand Petroleum Products Total = 4165.613 + 4.512 **Brunei_imports** + 1.162 Malaysia_imports + 3.471 **Indonesia_imports** + 0.665 **Russia_imports** + 0.271 SaudiArabia_imports + 1.273 **Kuwait_imports** - 0.029 Qatar_imports + 0.493 **UAE_imports** + 1.124 **Iran_imports** – 0.229 Iraq_imports + 44.297 **Crude oil production+ Ɛi**

The model itself is statistically significant, **F = 50.4**, and the adjusted R^2 value is also quite high, **74%.** Even though crude oil imports from Russia are statistically significant (t value = 2.49), the significance level is lower than that of **Indonesia_imports, Iran_imports** and **Kuwait_imports.** Japan's activity in the upstream sector also seems to be a significant factor in predicting country's domestic demand for petroleum products. Crude oil imports from neither **Saudi Arabia**, nor **Qatar** seem to play a significant role in predicting Japan's demand for petroleum products. Performing backward elimination and deleting insignificant variables does not drastically change the results. **Crude Oil Production factor** remains significant. Thus, even though imports of crude oil from different oil producing countries and demand for petroleum products are strongly related, the more Japanese companies get involved in the upstream activities (the level of crude oil self-sufficiency has significantly risen over the past years), the greater is the amount of crude oil that these companies deliver to domestic market to be consequently refined into petroleum products. **These petroleum products that have been produced from "Japanese oil" are more likely to be consumed domestically rather than exported abroad.**

Timespan (2009 - 2015)

Full regression:

Table 35

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.845[a]	.714	.670	981.509026

a. Predictors: (Constant), Y2009_CrudeOilProduction, Y2009_Indonesia, Y2009_UAE, Y2009_Brunei, Y2009_Kuwait, Y2009_Malaysia, Y2009_Russia, Y2009_Qatar, Y2009_Iraq, Y2009_Saudi Arabia, Y2009_Iran

Table 36

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	172958635.3	11	15723512.30	16.322	.000[b]
	Residual	69361917.71	72	963359.968		
	Total	242320553.0	83			

a. Dependent Variable: Y2009_DemandPetroleumProductsTotal

b. Predictors: (Constant), Y2009_CrudeOilProduction, Y2009_Indonesia, Y2009_UAE, Y2009_Brunei, Y2009_Kuwait, Y2009_Malaysia, Y2009_Russia, Y2009_Qatar, Y2009_Iraq, Y2009_Saudi Arabia, Y2009_Iran

Table 37

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2567.277	1436.647		1.787	.078
	Y2009_Brunei	.842	2.392	.025	.352	.726
	Y2009_Malaysia	-3.421	1.932	-.125	-1.771	.081
	Y2009_Indonesia	2.720	.787	.261	3.458	.001
	Y2009_Russia	1.369	.292	.357	4.693	.000
	Y2009_Saudi Arabia	.427	.248	.144	1.720	.090
	Y2009_Kuwait	.653	.390	.127	1.676	.098
	Y2009_Qatar	.146	.278	.040	.526	.601
	Y2009_UAE	.492	.274	.128	1.797	.077
	Y2009_Iran	-.144	.335	-.048	-.431	.668
	Y2009_Iraq	.381	.523	.056	.729	.469
	Y2009_CrudeOilProduction	89.392	16.780	.660	5.327	.000

a. Dependent Variable: Y2009_DemandPetroleumProductsTotal

Outcome (2009-2015)

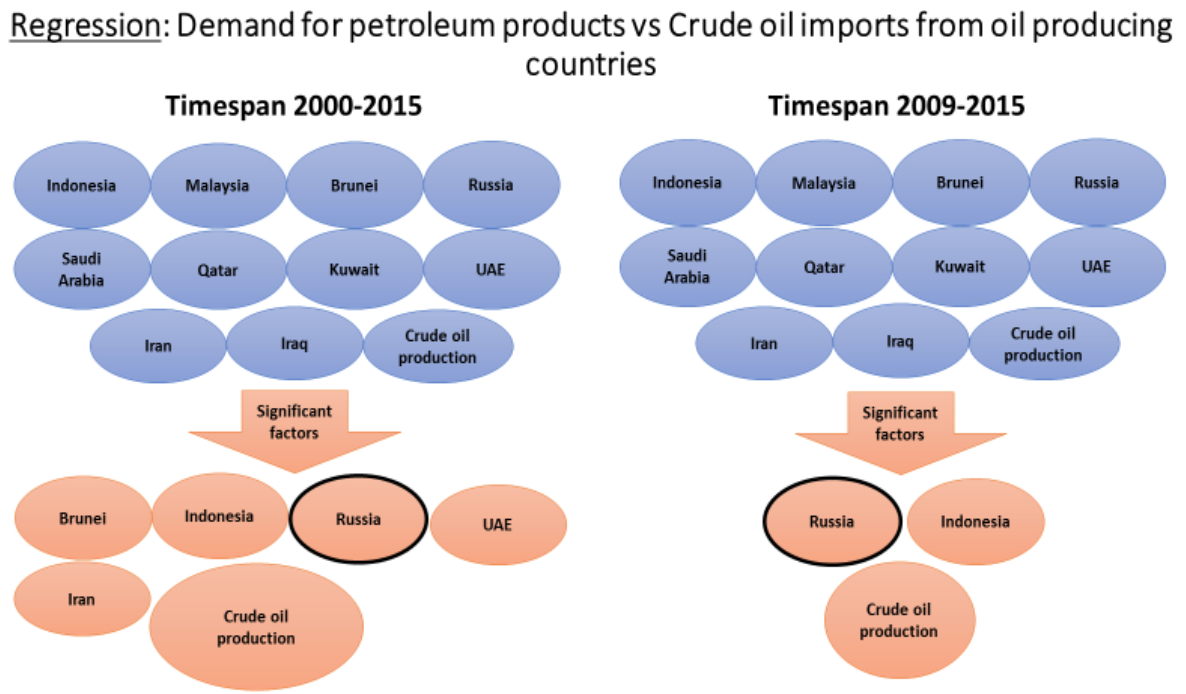
Y2009_Demand Petroleum Products Total = 2584.46 + 0.127 (Y2009_Brunei) – 2.88 (Y2009_Malaysia) + 2.66 (**Y2009_Indonesia)** + 1.396 **(Y2009_Russia)** + 0.476 (Y2009_SaudiArabia) + 0.866 (Y2009_Kuwait) + 0.065 (Y2009_Qatar) + 0.431 (Y2009_UAE) – 0.096 (Y2009_Iran) + 0.43 (Y2009_Iraq) + 85.51 (**Y2009_Crude oil production)**

The model is statistically significant, F-value = 16.32 R^2 = 0.67 is also very high implying that 67% of the variance in the dependent variable can be explained by our set of independent variables.

There are two important points in this regression that require specific attention. Compared with other independent variables responsible for crude oil imports, **Y2009_Russia** has suddenly become the most statistically significant one, **t-value = 4.69.** In other words, in recent years' crude oil imports from Russia have become a significant predictor of the demand for crude oil products in Japan i.e. the importance of

Russia's crude oil in the Japanese market has substantially risen. Another important finding is that significance of the **Y2009_Crude oil production** variable has risen as well as its coefficient. In other words, in recent years the **Y2009_Crude oil production** and **Y2009_Russia** have become more statistically significant compared to other variables (many of which have experienced serious decreases in t-values) implying that their role in responding to Japan's domestic demand for gasoline, naphtha etc. has risen. **Thus, at this point, I can conclude that the role of Russia's imports has risen over the recent years, not only in relation to the export and production of petroleum products, but also in relation to the demand for petroleum products. This is a significant finding, especially since Russia's share in Japan's crude oil imports is quite small, compared to other countries many of which have no significant relations to either exports, production or demand of petroleum products.**

Figure 19



Regression 5 (multiple regression; end stock of petroleum products)

The point of conducting this regression is to establish if imports of crude oil from different countries as well as the crude oil produced by Japanese companies abroad can be used as significant predictors for the level of end stock of petroleum products. My prediction is the further away the country-importers are from Japan the bigger is the end stock of petroleum products. Thus, being put in a position when they must buy large amounts of crude oil in advance, Japanese companies will end up buying excessive amount of crude oil to be processed inside Japan resulting in substantial amounts of end stock.

Dependent variable: End stock of petroleum products in Japan ('000 kilolitres)
Independent variable: Crude oil imports from Brunei, Malaysia, Indonesia, Russia, Saudi Arabia, Kuwait, Qatar, UAE, Iran, Iraq (000, kilolitres), Crude oil produced by Japan, Demand Petroleum Products, Production Petroleum Products ('000 kilolitres)

Timespan (2000 - 2015)

Full regression:

Table 38

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.603[a]	.363	.324	1164.927524

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Table 39

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	139380428.1	11	12670948.01	9.337	.000[b]
	Residual	244270104.5	180	1357056.136		
	Total	383650532.7	191			

a. Dependent Variable: EndStockPetroleumProducts

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

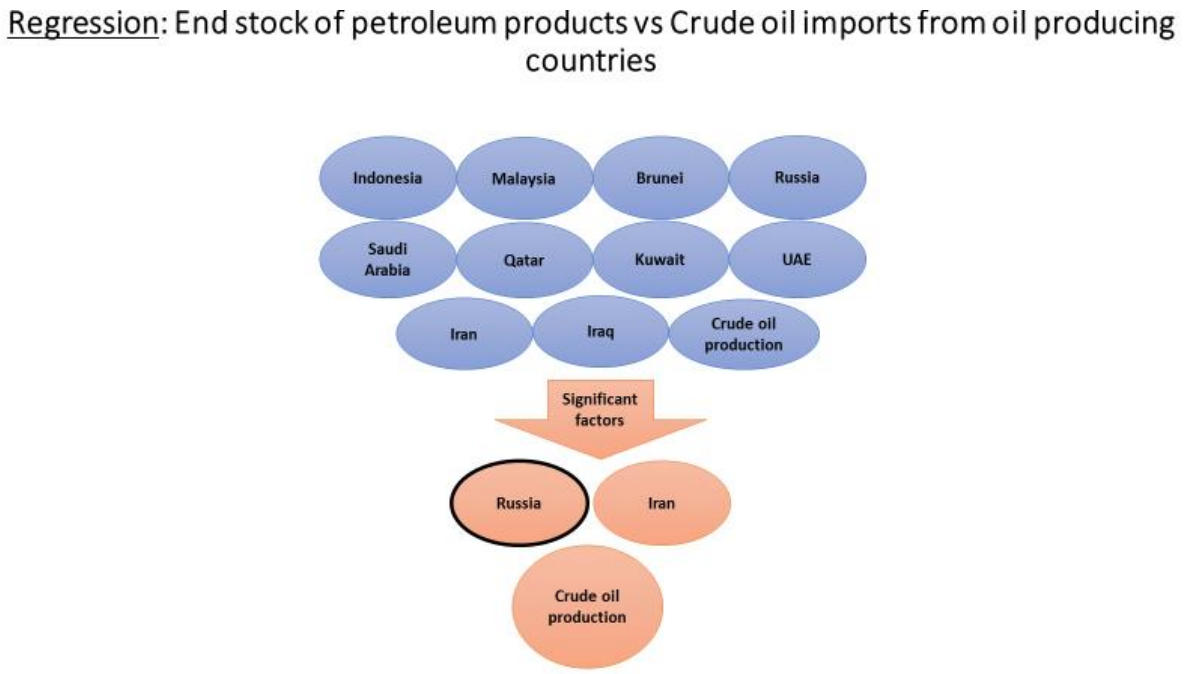
Table 40

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12267.493	928.937		13.206	.000
	Brunei_imports	.860	1.519	.042	.566	.572
	Malaysia_imports	-.420	1.302	-.021	-.323	.747
	Indonesia_imports	-.304	.489	-.047	-.622	.535
	Russia_imports	-1.081	.241	-.405	-4.483	.000
	Saudi Arabia	-.049	.134	-.026	-.362	.718
	Kuwait_imports	.306	.258	.081	1.186	.237
	Qatar_imports	.145	.245	.040	.591	.555
	UAE_imports	.164	.151	.089	1.086	.279
	Iran_imports	.330	.162	.209	2.032	.044
	Iraq_imports	.208	.339	.039	.613	.541
	CrudeOilProduction	-18.257	10.331	-.157	-1.767	.079

a. Dependent Variable: EndStockPetroleumProducts

Figure 20



Outcome (2000-2015)

End Stock Petroleum Products Total = 12265.7 + 0.86 Brunei_imports – 0.42 Malaysia_imports – 0.304 Indonesia_imports - 1.081 **Russia_imports** - 0.049 SaudiArabia_imports + 0.306 Kuwait_imports + 0.145 Qatar_imports + 0.164 UAE_imports - 0.32 **Iran_imports** + 0.208 Iraq_imports – 18.257 Crude oil production

+ Ɛi

The regression model is significant, **F-value = 9.337.** The coefficient of determination (R^2) is only 32.4%

implying that there must be other variables except crude oil imports from different countries that can be helpful in predicting the amount of end stock of petroleum products.

It seems that only **Russia_imports** and to a smaller extent **Iran_imports** have any significant effect on the amount of end stock of petroleum products at 5% significance level. **Crude oil production** independent is only significant at 10% significance level. Out of the two significant variables (at 5%), it is only **Russia_imports** that negatively effects the amount of stock of petroleum products: for every kilolitre of crude oil imported from Russia, Japanese companies **stock 1.08 less kilolitres** of petroleum products. In other words, it seems that less storage space for end stock petroleum products when Japanese companies import crude oil from Russia rather than other countries. This might suggest that **the bigger the volume of crude oil Japanese companies import from Russia the less are the storage/inventory costs for the refined products.**

However, since R^2 is low there is a high chance of omitted variable bias being present in the model. To see whether these findings hold, I will add two more variables and conduct another regression test to see whether **Crude oil production** variable remains significant or not. The new variables are **Production of petroleum products** and **Demand for petroleum products.** I included these variables on purpose since it is obvious that they are strongly related to the **End Stock Petroleum Products**. In other words, these two variables will be playing the role of **control variables**. Before including the control variables in the regression, I will conduct backward elimination in order to get rid of insignificant predictors.

Here are the results:

Table 41

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.650[a]	.423	.411	1088.046561

a. Predictors: (Constant), DemandPetroleumProductsTotal, Russia_imports, Iran_imports, ProductionPetroleumProductsTotal

Table 42

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	162271457.9	4	40567864.49	34.268	.000[b]
	Residual	221379074.7	187	1183845.319		
	Total	383650532.7	191			

a. Dependent Variable: EndStockPetroleumProducts

b. Predictors: (Constant), DemandPetroleumProductsTotal, Russia_imports, Iran_imports, ProductionPetroleumProductsTotal

Table 43

Coefficients[a]

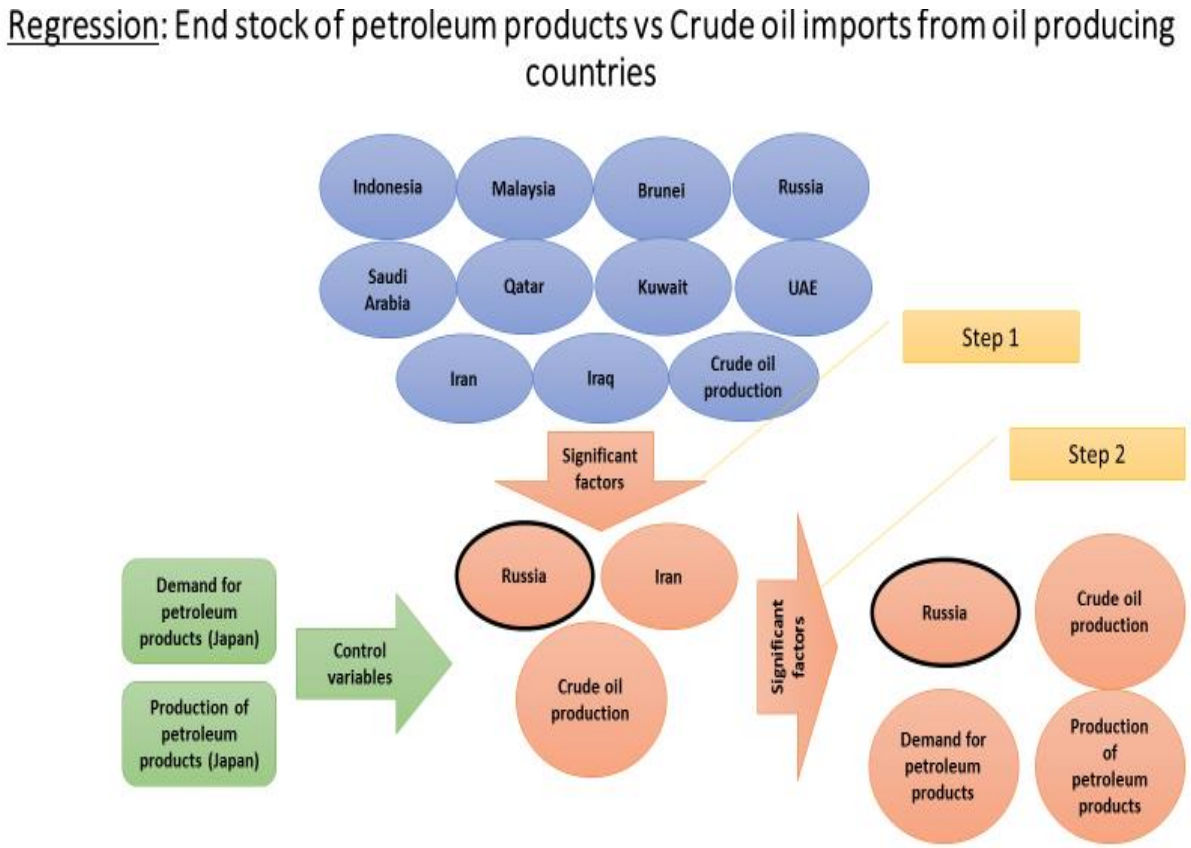
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9738.939	948.892		10.263	.000
	Russia_imports	-1.265	.204	-.474	-6.213	.000
	Iran_imports	.121	.160	.077	.757	.450
	ProductionPetroleumProductsTotal	.549	.107	.747	5.114	.000
	DemandPetroleumProductsTotal	-.362	.074	-.672	-4.878	.000

a. Dependent Variable: EndStockPetroleumProducts

Outcome (2000-2015) continued

Both **R^2** value and **F-value** turn out much higher compared to the previous model, therefore the new model is more statistically significant. The controlled variables slightly change the situation and **Iran_imports factor** is no longer a significant. **Crude oil production and Russia_imports variables** keep their significance.

Figure 21



Timespan (2009 - 2015)

This time the two control variables (**Production of petroleum products** and **Demand for petroleum products**) will be included in the regression equation from the beginning.

Full Regression:

Table 44

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.687[a]	.472	.374	703.536688

a. Predictors: (Constant), Y2009_DemandPetroleumProductsTotal, Y2009_Malaysia, Y2009_Russia, Y2009_Iraq, Y2009_UAE, Y2009_Brunei, Y2009_Qatar, Y2009_Indonesia, Y2009_Kuwait, Y2009_Saudi Arabia, Y2009_Iran, Y2009_CrudeOilProduction, Y2009_ProductionPetroleumProductsTotal

Table 45

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30997228.50	13	2384402.193	4.817	.000[b]
	Residual	34647470.95	70	494963.871		
	Total	65644699.45	83			

a. Dependent Variable: Y2009_EndStockPetroleumProducts

b. Predictors: (Constant), Y2009_DemandPetroleumProductsTotal, Y2009_Malaysia, Y2009_Russia, Y2009_Iraq, Y2009_UAE, Y2009_Brunei, Y2009_Qatar, Y2009_Indonesia, Y2009_Kuwait, Y2009_Saudi Arabia, Y2009_Iran, Y2009_CrudeOilProduction, Y2009_ProductionPetroleumProductsTotal

Table 46

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10706.611	1206.652		8.873	.000
	Y2009_Brunei	-.874	1.728	-.051	-.506	.614
	Y2009_Malaysia	1.813	1.459	.127	1.243	.218
	Y2009_Indonesia	-.244	.613	-.045	-.398	.692
	Y2009_Russia	-1.269	.243	-.636	-5.230	.000
	Y2009_Saudi Arabia	.051	.183	.033	.278	.782
	Y2009_Kuwait	-.084	.299	-.031	-.281	.779
	Y2009_Qatar	-.271	.212	-.142	-1.279	.205
	Y2009_UAE	-.404	.204	-.202	-1.977	.052
	Y2009_Iran	.233	.247	.150	.940	.350
	Y2009_Iraq	.689	.391	.196	1.764	.082
	Y2009_CrudeOilProduction	-34.515	14.287	-.489	-2.416	.018
	Y2009_ProductionPetroleumProductsTotal	.497	.156	.758	3.193	.002
	Y2009_DemandPetroleumProductsTotal	-.153	.111	-.293	-1.380	.172

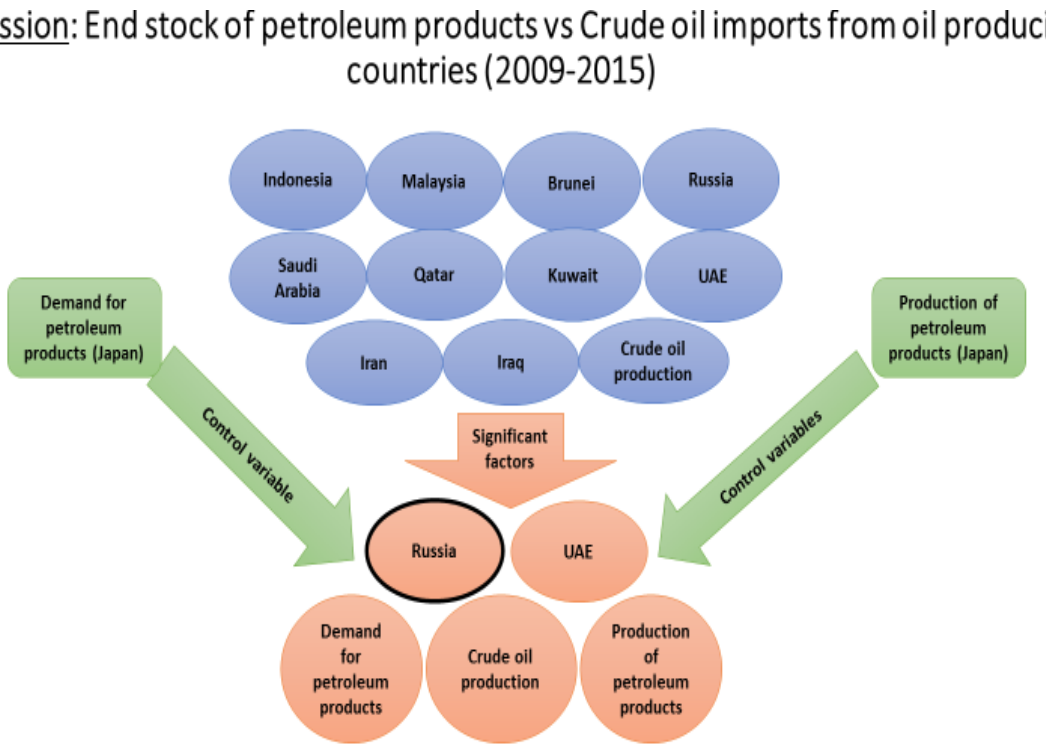
a. Dependent Variable: Y2009_EndStockPetroleumProducts

Outcome (2009 -2015)

Y2009_End Stock Petroleum Products Total = 10706.61 - 0.874 (Y2009_Brunei) – 1.813 (Y2009_Malaysia) – 0.244 (Y2009_Indonesia) - 1.269 **(Y2009_Russia_imports)** - 0.051 (Y2009_SaudiArabia) - 0.084 (Y2009_Kuwait) – 0.271 (Y2009_Qatar) – 0.404 (**Y2009_UAE)** + 0.233 (Y2009_Iran) + 0.689 (Y2009_Iraq) – 34.515 (**Y2009_Crude oil production)** + 0.497 (**Y2009_Production Petroleum Products Total)** – 0.153 (Y2009_Demand Petroleum Products Total) **+ ε_i**

The regression model is significant, F-value = 4.817. The R^2 value 37.4%. This time however the significance of **Russia_imports** independent variable is much higher than in the previous regression. In fact, the statistical significance of imports of crude oil from Russia outplays the significance (t-value) of Production of petroleum products (5.2 > 3.2). In the last 6 years as the volume of crude oil imports from Russia has increased the effect that the Russia_imports variable has on the **End Stock Petroleum Products Total** variable has increased. It is startling however that crude oil imports from no other country seem to have any effect whatsoever on the dependent variable. Russia's geographical closeness to Japan implies that the crude oil shipments take place at a much faster rate and the size of these shipments can be easily adjusted to minimize the inventory cost. Furthermore, there are no restrictions on reselling the crude oil to other players in the market, whilst the import contracts signed in the Middle East forbid the buyer to resell the crude oil. Therefore, one can conclude that increasing crude oil imports from Russia might potentially reduce the number of inventory shortages or excesses. For example, in a certain month if Company A that has bought more crude oil that it can physically absorb, then it can always sell to company B, that experiences shortages in crude oil for this particular month. The free flow of crude oil between different players within (or outside) Japanese market will contribute to a more effective use of resources and potentially reduce the amount of unrefined crude oil and consequently unused petroleum products in the market per year. **Thus, the end stock of petroleum products would go down.**

Figure 22



Russia_Import variable shows that over the recent years a stationary relationship has developed between imports of crude oil from Russia and the end stock of petroleum products in Japan. Obviously, there are other factors that can influence the final stock of petroleum products such as operation rate of refining factories, the availability of transportation ships, the timing of contracts etc. All this can be checked in the future researches.

Outcome of Regressions 1,2,3,4,5

So far having conducted numerous regression analysis I managed to verify few very important relationships and points:

- Compared to other oil producing countries that export crude oil to Japan, Russia seems to be the most significant predictor of Japan's export of petroleum products. The significance of Russia's imports has particularly grown strong over the recent 6 years as the country began to increase the volume of crude oil exports into the Japanese market.
- In a longer timespan the volume of crude oil imports from Russia is not the only variable that can be used to define the volume of production of petroleum products in Japan. However, looking at the recent 6 years the **Russia_imports** becomes the most significant independent variable that can be used to predict the level of production. The situation is very similar for the demand of petroleum products. This is not to say that demand or production of petroleum products is an outcome of imports from Russia or other oil producing countries; on the contrary: the crude oil imports from different oil producing countries is the outcome of the demand for petroleum products in Japan. However, the imports from these countries can be used to accurately predict the level of demand or the level of production of the petroleum products. The fact that crude oil imports from Russia, making up only 8.4% of Japan's crude oil imports can be used as a significant predictor for the two dependent variables, whilst other oil producing countries (whose share is much bigger) cannot show any significant relationship especially in the recent years, is an important observation.
- For the end stock of petroleum products Russia seems to be the only oil producing country whose exports of crude oil to Japan can be used as a significant predictor. **The relationship is the negative one, i.e. the higher the crude oil imports from Russia, the smaller is the end stock (unused fuel) of petroleum products.**

Even though all these tests are relevant to my research that tries to analyse the importance and the benefits of importing crude oil from Russia, rather than from other oil producing countries, the original aim of conducting regression analysis is to show that crude oil imports from Russia are a significant predictor of Japan's exports of petroleum products. Even though I have established Russia's relative significance compared to other countries, the variance of the dependent variable was far from being explained by the variance of independent variables. Therefore, my next and last regression would be devoted to establishing what kind of factors can be used to predict Japan's export of petroleum products and check whether Russia is included in these variables.

Regression 6 (multiple regression; export of petroleum products)

This time I will conduct a regression analysis, where I will try to establish what are significant factors that can be used to predict the amount of exports of petroleum products from Japan to other countries. There is a chance that the significance of imports from Russia can disappear at some point since, it is not a major factor. This time I will be using two timespans 2000-2015 and 2009-2015 and for each time span I expect that different factors to be significant predictors for each timespan. I will automatically include the country variables that turned out to be significant predictors in the previous regressions and ignore the insignificant country independent variables. I will first look at the longer timespan 2000-2015 and then switch to the more recent timespan to understand if there have been any changes over the last years.

Since the main destinations of Japan's export of petroleum products are Australia and Singapore, I will use Nikkei Currency index for the Australian dollar and Singaporean dollar as independent variables considering the effect of currency fluctuations on the amount of exports into certain countries. I will also use the exchange rate between Japan and Singapore as one of the predictors, since it should influence the exports of petroleum products. Furthermore, I will use the lending rates of Japanese banks domestically, having in mind that the oil business in Japan (as in the rest of the world) heavily depends on loan financing i.e. the more favourable is the rate the greater is the amount of petroleum products a Japanese oil company can produce and export. Even though it is obvious that **Domestic Demand for Petroleum Products**, **Production of Petroleum Products** and **Coal Imports** will be significant factors in explaining the **Exports of Petroleum Products**, I will use these three factors as control variables ensuring that there is no **omitted variable bias** and to prove that even when these variables are present the **Russia_imports** factor remains significant

This time I will check the regression for stationarity, multicollinearity and heteroscedasticity. Furthermore, I will also use dummy variables (Putin dummy and Lehman dummy) and interaction variables to have a better understanding of the state of affairs

Dependent variable: Japan's exports of petroleum products ('000 kilolitres)
Independent variable: Crude oil imports from Russia, Indonesia, Brunei, Qatar (000, kilolitres) Crude oil produced by Japan, Demand for Petroleum Products, Production of Petroleum Products ('000 kilolitres), Coal Imports (tons), Nikkei Currency Index Singapore Dollar (pts), Nikkei Currency Index Australia dollar (pts), Borrowing rate domestic banks (%)

Timespan (2000 - 2015)

Full regression:

Table 47

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890[a]	.793	.781	309.187217

a. Predictors: (Constant), BorrowingRates, Qatar_imports, Brunei_imports, CoalImports, Indonesia_imports, DemandPetroleumProductsTotal, AUD_NikkeiCurrencyIndex, Russia_imports, SGD_NikkeiCurrencyIndex, ProductionPetroleumProductsTotal

Table 48

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66187187.19	10	6618718.719	69.236	.000[b]
	Residual	17303009.11	181	95596.735		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), BorrowingRates, Qatar_imports, Brunei_imports, CoalImports, Indonesia_imports, DemandPetroleumProductsTotal, AUD_NikkeiCurrencyIndex, Russia_imports, SGD_NikkeiCurrencyIndex, ProductionPetroleumProductsTotal

Table 49

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4809.498	1068.767		-4.500	.000
	Brunei_imports	-.799	.404	-.084	-1.977	.050
	Indonesia_imports	-.551	.139	-.181	-3.959	.000
	Russia_imports	.272	.085	.218	3.183	.002
	Qatar_imports	.003	.069	.002	.044	.965
	SGD_NikkeiCurrencyIndex	32.140	6.964	.439	4.615	.000
	AUD_NikkeiCurrencyIndex	8.512	2.604	.165	3.269	.001
	CoalImports	.055	.019	.135	2.948	.004
	ProductionPetroleumProductsTotal	.289	.037	.842	7.884	.000
	DemandPetroleumProductsTotal	-.245	.025	-.977	-9.845	.000
	BorrowingRates	951.487	199.738	.389	4.764	.000

a. Dependent Variable: ExportPetroleumProductsTotal

Table 50

Correlations

		ExportPetroleumProductsTotal	Brunei_imports	Indonesia_imports	Russia_imports	Qatar_imports	SGD_NikkeiCurrencyIndex	AUD_NikkeiCurrencyIndex	CoalImports	ProductionPetroleumProductsTotal	DemandPetroleumProductsTotal	BorrowingRates
Pearson Correlation	ExportPetroleumProductsTotal	1.000	-.516	-.562	.638	.017	.618	.556	.538	-.452	-.650	-.469
	Brunei_imports	-.516	1.000	.423	-.424	.152	-.503	-.344	-.291	.485	.542	.450
	Indonesia_imports	-.562	.423	1.000	-.463	.173	-.424	-.430	-.354	.484	.555	.500
	Russia_imports	.638	-.424	-.463	1.000	-.137	.842	.593	.505	-.515	-.512	-.776
	Qatar_imports	.017	.152	.173	-.137	1.000	-.205	.000	.102	.424	.305	.276
	SGD_NikkeiCurrencyIndex	.618	-.503	-.424	.842	-.205	1.000	.634	.429	-.696	-.653	-.870
	AUD_NikkeiCurrencyIndex	.556	-.344	-.430	.593	.000	.634	1.000	.528	-.507	-.496	-.651
	CoalImports	.538	-.291	-.354	.505	.102	.429	.528	1.000	-.174	-.267	-.479
	ProductionPetroleumProductsTotal	-.452	.485	.484	-.515	.424	-.696	-.507	-.174	1.000	.913	.648
	DemandPetroleumProductsTotal	-.650	.542	.555	-.512	.305	-.653	-.496	-.267	.913	1.000	.565
	BorrowingRates	-.469	.450	.500	-.776	.276	-.870	-.651	-.479	.648	.565	1.000
Sig. (1-tailed)	ExportPetroleumProductsTotal	.	.000	.000	.000	.408	.000	.000	.000	.000	.000	.000
	Brunei_imports	.000	.	.000	.000	.018	.000	.000	.000	.000	.000	.000
	Indonesia_imports	.000	.000	.	.000	.008	.000	.000	.000	.000	.000	.000
	Russia_imports	.000	.000	.000	.	.029	.000	.000	.000	.000	.000	.000
	Qatar_imports	.408	.018	.008	.029	.	.002	.497	.081	.000	.000	.000
	SGD_NikkeiCurrencyIndex	.000	.000	.000	.000	.002	.	.000	.000	.000	.000	.000
	AUD_NikkeiCurrencyIndex	.000	.000	.000	.000	.497	.000	.	.000	.000	.000	.000
	CoalImports	.000	.000	.000	.000	.081	.000	.000	.	.008	.000	.000
	ProductionPetroleumProductsTotal	.000	.000	.000	.000	.000	.000	.000	.008	.	.000	.000
	DemandPetroleumProductsTotal	.000	.000	.000	.000	.000	.000	.000	.000	.000	.	.000
	BorrowingRates	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.
N	ExportPetroleumProductsTotal	192	192	192	192	192	192	192	192	192	192	192
	Brunei_imports	192	192	192	192	192	192	192	192	192	192	192
	Indonesia_imports	192	192	192	192	192	192	192	192	192	192	192
	Russia_imports	192	192	192	192	192	192	192	192	192	192	192
	Qatar_imports	192	192	192	192	192	192	192	192	192	192	192
	SGD_NikkeiCurrencyIndex	192	192	192	192	192	192	192	192	192	192	192
	AUD_NikkeiCurrencyIndex	192	192	192	192	192	192	192	192	192	192	192
	CoalImports	192	192	192	192	192	192	192	192	192	192	192
	ProductionPetroleumProductsTotal	192	192	192	192	192	192	192	192	192	192	192
	DemandPetroleumProductsTotal	192	192	192	192	192	192	192	192	192	192	192
	BorrowingRates	192	192	192	192	192	192	192	192	192	192	192

Conclusion 2000-2015

The model is significant, **F = 69.236**, and the coefficient of determination, **R^2 = 78.1%**, is also very high. The model seems to very persuasive. Nevertheless, some of the variables are insignificant so I will use backward elimination to clean the model a little bit. The **Russia_imports** variable is significant, t-**value = 3.183**. However as one would expect there are more significant variables in the regression equation. There is a high correlation between **Russia_imports** and **Nikkei Currency Index Singapore Dollar factors** (Pearson correlation = 0.842)

Backward elimination:

Table 51

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890[a]	.793	.783	308.338301

a. Predictors: (Constant), BorrowingRates, Brunei_imports, CoalImports, Indonesia_imports, DemandPetroleumProductsTotal, AUD_NikkeiCurrencyIndex, Russia_imports, SGD_NikkeiCurrencyIndex, ProductionPetroleumProductsTotal

Table 52

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66186999.88	9	7354111.097	77.353	.000[b]
	Residual	17303196.42	182	95072.508		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), BorrowingRates, Brunei_imports, CoalImports, Indonesia_imports, DemandPetroleumProductsTotal, AUD_NikkeiCurrencyIndex, Russia_imports, SGD_NikkeiCurrencyIndex, ProductionPetroleumProductsTotal

Table 53

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4820.405	1037.119		-4.648	.000
	Brunei_imports	-.799	.403	-.084	-1.982	.049
	Indonesia_imports	-.550	.139	-.181	-3.970	.000
	Russia_imports	.271	.085	.218	3.192	.002
	SGD_NikkeiCurrencyIndex	32.183	6.875	.440	4.681	.000
	AUD_NikkeiCurrencyIndex	8.540	2.517	.166	3.392	.001
	CoalImports	.056	.019	.135	2.968	.003
	ProductionPetroleumProductsTotal	.289	.035	.843	8.330	.000
	DemandPetroleumProductsTotal	-.245	.025	-.978	-9.968	.000
	BorrowingRates	953.189	195.464	.389	4.877	.000

a. Dependent Variable: ExportPetroleumProductsTotal

The Russia_imports variable remains significant. However, the F-value is suspiciously high (101), which makes me want to check this model for autocorrelations. Also since the Pearson correlation between demand and production of petroleum products is very high 0.919, I will delete the former variable from the regression equation.

I will now check is there is any multicollinearity in the regression model

Table 54

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4820.405	1037.119		-4.648	.000		
	Brunei_imports	-.799	.403	-.084	-1.982	.049	.640	1.563
	Indonesia_imports	-.550	.139	-.181	-3.970	.000	.549	1.823
	Russia_imports	.271	.085	.218	3.192	.002	.245	4.088
	SGD_NikkeiCurrencyIndex	32.183	6.875	.440	4.681	.000	.129	7.754
	AUD_NikkeiCurrencyIndex	8.540	2.517	.166	3.392	.001	.478	2.094
	CoalImports	.056	.019	.135	2.968	.003	.552	1.812
	ProductionPetroleumProductsTotal	.289	.035	.843	8.330	.000	.111	9.000
	DemandPetroleumProductsTotal	-.245	.025	-.978	-9.968	.000	.118	8.453
	BorrowingRates	953.189	195.464	.389	4.877	.000	.179	5.597

a. Dependent Variable: ExportPetroleumProductsTotal

Even though there are no factors that has VIF higher than 10, the fact that few independent variables have VIF values above 3 shows that we do have multicollinearity issues. To solve this problem, let us try different combinations of factors and see which one gives out the most optimal result. In the end, I ended up with the following regression:

Table 55

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.631	.621	407.065005

a. Predictors: (Constant), DemandPetroleumProductsTotal, CoalImports, Brunei_imports, Indonesia_imports, Russia_imports

b. Dependent Variable: ExportPetroleumProductsTotal

Table 56

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52669639.45	5	10533927.89	63.572	.000[b]
	Residual	30820556.84	186	165701.919		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), DemandPetroleumProductsTotal, CoalImports, Brunei_imports, Indonesia_imports, Russia_imports

Table 57

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2083.842	396.631		5.254	.000		
	Brunei_imports	-1.029	.523	-.108	-1.965	.051	.661	1.513
	Indonesia_imports	-.415	.172	-.136	-2.412	.017	.622	1.608
	Russia_imports	.290	.074	.233	3.945	.000	.569	1.757
	CoalImports	.104	.022	.252	4.805	.000	.719	1.391
	DemandPetroleumProductsTotal	-.083	.015	-.330	-5.403	.000	.533	1.876

a. Dependent Variable: ExportPetroleumProductsTotal

This time neither of the VIF values exceeds the threshold 3 (even 2) implying that there is no multicollinearity. The coefficient of determination is **62.1%** and the **F-value** is **63.572.** After trying different combinations of independent variables, this one seems to be the best out of all of them. In this combination, **Russia_imports factor** seems to be one of the most significant ones.

I will now check if the equation is heteroscedastic

Figure 23

Breusch-Pagan test:								
LM (observed value)	**10.850**							
LM (critical value)	**11.070**							
DF	**5**							
p-value (two-tailed)	**0.054**							
α	**0.05**							
Test interpretation:								
H0: Residuals are homoscedastic								
Ha: Residuals are heteroscedastic								
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.								
The risk to reject the null hypothesis H0 while it is true is 5.44%.								

Figure 24

White 検定:								
LM (observed value)	**21.834**							
LM (critical value)	**31.410**							
DF	**20**							
p-value (two-tailed)	**0.350**							
α	**0.05**							
Test interpretation:								
H0: Residuals are homoscedastic								
Ha: Residuals are heteroscedastic								
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.								
The risk to reject the null hypothesis H0 while it is true is 34.96%.								

Thus, I can conclude from the two tests on heteroscedasticity that our model is homoscedastic.

I will now check if the regression is spurious

Instead of conducting a unit root test, I will add **year dummy variables** (from 2000-2015) to the regression model and see whether there exist serious changes in the significance levels of variables

Table 58

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.904[a]	.817	.796	298.712523

a. Predictors: (Constant), b2015, b2014, b2013, b2012, b2011, b2010, b2009, b2008, b2007, b2006, b2005, b2004, b2003, b2002, Brunei_imports, b2000, CoalImports, DemandPetroleumProductsTotal, Indonesia_imports, Russia_imports

Table 59

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	68232007.96	20	3411600.398	38.234	.000[b]
	Residual	15258188.34	171	89229.172		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), b2015, b2014, b2013, b2012, b2011, b2010, b2009, b2008, b2007, b2006, b2005, b2004, b2003, b2002, Brunei_imports, b2000, CoalImports, DemandPetroleumProductsTotal, Indonesia_imports, Russia_imports

Table 60

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1549.083	357.909		4.328	.000
	Brunei_imports	-.010	.416	-.001	-.025	.980
	Indonesia_imports	.025	.172	.008	.146	.884
	Russia_imports	.366	.094	.294	3.888	.000
	CoalImports	.086	.020	.209	4.323	.000
	DemandPetroleumProductsTotal	-.073	.013	-.291	-5.675	.000
	b2000	131.965	125.962	.048	1.048	.296
	b2002	-104.982	123.818	-.039	-.848	.398
	b2003	-241.374	125.037	-.089	-1.930	.055
	b2004	-125.598	132.637	-.046	-.947	.345
	b2005	284.402	138.135	.104	2.059	.041
	b2006	316.929	138.002	.116	2.297	.023
	b2007	526.177	149.912	.193	3.510	.001
	b2008	984.962	150.872	.362	6.528	.000
	b2009	814.659	167.343	.299	4.868	.000
	b2010	446.578	177.275	.164	2.519	.013
	b2011	382.520	157.293	.140	2.432	.016
	b2012	59.641	159.605	.022	.374	.709
	b2013	153.275	186.865	.056	.820	.413
	b2014	75.864	201.694	.028	.376	.707
	b2015	294.824	212.733	.108	1.386	.168

a. Dependent Variable: ExportPetroleumProductsTotal

The model has kept its significance, **F-value = 38.234.** Some of the year dummy variables turned out to be statistically significant (2005-2011), implying that we are dealing with a spurious regression. And yet linear relationship between **Russia_imports/ Coal Imports/ Demand for petroleum products** variables and **Export of Petroleum Products** has been kept (t-values have not even significantly decreased) suggesting that there is no spurious correlation between these factors. Nevertheless **Indonesia_imports** and **Brunei_imports** variables have become insignificant, so there was spurious relationship between Japan's export of petroleum products and imports from these oil producing countries. Since relationship between **Russia_imports** and Japan's exports of petroleum products variables interests me the most, I will continue conducting my analysis without worrying about the unit root test.

Finally, I will add two dummy variables and observe the results:

- Lehman dummy (1 = Lehman shock, 0 = no Lehman shock)
- Putin dummy (1 = Putin president, 0 = Putin not president)

Here are the results

Table 61

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871[a]	.759	.750	330.584217

a. Predictors: (Constant), LehmanShockDummy, Russia_imports, PutinDummy, Brunei_imports, Indonesia_imports, CoalImports, DemandPetroleumProductsTotal

Table 62

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63381586.16	7	9054512.308	82.852	.000[b]
	Residual	20108610.14	184	109285.925		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), LehmanShockDummy, Russia_imports, PutinDummy, Brunei_imports, Indonesia_imports, CoalImports, DemandPetroleumProductsTotal

Table 63

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2987.515	368.256		8.113	.000
	Brunei_imports	-.586	.428	-.061	-1.370	.172
	Indonesia_imports	-.393	.143	-.129	-2.745	.007
	Russia_imports	.357	.061	.287	5.899	.000
	CoalImports	.080	.019	.193	4.171	.000
	DemandPetroleumProductsTotal	-.072	.013	-.287	-5.758	.000
	PutinDummy	-290.441	58.959	-.196	-4.926	.000
	LehmanShockDummy	-667.077	90.876	-.287	-7.341	.000

a. Dependent Variable: ExportPetroleumProductsTotal

It seems that both dummy variables are statistically significant. The adjusted **R^2 value** has risen **by 13%** to **75%** and the t-values of every independent variable have also undergone changes, implying that connection exists between the original independent variables and the new dummy variables. The model itself has become more statistically significant, **F-value = 82.852**. To test if the connection exists, I will compute interaction variables and include them in the regression. The computation of interaction variable will be divided into 2 phases: first, I will compute 5 standardized variables **(Russia_imports, Coal imports, Brunei_imports, Indonesia_imports, Demand for Petroleum Products)** then I will multiply the standardized variables by the 2 dummy variables.

10 new interaction variables: Lehman_Russia, Lehman_Brunei, Lehman_Indonesia, Lehman_Coal, Lehman_Demand, Putin_Russia, Putin_Indonesia, Putin_Brunei, Putin_Demand, Putin_Coal

Table 64

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871[a]	.759	.750	330.584217
2	.875[b]	.765	.742	335.947391

a. Predictors: (Constant), LehmanShockDummy, Russia_imports, PutinDummy, Brunei_imports, Indonesia_imports, CoalImports, DemandPetroleumProductsTotal

b. Predictors: (Constant), LehmanShockDummy, Russia_imports, PutinDummy, Brunei_imports, Indonesia_imports, CoalImports, DemandPetroleumProductsTotal, Putin_Coal, Putin_Indonesia, Putin_Brunei, Putin_Demand, Putin_Russia, Lehman_Coal, Lehman_Brunei, Lehman_Indonesia, Lehman_Russia, Lehman_Demand

Table 65

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63381586.16	7	9054512.308	82.852	.000[b]
	Residual	20108610.14	184	109285.925		
	Total	83490196.30	191			
2	Regression	63852443.26	17	3756026.074	33.280	.000[c]
	Residual	19637753.04	174	112860.650		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), LehmanShockDummy, Russia_imports, PutinDummy, Brunei_imports, Indonesia_imports, CoalImports, DemandPetroleumProductsTotal

c. Predictors: (Constant), LehmanShockDummy, Russia_imports, PutinDummy, Brunei_imports, Indonesia_imports, CoalImports, DemandPetroleumProductsTotal, Putin_Coal, Putin_Indonesia, Putin_Brunei, Putin_Demand, Putin_Russia, Lehman_Coal, Lehman_Brunei, Lehman_Indonesia, Lehman_Russia, Lehman_Demand

Table 66

Coefficients[a]

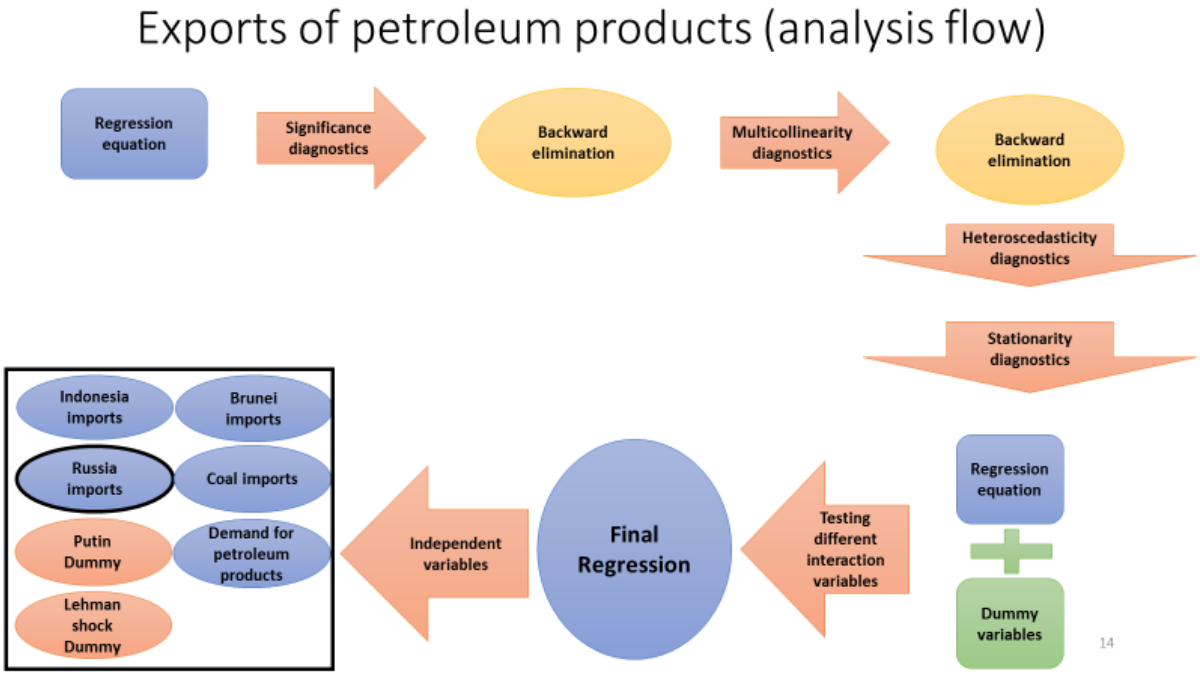
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2987.515	368.256		8.113	.000
	Brunei_imports	-.586	.428	-.061	-1.370	.172
	Indonesia_imports	-.393	.143	-.129	-2.745	.007
	Russia_imports	.357	.061	.287	5.899	.000
	CoalImports	.080	.019	.193	4.171	.000
	DemandPetroleumProductsTotal	-.072	.013	-.287	-5.758	.000
	PutinDummy	-290.441	58.959	-.196	-4.926	.000
	LehmanShockDummy	-667.077	90.876	-.287	-7.341	.000
2	(Constant)	4116.134	1853.398		2.221	.028
	Brunei_imports	.457	2.285	.048	.200	.842
	Indonesia_imports	-1.083	1.082	-.356	-1.001	.318
	Russia_imports	-.219	.549	-.175	-.398	.691
	CoalImports	.045	.089	.109	.502	.616
	DemandPetroleumProductsTotal	-.070	.072	-.280	-.980	.329
	PutinDummy	-262.283	70.802	-.177	-3.704	.000
	LehmanShockDummy	-750.560	1330.971	-.323	-.564	.574
	Putin_Brunei	-25.358	71.420	-.033	-.355	.723
	Putin_Indonesia	77.743	76.129	.097	1.021	.309
	Putin_Russia	-.237	97.494	.000	-.002	.998
	Putin_Coal	73.452	70.378	.091	1.044	.298
	Putin_Demand	-3.614	86.467	-.005	-.042	.967
	Lehman_Brunei	-54.390	150.951	-.081	-.360	.719
	Lehman_Indonesia	96.786	234.905	.145	.412	.681
	Lehman_Russia	309.887	292.800	.466	1.058	.291
	Lehman_Coal	7.254	146.984	.010	.049	.961
	Lehman_Demand	.002	.074	.019	.030	.976

a. Dependent Variable: ExportPetroleumProductsTotal

We can see that by adding interaction variables the coefficient of determination (adjusted R^2) has decreased by 0.8%. Unfortunately, none interaction variables turned out to be statistically significant. Hence, I end with the following model for the exports of petroleum products

Export Petroleum Products = 2987.515 – 0.586 Brunei_imports – 0.393 Indonesia_imports + 0.35 Russia_imports + 0.08 Coal Imports – 0.072 Demand for petroleum products – 290.4 Putin Dummy - 667.077 Lehman Dummy+ Ɛi

Figure 25



Now I will move on to the more recent timespan and see how different/similar is the situation there

Timespan (2009 - 2015)

Full regression:

Table 67

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.778[a]	.606	.558	264.488910

a. Predictors: (Constant), Y2009_CoalImports, Y2009_DubaiBlendPrice, Y2009_ProductionPetroleumProductsTotal, Y2009_Russia, Y2009_Indonesia, Y2009_SGD_NikkeiCurrencyIndex, Y2009_AUD_NikkeiCurrencyIndex, Y2009_CrudeOilProduction, Y2009_DemandPetroleumProductsTotal

Table 68

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7959361.769	9	884373.530	12.642	.000[b]
	Residual	5176624.389	74	69954.384		
	Total	13135986.16	83			

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

b. Predictors: (Constant), Y2009_CoalImports, Y2009_DubaiBlendPrice, Y2009_ProductionPetroleumProductsTotal, Y2009_Russia, Y2009_Indonesia, Y2009_SGD_NikkeiCurrencyIndex, Y2009_AUD_NikkeiCurrencyIndex, Y2009_CrudeOilProduction, Y2009_DemandPetroleumProductsTotal

Table 69

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4917.016	1607.535		3.059	.003
	Y2009_Indonesia	.085	.247	.035	.344	.732
	Y2009_Russia	.123	.096	.137	1.282	.204
	Y2009_SGD_NikkeiCurrencyIndex	-31.636	11.725	-.456	-2.698	.009
	Y2009_AUD_NikkeiCurrencyIndex	2.768	6.856	.061	.404	.688
	Y2009_CrudeOilProduction	-22.754	5.952	-.721	-3.823	.000
	Y2009_ProductionPetroleumProductsTotal	.312	.055	1.064	5.712	.000
	Y2009_DemandPetroleumProductsTotal	-.197	.044	-.848	-4.464	.000
	Y2009_DubaiBlendPrice	-4.346	2.466	-.262	-1.762	.082
	Y2009_CoalImports	.038	.025	.143	1.552	.125

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

We can see that both **Y2009_Russia** variable as well as **Y2009_Indonesia** variable stop being statistically significant when it comes to predicting the level of petroleum product exports. This might imply that in the short-term perspective crude oil imports from these two countries don't play any role in either increasing or decreasing the amount of petroleum products that Japan exports abroad. In fact, if I conduct the same regression, but without including **the Demand for Petroleum Products** or **Production of Petroleum Products** variables, **I could see that suddenly the Y2009_Russia variable becomes significant.** This means the following - even though **imports from Russia factor** is a statistically significant predictor of the Export of Petroleum products, compared to other countries, its significance vanishes when you start including other variables in the model.

The model itself is significant with **F-value = 12.642 and R^2 = 55.8%**. These are very good results that speak in favour of this model.

Table 70

Correlations

		Y2009_ExportPetroleumProductsTotal	Y2009_Indonesia	Y2009_Russia	Y2009_SGD_NikkeiCurrencyIndex	Y2009_AUD_NikkeiCurrencyIndex	Y2009_CrudeOilProduction	Y2009_ProductionPetroleumProductsTotal	Y2009_DemandPetroleumProductsTotal	Y2009_DubaiBlendPrice	Y2009_CoalImports
Pearson Correlation	Y2009_ExportPetroleumProductsTotal	1.000	-.337	.230	.003	-.406	-.257	.068	-.249	-.450	.179
	Y2009_Indonesia	-.337	1.000	-.003	.206	.566	.041	.129	.340	.563	.117
	Y2009_Russia	.230	-.003	1.000	.586	-.091	-.418	.060	.129	-.168	.458
	Y2009_SGD_NikkeiCurrencyIndex	.003	.206	.586	1.000	.122	-.794	-.408	-.208	.072	.464
	Y2009_AUD_NikkeiCurrencyIndex	-.406	.566	-.091	.122	1.000	-.002	-.094	.137	.859	.150
	Y2009_CrudeOilProduction	-.257	.041	-.418	-.794	-.002	1.000	.687	.611	.046	-.290
	Y2009_ProductionPetroleumProductsTotal	.068	.129	.060	-.408	-.094	.687	1.000	.860	-.087	.096
	Y2009_DemandPetroleumProductsTotal	-.249	.340	.129	-.208	.137	.611	.860	1.000	.106	.138
	Y2009_DubaiBlendPrice	-.450	.563	-.168	.072	.859	.046	-.087	.106	1.000	.085
	Y2009_CoalImports	.179	.117	.458	.464	.150	-.290	.096	.138	.085	1.000
Sig. (1-tailed)	Y2009_ExportPetroleumProductsTotal	.	.001	.018	.490	.000	.009	.268	.011	.000	.052
	Y2009_Indonesia	.001	.	.490	.030	.000	.355	.122	.001	.000	.144
	Y2009_Russia	.018	.490	.	.000	.206	.000	.293	.120	.063	.000
	Y2009_SGD_NikkeiCurrencyIndex	.490	.030	.000	.	.135	.000	.000	.029	.258	.000
	Y2009_AUD_NikkeiCurrencyIndex	.000	.000	.206	.135	.	.492	.197	.107	.000	.087
	Y2009_CrudeOilProduction	.009	.355	.000	.000	.492	.	.000	.000	.338	.004
	Y2009_ProductionPetroleumProductsTotal	.268	.122	.293	.000	.197	.000	.	.000	.215	.193
	Y2009_DemandPetroleumProductsTotal	.011	.001	.120	.029	.107	.000	.000	.	.168	.105
	Y2009_DubaiBlendPrice	.000	.000	.063	.258	.000	.338	.215	.168	.	.220
	Y2009_CoalImports	.052	.144	.000	.000	.087	.004	.193	.105	.220	.
N	Y2009_ExportPetroleumProductsTotal	84	84	84	84	84	84	84	84	84	84
	Y2009_Indonesia	84	84	84	84	84	84	84	84	84	84
	Y2009_Russia	84	84	84	84	84	84	84	84	84	84
	Y2009_SGD_NikkeiCurrencyIndex	84	84	84	84	84	84	84	84	84	84
	Y2009_AUD_NikkeiCurrencyIndex	84	84	84	84	84	84	84	84	84	84
	Y2009_CrudeOilProduction	84	84	84	84	84	84	84	84	84	84
	Y2009_ProductionPetroleumProductsTotal	84	84	84	84	84	84	84	84	84	84
	Y2009_DemandPetroleumProductsTotal	84	84	84	84	84	84	84	84	84	84
	Y2009_DubaiBlendPrice	84	84	84	84	84	84	84	84	84	84
	Y2009_CoalImports	84	84	84	84	84	84	84	84	84	84

Looking at Pearson correlation coefficients I can see (as one would expect) that there is some correlation between demand and production of petroleum products. Therefore, in the next regression I will make sure that only **Production for Petroleum Products variable** gets included into the regression.

I will now perform backward elimination to delete all the insignificant factors from the model. Having done that I will check if there is any serious multicollinearity problem in the regression model:

Table 71

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.686[a]	.470	.444	296.726827

a. Predictors: (Constant), Y2009_DubaiBlendPrice, Y2009_CrudeOilProduction, Y2009_ProductionPetroleumProductsTotal, Y2009_SGD_NikkeiCurrencyIndex

Table 72

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6180288.159	4	1545072.040	17.548	.000[b]
	Residual	6955697.998	79	88046.810		
	Total	13135986.16	83			

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

b. Predictors: (Constant), Y2009_DubaiBlendPrice, Y2009_CrudeOilProduction, Y2009_ProductionPetroleumProductsTotal, Y2009_SGD_NikkeiCurrencyIndex

Table 73

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	7632.188	1257.028		6.072	.000		
	Y2009_SGD_NikkeiCurrencyIndex	-46.496	10.160	-.669	-4.576	.000	.313	3.193
	Y2009_CrudeOilProduction	-36.803	5.858	-1.167	-6.283	.000	.194	5.144
	Y2009_ProductionPetroleumProductsTotal	.167	.036	.571	4.679	.000	.450	2.221
	Y2009_DubaiBlendPrice	-4.936	1.419	-.298	-3.478	.001	.913	1.096

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

Even though two of the variables have VIF values greater then 3, there are no problems with multicollinearity in this model. The model is significant and the coefficient of determination is also quite high, **R^2 = 44.4%**. The VIF values of all the independent variables suggest that there is no problem with multicollinearity in this model.

I will now check if the equation is heteroscedastic:

Figure 26

Breusch-Pagan test:	
LM (observed value)	3.022
LM (critical value)	9.488
DF	4
p-value (two-tailed)	0.554
α	0.05
Test interpretation:	
H0: Residuals are homoscedastic	
Ha: Residuals are heteroscedastic	
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.	
The risk to reject the null hypothesis H0 while it is true is ： 55.41%.	

Figure 27

White test:	
LM (observed value)	9.461
LM (critical value)	23.685
DF	14
p-value (two-tailed)	0.800
α	0.05
Test interpretation:	
H0: Residuals are homoscedastic	
Ha: Residuals are heteroscedastic	
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null	
The risk to reject the null hypothesis H0 while it is true is ： 80.04%.	

The two tests tell me the model is homoscedastic, so there is nothing to worry about.

I will now check if the regression is spurious. I will use similar technique as in previous timespan i.e. add year dummies to the regression.

Table 74

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.704[a]	.495	.426	301.472369

a. Predictors: (Constant), Y2009_b2015, Y2009_b2010, Y2009_b2014, Y2009_b2009, Y2009_ProductionPetroleumProductsTotal, Y2009_b2012, Y2009_b2013, Y2009_CrudeOilProduction, Y2009_DubaiBlendPrice, Y2009_SGD_NikkeiCurrencyIndex

Table 75

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6501338.132	10	650133.813	7.153	.000[b]
	Residual	6634648.025	73	90885.589		
	Total	13135986.16	83			

a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

b. Predictors: (Constant), Y2009_b2015, Y2009_b2010, Y2009_b2014, Y2009_b2009, Y2009_ProductionPetroleumProductsTotal, Y2009_b2012, Y2009_b2013, Y2009_CrudeOilProduction, Y2009_DubaiBlendPrice, Y2009_SGD_NikkeiCurrencyIndex

Table 76

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6524.444	3882.875		1.680	.097
	Y2009_SGD_NikkeiCurrencyIndex	-35.837	34.867	-.516	-1.028	.307
	Y2009_CrudeOilProduction	-36.444	6.883	-1.155	-5.295	.000
	Y2009_ProductionPetroleumProductsTotal	.171	.040	.583	4.296	.000
	Y2009_DubaiBlendPrice	-4.875	3.498	-.294	-1.394	.168
	Y2009_b2009	-59.087	294.184	-.052	-.201	.841
	Y2009_b2010	-110.413	223.887	-.098	-.493	.623
	Y2009_b2012	-251.795	157.138	-.223	-1.602	.113
	Y2009_b2013	-190.731	202.832	-.169	-.940	.350
	Y2009_b2014	-194.918	255.755	-.172	-.762	.448
	Y2009_b2015	-198.448	347.435	-.176	-.571	.570

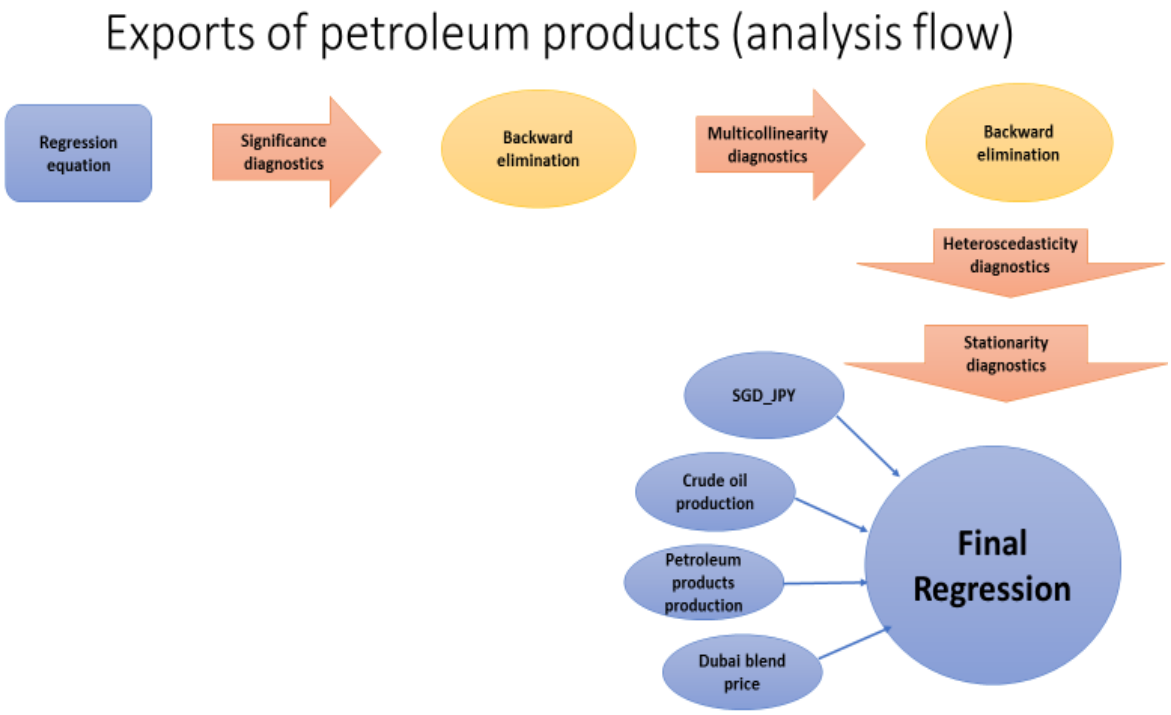
a. Dependent Variable: Y2009_ExportPetroleumProductsTotal

The regression equation remained statistically significant with **F-value = 7.153** and **R^2 = 42.6%. Nikkei Index for Singaporean Dolla**r and **Dubai Blend price** became insignificant suggesting that the correlation between these variables and **Exports of petroleum products** variable is spurious

Here is how the final regression equation will look:

Export Petroleum Products Total = 7632.188 - 46.496 **(Y2009_SGD_NikkeiCurrencyIndex) –** 36.803 **(Y2009_CrudeOilProduction) –** 0.167 (**Y2009_ProductionPetroleumProducts) –** 4.936 **(Y2009_DubaiBlendPrice) + Ɛi**

Figure 28



Conclusion 2009-2015

In recent years **Russia_imports variable** turned out to be an insignificant predictor of the volume of Japan's exports of petroleum products. It appears that the main reason for this outcome was including control variables such as **Production of petroleum products** and **Demand for petroleum products,** the impact of which on the dependent variable has outweighed the impact of the **Russia_imports.** Excluding **Production of petroleum** or **Demand for petroleum products** from the regression equation would make **Russia_imports** a significant predictor. One possible interpretation of why **Russia_imports** factor was no longer a significant in 2009-2015 timespan is the following: in the same timespan **Russia_imports factors** is one of the most statistically significant predictors of both **Demand for petroleum products** and **Production of petroleum products.** Thus **Russia_imports** factor is the main predictor of these two factors. Therefore, obviously, it will not have a significant effect on the **Exports of petroleum products** when either of these factors happens to be in the same equation, unless the effect of **Russia_imports** predictor goes beyond just predicting demand and production of petroleum products.

Conclusion for exports of petroleum products

After conducting numerous regression analyses and using different tests to validate the significance and eloquence of the results, I arrived at a very important conclusion: unlike imports from most of oil producing

countries, the crude oil imports from Russia represent significant predictor of Japan's exports of petroleum products. In fact, the level of significance of **Russia_imports** factor is so high that when looking at 2000-2015 timespan it remains a significant predictor despite including other independent variables such as **Lending rates, JPY/SGD exchange rate, Production of Petroleum products, Demand for Petroleum products inside Japan** etc. This can imply many different things and I am not in a position to state that the bigger the amount of crude oil Japan imports from Russia, the greater is the volume of petroleum products it can export abroad. In my opinion, in first half of 2000`s Japan establishing a stable crude oil supply route from Russia and steadily increasing the volume of exports of petroleum products – is not just a coincidence. In other words, **Russia_imports** and **Exports of Petroleum Products** are interrelated factors and it seems that crude oil imports of Russia have a positive effect on Japan's ability to export refined oil products. Mind you, crude oil imports from Russia only make up 8.4% of all the crude oil imported into the country – how big will the effect of Russia's imports be if 8.4% would turn into 10%, 15%, 20% or even 25%? Especially having in mind that demand for petroleum products in Japan due to ageing population and environmental policies will be slowly decreasing, the need to export refined oil products (to compensate for the falling demand) would grow over the years. Since neither the crude oil imports from Gulf States, nor other oil producing countries can be used to predict the level of Japan's exports of petroleum products (despite delivering more than 80% of Japan's crude oil), the statistical significance of **Russia_imports** factor gets further reinforced. This suggests that despite having a modest share in Japan's crude oil market, the crude oil imports from Russia seem to play a significant role in Japan's ability to export petroleum products, giving them a competitive edge. This finding would be used to support the following argument: **increasing crude oil imports from Russia will bring benefits to Japan that are not just limited to transportation costs and can play a significant role in reviving and strengthening country's refining industry.**

Part 4: Geopolitical situation

Importance of grasping geopolitical realities

Unlike most of the commodities, crude oil has a very strong geopolitical overtone that cannot be ignored. This originates from the importance and irreplaceability of crude oil to an economy of any modern state. Without crude oil or crude oil refining facilities it is impossible to imagine any country functioning. In other words, crude oil industry is a backbone of a modern and post-modern economy. Therefore, to any government the crude oil issue will always have a strategic connotation, since stable and safe supply of hydrocarbons not only allows the economy to function, but also provides the whole country with relative political and economic independence. The sudden economic rise of such countries like Saudi Arabia and Venezuela, clearly illustrates my point. Countries that turned out to have enormous crude oil resources have quickly transformed from semi-feudal states with primitive economies into a big regional (if not to say global) players with enormous political ambitions. The fact that these states have unbelievable reserves of crude oil, whilst most of the states suffer from shortages of this commodity, allowed them to utilize this difference for their benefit, enrich themselves and gain some geopolitical points. However, in most of the cases enrichment of most of these countries did not lead to modernization of their economies or development of other sectors of the economy. Oftentimes a substantial share of these profits gets invested into pursuing extremely ambitious geopolitical projects of the elites in these states. These elites lavishly invest money into projects that in their opinion would guarantee them stronger international positions. **In other words, crude oil has created new geopolitical players that started to play greater role in their own regions as well as in the world.**

On the other hand, the crude oil reserves are scare and are expected to get completely used up in around 50-60 years from now. (Federation, 2016) (Federation, 2016) This is a very crucial point to understand and interpret correctly. The fight for global reserves of crude oil is on with major economies like USA, China, India, Japan etc. competing to get substantial amount of crude oil resources for the cheapest possible price. By using their financial, political, technological and sometimes even military resources modern states through their oil majors acquire exploration and extraction rights in different parts of the world, to ensure that they will not be the first ones to suffer when the scarcity of crude oil will start getting acute. At the same time, you have major oil producing states that try to sell their crude oil reserves at a best possible price to different states. The fight for new consumer markets between different oil producing countries is also very tough. Having immense amount of crude oil reserves, they intend to sell their product to different regions to compensate for expensive infrastructure investments and to get the new buyers dependent on their crude oil (natural gas). By discovering new consumer markets and finding ways in which they could transport their hydrocarbons to these markets, the oil producing countries increase their economic and political influence over different regions in the world.

Thus, there is a very troubling picture on both demand and supply sides of the crude oil market: on one hand, you have modern industrialized states fighting to procure all the hydrocarbon resources they can get, on the other – there are major oil producers competing for various consumer markets around the world. The situation is further aggravated by these two facts: first, there are not that many hydrocarbons in the first place, second, the growing population of the world implies that the rate of consumption of crude oil will only continue to increase. Observing the state of world affairs from this angle, the idea that modern wars originate from ambitions of different countries to control hydrocarbon resources or hydrocarbon export routes, does not seem as inconceivable as before. **In fact, it would not be an exaggeration to say that much of what is happening in the Middle East, especially in Syria and Iraq is due to different regional and global powers trying to expand their spheres of influence to either control the rich crude oil reserves in the region or control the transportation of their hydrocarbons to the consumer markets in Europe.**

The situation is quite grave and there seems to be no happy end to it. Therefore, when analysing Japan's energy policy, particularly the procurement of crude oil around the world, it is not enough to look at different projects from the standpoint of short term costs or profitability. Quite the opposite, it is essential to adopt a long-term view on the hydrocarbon security. This long-term view must be constantly supported by analysis of global geopolitical canvas. If at some point a country realizes that the current geopolitical situation in the world poses serious threat to its energy security, then adjustments must be made to minimize the effects of the threat. This part of the diploma will be devoted to looking and analysing the most relevant parts of geopolitical canvas and understanding if there are serious threats to Japan's energy security. Most of the attention in this part will be devoted to Middle East and China.

Middle East

As was mentioned several times before 80% of Japan's crude oil imports come from the Middle East, to be exact from the Persian Gulf. Every time the oil tankers carry the crude oil from the Persian Gulf to Japan, they need to pass the Strait of Hormuz which is only **54 km** long. Around 17 million barrels of crude oil per day pass this straight – a significant amount of crude oil that can easily be blocked by the military ships of any major regional power. What are the chances of this happening? Why has the violence escalated this far? What powers stand behind the war in Syria and Yemen? How long will these conflicts last? What are the chances of a full-scale war between Iran and Saudi Arabia? In the following passages, I will try to answer these questions, whilst giving a detailed analysis of the current state of affairs.

Trends

It will be logical to start off by describing the prevailing trends in the region. This will help the reader to understand the direction in which different regional powers are moving as well as shed light on the nature

of recent developments.

Decline of US power. Even though watching media news networks like CNN, NBC, and CNBC etc. one might get an impression that US diplomacy dictates the rules in the Middle East region – this is far from being the truth. In recent years, United States started to lose its grip in this part of world and is no longer willing to demonstrate its military strength to neither allies, nor enemies. Compared to 90's, it has become very difficult for the White House to dictate its rules and impose its will to such traditional allies like Qatar, Turkey and Saudi Arabia. Some analysts even say that the roles have switched and that Washington is in a position where it has no other choice left, but to support the policies of Doha, El Riyadh and Istanbul i.e. the tail is wagging the dog and not the other way around. The war in Syria and Yemen, atrocities of ISIS, worsening US-Turkey bilateral relations once again prove that despite numerous military bases in the region, the presence of US army can no longer force the regional powers to abide the will of the White House or even prevent a war. Thus, for Japan and Japanese oil companies **it would be wrong to assume that US military presence will constantly prevent an outbreak of serious regional war and will always guarantee stable flow of hydrocarbons from this region to the rest of the world.**

Growing influence of Saudi Arabia and Qatar. There is no doubt that Arab Spring as well as many other uprisings against secular dictatorships in the Middle East have been financed by two monarchies. The excess of oil money, geopolitical ambitions and loosening grip of Washington allowed these countries to increase their activity in the region and spread their political and economic influence in a very unorthodox way: overthrowing dictatorships, sponsoring radical Islamic organizations (Muslim Brotherhood) as well as terrorism (ISIS and Al Nusra Front). Their success in Libya, Tunis, and partial success in Egypt has motivated them to continue their activities and spread their influence and power around the world. The point behind these rebellions is spreading radical Sunni Islam throughout the whole region that would guarantee protection of its interests (protection of natural gas and crude oil imports) and seriously damage Iran's spheres of influence.

Rivalry between Iran and Saudi Arabia. Though religious disagreements between Shias and Sunnis can partially explain the long-standing rivalry between the two powers, the religious factor is far from being the main one. In fact, there is more geopolitics and economics at the root of this conflict than anything else. The two countries representing two different civilizations, Persian and Arab, are desperately fighting for the spheres of influence in the Middle East. Although there is no direct collision between the two sides, both countries are using their allies and satellite states to wage war on each other. As a matter of fact, if you dig deeper and try to find out what are the real causes of wars in Yemen and Syria, then you will find that at the heart of the conflict there is Saudi Arabia and Iran fighting for spheres of influence. In Syria – both Saudi Arabia and Qatar finance terrorist and semi-terrorist organization to destroy the Assad government and force Syria outside Tehran's sphere of influence. In Yemen: Iran-backed rebels are waging a long-term partisan war against the armies of Saudi Arabia and its Arab coalition (Friedman, 2016). The fight is not only for spheres of influence, but also for economic preferences and crude oil consumption markets, since both

countries have substantial reserves of crude oil and natural gas that they are willing to sell abroad. Having said that, the recent termination of Iranian oil embargo has been a source of irritation for the Saudis, since now their main rival is no longer suffering from economic sanctions and can start exporting its crude oil to European and Asian markets. To sum up, the level of antagonism between the two major powers is extremely high and it keeps on growing year by year. Now both countries refrain from direct conflict and challenge each other indirectly using rebel groups or terrorist organizations. However, year by year the full-scale war between these major powers seems unavoidable, especially as US influence in the region decreases.

Radicalization and unpredictability of the region. Finally, the last prevailing trend in the Middle East that is worth mentioning is ongoing radicalization of the region. Before the Arab Spring most the countries in the Middle East and North Africa were secular states, on top of which were dictators that tightly controlled everything that was happening in their countries. Once these dictatorships were overthrown, rapid radicalization quickly spread throughout the region. These radicalization movements received financing from the Gulf Monarchies that tried to control the process and thus increase their spheres of influence. On top of that, Turkey, a country that for a long time was considered the most secular and modern state in the whole Islamic world, has also been undergoing the trend of radicalization. The ambitions of president Erdogan, who as some analysts say, is trying to rebuild Ottoman Empire and expand Turkey's territory, are very alarming and promise new conflicts in the future. This is all fuelled up by Kurds fighting against oppression from the Turks and trying to form their own independent state – Kurdistan that would include parts of Turkey, Iraq, Iran and Syria. Therefore, it would be wrong to exclude the possibility of borders changing sometime in the near future. (Vysotsky, 2014)

These are the main prevalent trends in Middle East region, from which Japan exports 80% of its crude oil. Most of these trends are alarming and with years the situation is only getting worse. On the other hand, nothing suggests that the situation will stabilize any time soon. To say that roots of all these troubles lie in Islam and the violence that it propagates would be a misstatement. Islamic civilization is going through violent series of conflicts between different religious groups – process that has finished in the Christian civilization in the 19th century. These religious collisions are fuelled up by geopolitical ambitions of regional states.

Yemen War

This part will be devoted to understanding the origins of Yemen War and predicting possible consequences of the conflict. Even though it might seem as a small-scale regional conflict that has no relation to the crude oil exports from the region, it sheds light on the ambitions of Saudi Arabia and shows how futile are its ambitions to dominate in the region. Saudi Arabia in its attempts to dominate in the Arab Peninsula used the conflict between North Yemen and South Yemen to establish its dominance in the country where there is 50:50 population divide between Sunni and Shia Muslims. This was done to protect Saudi Arabia's

southern border as well as control strategically important Bab-el-Mandeb strait, another key choke point in the region. The main mastermind behind the Yemen war is the potential heir to the throne Mohammad bin Salman Al Saud, who represents the party of war that is willing to seek confrontation with Shias and Iran. Regarded by many as a promising, young and active leader, it seems that his ambitions far exceed his analytical skills(Vysotsky, 2014).

The war that started in Yemen in 2014-2015 still goes on and there is little chance that it will end soon. The Saudi coalition (Egypt, Saudi Arabia, UAE and Qatar) are still unable to take the country under control despite numerous air raids and massive casualties in the civilian population. At the same time the casualty count in the Saudi army is substantial. This once again reveals Monarchy's inability to fight a war, although the military budget of the Kingdom is 3rd in the world ranking (after United States and China). The Yemen rebels continue standing their ground and fighting off the Saudi army. One may wonder, what will happen to Saudi Army, in case of a war with Iran? – it will probably end up being destroyed.

Figure 29

Quick comparison of Saudi Arabia and Yemen		
	Saudi Arabia	Yemen
Population	28.83 million	24.1 million
GDP per capital	53,624 USD	2,927 USD
Water resources	Some	Extremely scarce
Specifics	Not armed population, that is not used to wars	Highly armed population, very used to war

From the table above we can see that Yemen population is in a better position to fight and that Saudi Arabia has much more to lose. In a fight between hungry and poor warrior against obese and rich sheikh there can be little doubt about who will win. The rebels in Yemen are supported by Iran that tries to weaken Saudi Arabia's influence in the region. The problem however is not the war, but the potential consequences of it, that can have a global impact. These are the two points that require attention:

- Tanker traffic through Bab-el-Mandeb strait
- Southern border regions of Saudi Arabia

Bab-el-Mandeb strait through which part of Saudi Arabia crude oil gets exported to the world is located off the coast of Yemen. The further escalation of the conflict can possibly lead to oil tankers being attacked or in a position when they can't pass through this strategically important straight. Recent attack of Yemen rebels on the UAE military vessel with consequent sinking of it is evidence that the passage through Bab-el-Mandeb straight is not safe at all, especially since rebels might not be able to distinguish between military

vessels and oil tankers. Since **3.8 million barrels of crude oil per day** passes the Bab-el-Mandeb strait, the problems in the region can cause serious disruptions the global crude oil supply. Fortunately, most of the oil that gets delivered to Japan does not pass through the Bab-el-Mandeb straight (Friedman, 2016).

Figure 30 (Source: http://www.eaglespeak.us/2015/02/is-bab-el-mandeb-strait-threatened-by.html)

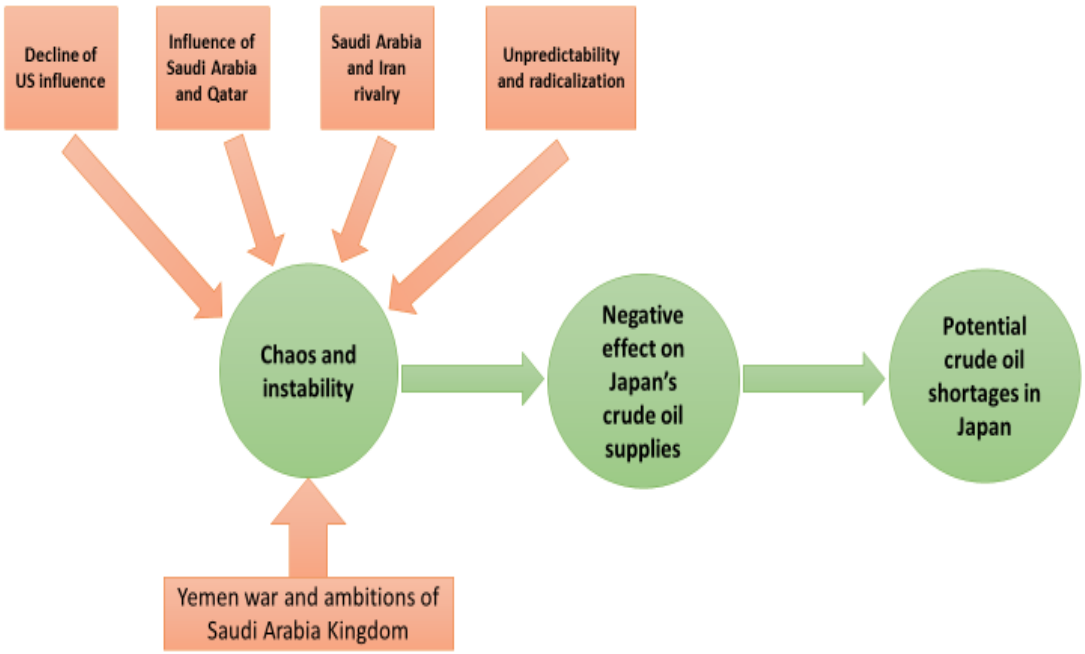
The southern parts of Saudi Arabia – is one of the country's main oil producing regions, that is inhabited mainly by Shia Muslims, not the title religious group in Saudi Arabia that often faces discrimination within the country. The further continuation of the war could potentially imply that Saudi Arabia's southern regions can get attacked by the rebels. Yemen rebels attacking the oil-bearing regions inhabited by discriminated Shia Muslims would create serious problems to the authority of the Monarchy as well as Kingdom's production capabilities. This can also lead to big disruptions in the region's crude oil exports.

Having seen all these explanations, the reader can righteously ask: "What does all this have to do with Japan's energy security?" Well by importing 80% of its crude oil from this region (30% from Saudi Arabia), Japan puts itself in a position where its energy security heavily depends on the discretion of these Monarchies and their ability to maintain a stable production and supply of hydrocarbons. In other words, Japan entrusts its crude oil supplies to the prudence of these countries assuming that their governments will not take any wrong steps that would endanger the stable flow of hydrocarbons. Ambitions of such countries like Saudi Arabia and Qatar and their desire to spread their influence in the region, makes them act in a way that could undermine the stable supply of hydrocarbons to the rest of the world. Yemen war is a good example of such irrational behaviour – an extremely expensive enterprise that brings no results, reveals the weaknesses of the Saudi army and puts the Saudi Kingdom into a very dangerous situation that could sabotage its crude oil production and exports. Since the other regional countries depend on Saudi Arabia politically and financially (UAE, Qatar, Egypt etc.) their armies also end up being involved in this war. This suggests that the country`s leadership is used to acting on its own accord without really thinking of financial and geopolitical consequences. If now it has only Yemen to deal with – the situation is quite far

from being critical. However, what will happen if Saudi Arabia decides to start war with Iran? What could the possible war between the two major countries potentially lead to? How could the crude oil exports from this region be affected by this war? If Mohammad bin Salman Al Saud will come to power in the future, the possibility of a big regional war will only increase. Furthermore, inflated military spending, national budget's heavy dependence on crude oil exports and majority of Kingdom's population (70% ~ 90%) receiving salaries from the government, only raises concerns on economic and political stability in this country and peninsula(Vysotsky, 2014). Under these circumstances could Saudi Arabia and other Gulf States that heavily depend on it geopolitically be called reliable trade partners?

In most of the cases the reluctance of Japanese government and oil companies to invest into Russia's oil projects or strengthen Japan-Russia energy cooperation can be summed up in the following phrase: "the political risks are too high". In most of the cases this reasoning is justified as Russia's business practices and judicial system are far from being perfect. However naturally a question arises: "Are political risks in Saudi Arabia, Qatar, Kuwait and UAE far lower than the ones in Russia?" Mind you, 30% of all crude oil consumed by Japan comes from Saudi Arabia, a country that gets engaged in wars that it cannot physically win, that openly finances terrorist activities in the region and that cannot clearly foresee the consequences of its ambitious actions. The rest of the crude oil coming from the Middle East region, gets imported from the countries, whose foreign policy is dictated or strongly influenced by Saudi Arabia: Qatar, Kuwait and UAE. **Thus in my opinion political risks of 80% crude oil dependence on the Middle East are extremely high. The conflict of interests and religious disputes have been tearing this region apart for many years and there is no sign that the situation will stabilize any time soon. The region is too dangerous and unpredictable for long term investments and constructive energy cooperation. Thus, for Japan it might be useful to have a sober look at the actual state of affairs and adjust its energy policy to present-day realities.**

Figure 31



China

China represents another major part on the geopolitical canvas. Therefore, it is essential to analyse this new Asian Tiger and its relations with Russia and Japan to get a better insight on what is happening in the North Asia Pacific region. Putting the Chinese factor into the equation, will enable me to evaluate the importance of Russia-Japan trade relations from a macro perspective. This part will be divided into several subparts: China-Russia trade ties, China-Japan trade ties, re-evaluating importance of Japan-Russia trade ties.

China-Russia trade ties. In recent years, China has become a major trade partner for Russia. Bilateral trade volume between the two countries, which amounted to $15.8 billion in 2003, has increased more than 6 times over the last 10 years, reaching $95.3 billion in 2014. Chinese companies and banks actively invest in various sectors of the Russian economy: oil, gas, transportation, financial, tourist sectors etc. Unlike European markets, the Chinese market is growing very fast implying increasing energy consumption – unique opportunity for Russia's oil and gas companies to sign long term export contracts. Moreover, China with its growing military represents a major market for Russia's defense industry. Finally, the strong economic ties seem to be backed up by similar geopolitical views on the different issues like Syria war, Iran's nuclear program and dominance of United States in different regions of the world.

A substantial part of trade relations between Russia and China is energy. In **2014** China, has imported **7,000,000 barrels per day** of crude oil, by 2021 the figure is expected to rise to **9,500,000 barrels per day** as the country seeks to diversify its sources of energy by increasing the share of crude oil and natural gas and reducing the share of coal. The Chinese refining industry is also experiencing a boom - from **2000 to 2015** country's refining capacity has increased from 5,500,000 bpd to 14,000,000 bpd **(more than 2.5 times).** The growing Chinese energy and crude oil market is extremely attractive and alluring to Russia's oil majors like Rosneft, Lukoil, and Gazpromneft, because it is huge and has a significant growth potential. Therefore, it is not surprising that in **2015** Russia became the second largest exporter of oil to China, selling **42.43 million tonnes** of oil and products, second only to Saudi Arabia (50.55 million tons). Most of the crude oil gets delivered to China by **oil tankers** from port Kozmino or by **pipelines** from ESPO (Skovorodino – Daqing) or transit via Kazakhstan. The long-term contracts with Rosneft:

- 700,000 barrels per day (2016 – 2022)
- 600,000 barrels per day (2023 – 2030)
- 300,000 barrels per day (2031 – 2038)

This shows that the exports of crude oil from Russia to China are not short term and will continue over a long period time (Mitrova, 2016).

For China, the strengthening trade ties with Russia is strategically significant for several different reasons. First, Russia is an important source of primary energy sources. Over the past 12 years the energy demand has doubled increasing demand for hydrocarbon imports. Russia's vast mineral resources allow China to stimulate its industrial growth and reduce its dependence on the Middle East crude oil. Besides the ground supply of hydrocarbons implies that China becomes less reliant on sea routes for crude oil and natural gas transportation – a considerable gain for the Chinese government as it regards US Pacific fleet, dominant power in Asia Pacific region, as a serious potential threat to China's stable supply of energy resources. Other Chinese trade interests in Russia include electricity imports across the border and large scale investments into strategic sectors of Russia's economy: petrochemical industry, coal, shipbuilding, atomic icebreakers etc. From 2005-2015 the cross-border electricity supply between Russia and China has quadrupled and is expected to grow even more in the future. The main Russian companies that sell electricity to China are RusHydro, Rosseti and RosAtom. In 2016 China proposed various investments in 12 key industries. The offer has been very positively received by the Russian side.

To China, Russia is more than a country that provides oil, gas, electricity and petroleum products to the Chinese consumers. China sees Russia as a consumer market for its products, especially after sanctions from the West forced many European and American engineering companies to withdraw from the Russian market, providing a tremendous opportunity for the Chinese oil equipment manufacturers to enter the Russian market. Thus, the export of Chinese oil drilling and engineering equipment to Russia started to steadily grow from 2015. Yantai Jereh Oilfield Service Group is one of the companies that has been

particularly profiting from these geopolitical changes. **Having said that, the share of Japanese engineering companies in the crude oil equipment market is very modest, suggesting that there is lots of room for growth.** Chinese central government also seeks Russia's neutrality and even support for the Chinese dominance in the Asia Pacific region, in other words, China aims to use Russia as its geopolitical partner in the region to further spread its influence and dominate in the region. Finally, when it comes to PRC's (Peoples Republic of China) interests outside the Asia Pacific region, Russia territory (both land and sea) becomes a valuable asset as the shortest key route between Asia and Europe, especially the Arctic sea route. China intends to utilize and commercialize the Northeast Passage (in the Arctic), the route of which goes through Russia's territorial waters. Furthermore, Russia's infrastructure and territory is used for the transit of Kazakhstan's crude oil.

Russia's weak position. Strengthening trade ties with China is a legitimate outcome of the direction that the economies of the two countries have recently taken. Especially in recent years when Russia's relations with the West have deteriorated, robust economic relations with the Chinese partners can be considered a necessity. Russia needs to generate revenue from sales of oil, gas and coal and sees China, and more broadly Asia, as an expanding market which can offer diversification from the more mature, and stagnant, Western markets. When U.S. and EU sanctions limited Russia's ability to access technology and finance in the oil sector, Russia became strongly dependent on imports of oil discovery and production equipment from China. On top of that China's crude oil market remains the major buyer of East Siberian crude oil, although Russia seeks to diversify its crude oil sales in Asia via port Kozmino (Mitrova, 2016) (JPEC, 2015b).

Nevertheless, the willingness of the Chinese side to cooperate remains questionable. Chinese government and business feels that there is no need to invest in oil fields of East Siberia as they will be the final users of that oil anyway. In the end of the day the bulk of Russia's Eastern oil sales will be reliant on China, unlike assets in Africa or Latin America where foreign direct investment is necessary. Chinese oil companies heavily invest into oil and gas activities in: Iraq, Kazakhstan, Nigeria, Canada, whilst investments in Russia are only on 11th place (Mitrova, 2016). Several small deals have been completed, but an equal number remain under discussion or have failed, despite efforts made by Vladimir Putin and Igor Sechin (especially regarding Taas Yuriakh & Vankor oil fields). Finally, the fact that Chinese banks complied with Western sanctions and refused to give out extra loans to Russian companies, shows that the Chinese side might not be as willing to build strong bilateral relations with Russian partners, if it will in any way endanger their relations with the American or European companies/banks.

There exists deep-rooted suspicion within Russia's business circles that China is just trying to exploit the country's vulnerable position**. The perception that Russia is in a weak negotiating position, both politically and commercially, has encouraged Chinese companies to drive a hard bargain on valuation, especially given the recent decline in the oil price**. The difference in size of the economies and population always puts Russia in a powerless position when it comes to negotiating trade deals with China. On top of that, there are areas where China's and Russia's interests collide and both countries end up in head-to-head

competition, a typical example of such conflict of interests would be Central Asia. China with its interests in rich mineral resources of such countries like Kazakhstan, Turkmenistan, Uzbekistan, Kyrgyzstan and Tajikistan is seen as a major threat to Russia's economic power in the region. There are two conflicting projects of economic integration: Silk Road Economic Belt (China) vs Eurasian Union (Russia). The Russian side constantly fears that military and technological cooperation between Russia and China is only advantageous to the Chinese side. Lastly there were instances when reputation of China`s public and private enterprises as reliable business partners has been severely damaged. **Hold-up problem** is the most serious of all the problems between the two sides. The problem is centered on Chinese side refusing to pay for the crude oil that it imported from Russia. This resulted in Russian oil companies cutting the supply until receiving the payment. Despite the problem not receiving any publicity, the solution required Putin's and Xi Jinping's personal involvement. The situation around the holdup problems is aggravated by series of big corruption scandals in China's oil sector(Mitrova, 2016). **When it comes to Japan-Russia trade relations there are less instances of exploitative behavior from either sides, nor there exist spheres /geographical locations, in which the interests of the two countries seriously collide**. **Above all, the reliability of the Japanese partners when it comes to following the terms of the contract and paying on time excludes the possibilities of hold-up or underpayment problems.**

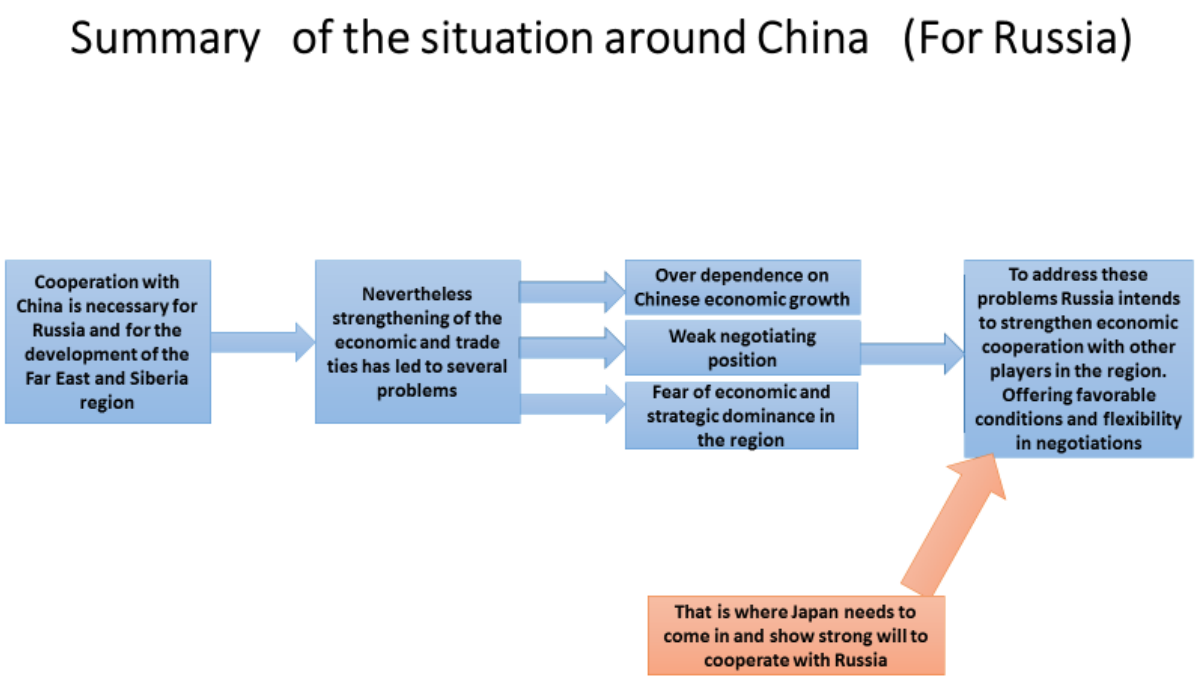
There are other problems that can potentially arise from the overdependence on China. First of all, no one really knows how long the Chinese economic growth will actually last and how will the slowing down of the economic growth affect its trade partners. Some experts suggest that a slower economic growth is expected in the future. This has been evident in the deceleration of China's need for imports from Russia implying that The Chinese demand for Russian crude oil will not grow infinitely. It is possible that these developments will slow the increase in exports through the ESPO pipeline. Numerous oil projects are financed by the loans from the Chinese banks, since the European and U.S. banks are no longer allowed by their governments to participate in business activities in Russia. Thus, it can be said that Chinese banks are in a position of supply side monopoly, as no one else is willing to provide loans to the Russia side. This provides them with authority to set interests rates as high as they want without worrying that the Russian oil companies could possibly object (Mitrova, 2016) (Friedman, 2016).

Russia is the weaker one in this situation and has no other choice, but to follow all the terms and conditions set by the Chinese side, that twists arms of the Russian government and business and maximizes its profits. However, there are some cases of resistance to the one-side pressure. Russia has responded to procrastination by demonstrating that its bargaining position is not as weak as it might seem, offering the assets originally destined for Chinese companies to other international players, with a focus on India. In addition to that Russia seeks to deepen its cooperation with other players in the region: Japan, South Korea, and ASEAN.

To conclude, when it comes to strengthening trade relations with China, the Russian side has numerous fears, some justified by facts, others – more superficial. First and foremost, there is a tremendous fear of

overdependence on the Chinese economy and Chinese politics that can sometimes undermine Russia's strategic and economic interests. Tough price negotiations and frequent hold-up problems contribute to overall uneasiness that Russia's natural resources will be completely absorbed/sucked out by the Chinese economy for a relatively cheap price. Also in many cases, overwhelming volume of cooperation between Russia and China in the Far East region can undermine similar cooperation with other regional partners i.e. Japan and South Korea. On top of that there is constant fear of mass migration from overpopulated Northern Chinese provinces into underpopulated East/Central Siberia and Far East with consequent economic dominance of Chinese businesses in the region. This social and demographic problems entail environmental problems such as pollution problems on the China-Russia border (on the Amur River etc.) and the problem of Chinese poachers that operate in Siberia region. Even though strengthening trade ties between Russia and China is necessary and unavoidable process, there are many problems and misunderstandings between the two sides on how this process should take place. The situation is aggravated by the desire of the Chinese side to exploit Russia's vulnerability and maximize its own profits by acquiring large volumes of crude oil and gas as well as many strategic assets in East Siberia and Far East for a very cheap price. **Therefore, Russia ends up being in a situation when it desperately needs to make strong partnerships with other main players in the region to reduce the overwhelming pressure of Chinese business and Chinese investments.**

Figure 32



China-Japan relations. When it comes to China-Japan trade relations the situation is much more complex compared to China-Russia relations. This is partly because a strong divide must be made between business world and political world. The business cooperation between two countries is substantial. China is Japan's major trading partner. Growing Chinese economy represents a major market for the Japanese products and services, which results in multi-sphere cooperation between Chinese and Japanese businesses. Furthermore, Chinese businesses invest substantial amounts of money into Japanese economy acquiring real estate, land

and businesses. At the same time, Japan's travelling industry is experiencing a serious growth due to the influx of the Chinese tourists. On the other hand, Japanese businesses have substantial interests in the Chinese market - factories built in China serve as a major industrial base for the Japanese companies. Japan also depends on China for the import of raw materials, for example until recently most of rare earth metals used in Japan's manufacturing industry has been imported from PRC.

Nevertheless, not everything in the business relations between the two countries is as smooth as it seems. Overdependence of Japanese businesses on the Chinese economy can lead to negative consequences when things go wrong or at least not as planned:

- Massive anti-Japanese protests in the main Chinese cities (2012)
- Slowing down of the Chinese economic growth and falling consumption
- Increase in average wages in China resulting in high production costs

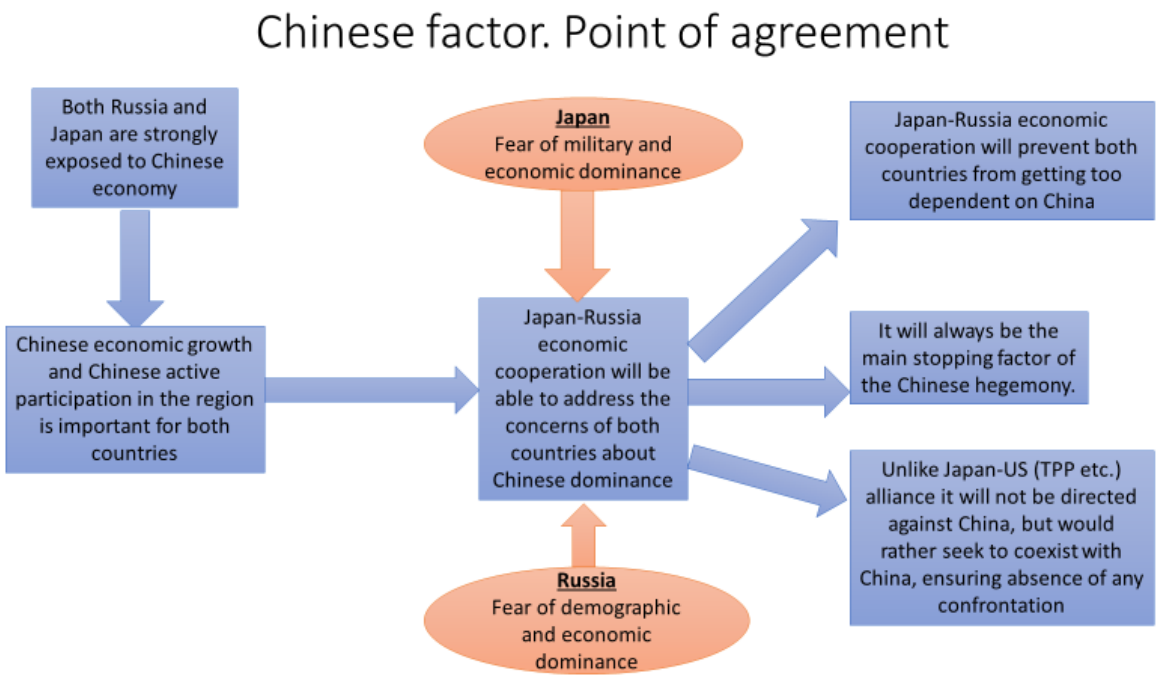
Transferring production to China and strengthening business cooperation with the local businesses can activate technological espionage, a common practice in PRC. Eventually the Japanese firms can end up losing their competitiveness, since their manufacturing/engineering know-how is no longer unique. Even though Japanese firms heavily invest in Mainland China and transfer their technological and engineering equipment to the country, there are many geographical areas around the world, where Japanese and Chinese businesses compete head-to-head with each other. In Africa, South East Asia, Central Asia the Japanese manufacturing firms often find themselves being pushed out and undermined by the Chinese companies. **Here one can observe an apparent conflict of interests.**

If in the business/trade sphere of China-Japan bilateral relations you have both cooperation and rivalry, the political sphere is dominated by rivalry as there are many sensitive issues over which the two countries collide. In the military/strategic doctrine of the United States, China is listed as the top enemy, implying that lots of financial and military resources will be devoted weakening and containing China. Strategic alliance with the United States and numerous military bases on its territory puts Japan into a state of constant geopolitical confrontation with PRC. However, Japan is not in a position to protect itself in case of the Chinese aggression, since until the present day the protection of Japanese archipelago was entrusted to the US military. **Japan is forced to confront China because it is a strategic ally of the United States, but Japan cannot physically confront Chinese military, because yet again it is a strategic ally of United States – paradox.**

Nevertheless, there is a constant military threat coming out of China, especially since there are serious territorial disputes between Japan and China over the Senkaku islands. The fact that the United States refuses to take distinct sides in this rivalry questions commitment of the US military to protect Japanese territorial integrity in case of aggression from People's Liberation Army. Trump's victory in the recent US presidential election makes the situation even more interesting, since one of his promises was to withdraw

from military agreements with Japan, if the Japanese government refused to pay for the presence of the military bases (which it already does). In case of the US military withdrawal from the region, Japan will find itself in an extremely vulnerable situation, as it will have to protect its geopolitical interests with its own military force. Since Japan army is not ready for direct military confrontation with China, it might need other countries in the region to act as neutralizing powers, preventing potential Chinese aggression. **Russia could potentially act as this buffer and military cooperation between Japan and Russia could prevent possible Chinese aggression against Japan.**

Figure 33



Russia-Europe energy ties and Ukrainian gas crisis

Russia is often seen as an unreliable partner especially when it comes to business interests. Indeed, there are cases when the actions of the country's oil/gas majors resemble to one's of corporate raiders, when the interests of foreign investors are being completely ignored and even damaged. The Russian government and Gazprom forcing Royal Dutch Shell (as well as Mitsui and Mitsubishi corporations) to sell its share in Sakhalin II project is a very illustrative example of such actions. Obviously, after this incident investors will be very reluctant to invest into the country where the bureaucratic machine as well as the national giants blackmail the foreign capital. However, there are cases when Russia's unreliability is not being backed up by concrete facts. Russia-Ukraine gas conflict (2008-2009) and Russia turning off the gas supply to Europe often gets brought up as a proof of how unreliable is the country's government and business when it comes to fulfilling the terms of the contract. **Explaining the essence of this problem will help to understand the true story behind the dispute and get rid of the myth that Russia was blackmailing Europe with gas to get a better**

deal. This in turn might make Japanese companies less reluctant to cooperate with Russia, especially in the field of energy, since it will prove that excluding some rare occasions Russian side usually keeps it promises and in most cases, is renown as a stable and trustworthy supplier of hydrocarbons through either long-term or short-term contracts.

Most of Russia's oil and gas passes Ukraine, because during the Soviet Union Russia and Ukraine were one country and when natural gas infrastructure was being built to supply West Germany with natural gas from the Soviet Union, no one would have ever suspected that USSR would ever split up and Russia and Ukraine will become two separate countries. After 1991, with most of Russia's gas passing its territory and being an ex-Soviet Union country Ukraine could purchase natural gas for a discount price that neither of the countries in Europe could possibly get. According to the contracts signed between European countries and Russia, the natural gas that passes Ukraine is under Ukraine's complete jurisdiction and there are no ways that either Russia or EU countries could control what happens to that gas. Therefore, during the 90's and 00's there were many cases when natural gas passing through the Ukrainian pipe was being using by the Ukrainian side without any money paid, in other words the gas was simply stolen. Despite Russia calling numerous times for Ukraine to stop these actions, the stealing of natural gas continued, no one was being punished and the problem remained unresolved. Europe was also the suffering side, because the final consumer did not get the full amount of natural gas it paid for. However, there were no attempts from the EU side to stop Ukraine stealing the natural gas.

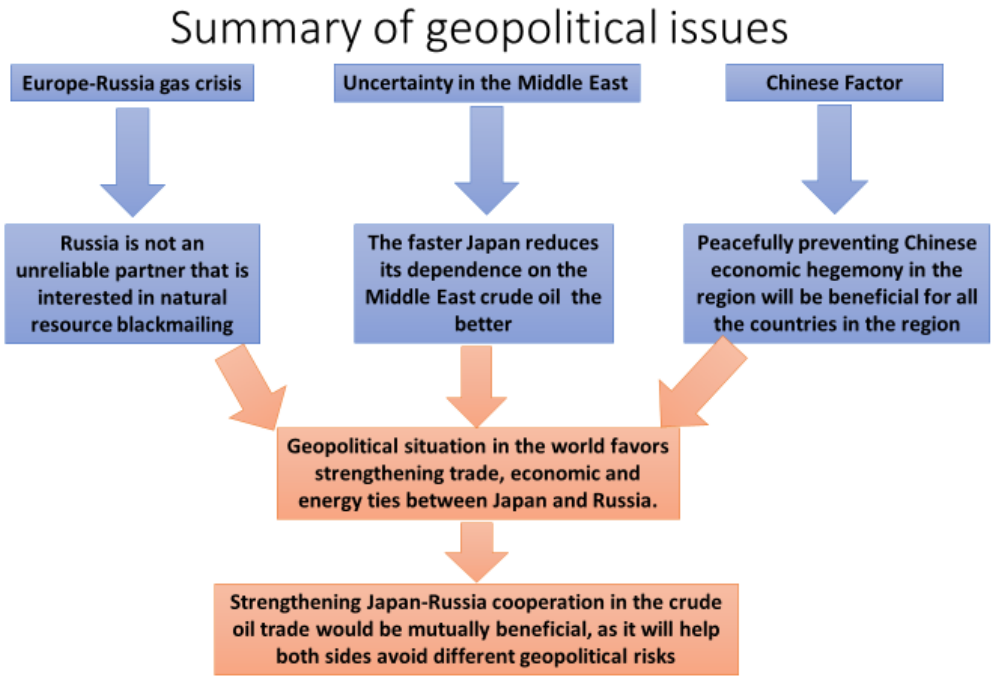
Due to the budget problems, Ukrainian side was no longer able to pay for Russia's natural gas and the amount of natural gas it started illegally pumping out of the pipe started becoming substantial. Being put in a position in which most of the product Russia sells to the West is being stolen half way through and having no tools/methods to influence the situation and faced with Europe's inability to force Ukraine to stop stealing gas, Russia has simply stopped the supply on natural gas to Europe through the pipes in Ukraine. Most of the Western media regarded this as "tough" Putin trying to show his muscles and threaten Europe. Putin's "true intentions" were regarded as blackmailing Europe and making it realize how vulnerable it is without Russia's natural gas imports. Putin portrayed as bloodthirsty dictator that was making Europe succumb to his own will, by using natural gas manipulations. I hardly doubt that Russian president had such intentions, at least to an extent when he would deliberately close the natural gas supply to Europe. The situation has aggravated so far that he could not have acted in any other way, since it would mean that he is closing his eyes on the fact that natural gas is being stolen. It would also mean that Russia is doing nothing about contracts, signed with European countries, not being fulfilled at all. The extent to which United States and consequently Japanese media have blown this situation out of proportion is staggering. Having a sovereign country Ukraine asking for free natural gas from Russia and using its strategic geographical position to steal it on its way to Europe – it is ridiculous that EU has played such a passive role in trying to stop this process. In fact, EU's actions were full of resolve only when Russia has cut the natural gas supply to Europe.

To conclude, over history Russia/Soviet Union has proven that it is a stable and reliable supplier of hydrocarbons. No secret schemes designed to blackmail the buyers or make any extra profit were ever used by the Russian side. In fact, all the cries that Russia is an empire of evil that aims to control EU policies by threatening to cut gas supply are rumors worthy of such news channels as Fox News, CNN etc. When deciding on how trustworthy are Russian oil and gas majors as energy partners Japan would be better off not relying entirely on Western Media.

Conclusion of geopolitical part

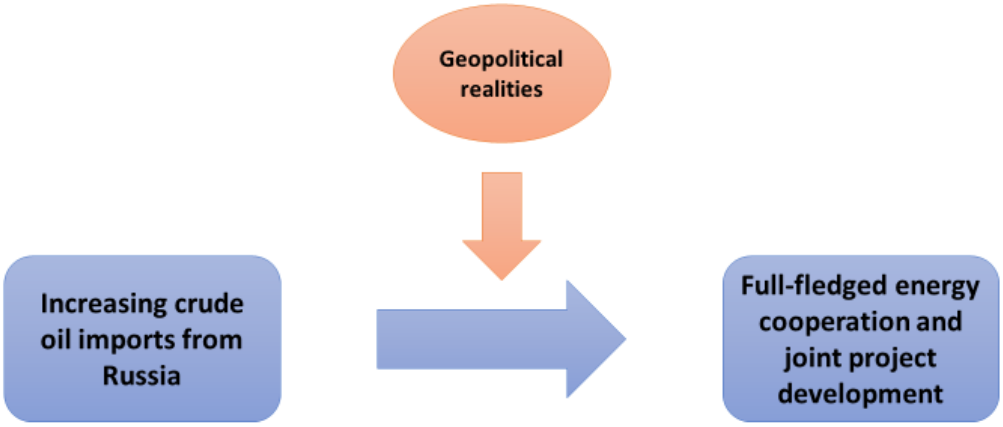
This part was devoted to describing and analysing the geopolitical situation around the world. Not every single region or country around the world was described, but only the ones that in my opinion directly influence the dynamics of Japan-Russia energy cooperation. The aim of this analysis was to illustrate that developments in different regions of the world all speak in favour of Japan-Russia strengthening their energy ties and becoming more dependent on each other in terms of trade. The deteriorating situation in the Middle East means that Japan can no longer heavily rely on the partners in the region for the stable supply of crude oil and other hydrocarbons. Potential Chinese economic and military hegemony in the region is alarming to both Russia and Japan, especially since both countries strongly depend on PRC's growing (currently slowing down) economy. Strong trade ties between Japan and Russia would guarantee peace and stability in the Asia Pacific region and prevent the dominance of China. Finally, the portrayal of Russia as an unstable trading partner that can stop the supply of energy resources and blackmail the country-importers, is a groundless rumour spread by the Western media. To understand the nature of the problems one needs to analyse how and when the export infrastructure was built as well as look deep into Russia-Ukraine energy and political ties. Only then it becomes clear that the image of Russia as an evil power that tries to control Europe by freezing natural gas exports at any time – is absolutely false. Therefore, Russia can be regarded as relatively stable and reliable partner when it comes to energy cooperation.

Figure 34



The analysis above allows me to conclude that strengthening trade and energy ties between Japan and Russia would be beneficial to both sides. The intention behind bringing geopolitical bit to the argument is to look at Japan-Russia trade relations in a broader perspective. In other words, since geopolitically it makes sense for two countries to cooperate, the next step after increasing imports/exports of hydrocarbons would be the joint development of East Siberia and the Far East oil and gas fields. Joint development, technological cooperation would allow the two sides to build trust relations and create more business opportunities. In the next part of the thesis I will try to show that by capitalizing on mineral and natural resource potential of East Siberia and the Far East, both Japan and Russia would be able to gain substantial benefits and solve their own strategic problems.

From short-term to long-term



Part 5: Long-term cooperation in the energy field

Introduction.

In this part I intend to go back to Japan-Russia energy cooperation, but to analyse it in a more long-term and macro perspective. In the previous chapters a certain base was set and analysis of short term Japan-Russia cooperation was thoroughly made. In the end conclusion was reached that increasing crude oil imports from Russia would be beneficial to both Japanese and Russian economies. However, having in mind the geopolitical aspects, naturally, several questions arise. First, is it possible for energy cooperation between Japan and Russia to expand from simple trade of mineral resources to joint development of crude oil and natural gas fields? Second, will Japanese companies be able to acquire extraction and exploration rights of East Siberian and Far East oil fields? Lastly, will the Japanese companies and the Japanese economy benefit from this cooperation? To answer the first and the second questions, I will conduct a brief analysis of the current situation in Russia, where the country's economy and policies aimed at developing the Far East and Siberian regions will be discussed. Through this analysis, I intend to arrive at a conclusion that **yes**, the current situation in the country makes it possible for the Japanese companies to invest in Russia as well as participate in joint development of mineral resources. For the last question, the potential of the Siberian region will be discussed in detail. Prospects and possibilities of Siberia's and Far East's innovative development will be evaluated. The significant role that these two regions can play in Japan's future will be considered. Finally, I will look at the current state of Japan-Russia joint oil and natural gas field development projects and try to understand what factors limit the full-fledged cooperation between the two countries.

Analysis of Russian economy and its Far East policies

Outline and PEST analysis. Before going on to analysing Russia's economy and its policies in the Far East, it would first make sense to understand what kind of a country are we dealing with. Here is the profile of the country that should give a reader an approximate idea of how big is Russia's resource potential.

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Figure 35

Russia profile

1. GDP = 1.8608 trillion USD GDP per capita = 13,000 USD
2. PPP = 24,449 USD
3. Minus GDP growth (2015)
4. Natural resources
   - 20% of World's reserves of natural resources
   - 1st place in natural gas reserves
   - 3rd place in crude oil production
   - 3rd place in coal reserves
   - 1st place in iron ores
   - 2nd place in tin
5. Main exporting destinations: Holland, China, Germany, Italy, Turkey, Japan, Korea
6. Main importing destinations: China, Germany, USA, Italia, Japan, France
7. Most of FDI into the country comes from Cyprus, Luxembourg, Bahamas, Ireland

We can see that Japan is already one of Russia's main export and import partners.

We can now go on observing the recent trends and events that have affected political, economic, social and technological life of the country. In order to do this, I will conduct a PEST analysis

Figure 36

PEST Analysis (Russia)

Political
- Surge of patriotism
- Weak opposition
- **Putin's support is strong (85%)**
- Weak relations with EU and United States (Crimea)
- No prospects of reconciliation with the West
- **Strengthening interest in the Far East**
- Strengthening strategic ties with China
- **Strong presence in the Middle East, conflict of interests between Russia and United States**
- Worsening situation in Russia-Ukraine relations

Economic
- **Country's economy badly weakened in 2014, 2015**
  - **Brent price decline**
  - **Economic sanctions from the West**
- The peak of economic crisis has passed, slow recovery expected (1.5% GDP growth)
- High inflation due to falling ruble
- **Natural resources make up 70% of total exports**
- Offshore zone and big shadow economy
- **EEU – progress in creating customs free zone in Eurasia (Russia, Belarus, Kazakhstan, Armenia, Kyrgyzstan)**
- Falling government spending due to budget deficit
- Growth in the agricultural sector especially after embargo on EU agricultural produce
- **Strong economic and energy ties with China**

Social
- Relatively high poverty rate
- Strong migration trend from Central Asia and East Ukraine
- **Corruption scandals**
- Ministers and government officials are being changed in a higher rate
- Birthrate on the rise
- **Strong decrease in population in the Far East**
- Concern over migration increase from China
- Problems with consumption of drugs
- Reduced number of terrorist attacks

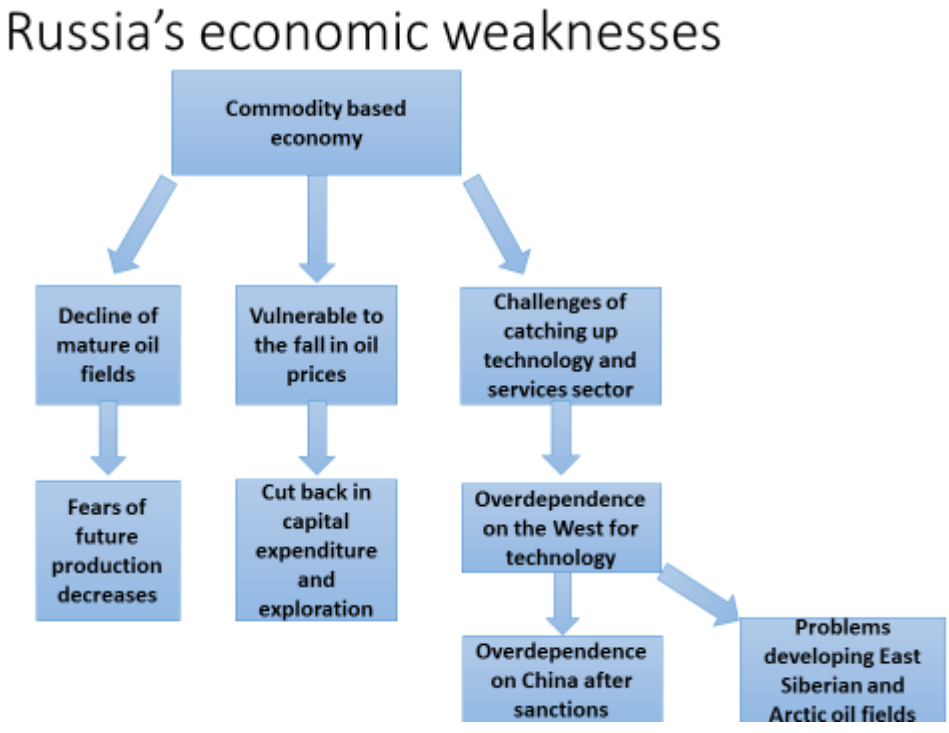
Technological
- Strong and fast technological development in the military
- Corruption scandals with technological giant "RosNano"
- Limited technological progress in social infrastructure
- Outflow of talented scientists to the West
- Technological dependence on the West
- Technological progress remains quite local without affecting masses
- **Very little cooperation between business and science**

The PEST analysis deepens reader's understanding of Russia and gives some insight on how the country functions. It shows potential investors all positive and negative sides of the country. In case of Russia, we can see that there is a strong leader that has support of 80% of the population. The country has started to play an active role in international arena: military backing of president Assad in Syria, organizing customs union with other ex-Soviet republics and strengthening ties with China. At the same time the country has many domestic problems that it needs to tackle like corruption and crisis of administrative system. Russia's

economy is still far from being considered modernized and self-sufficient. In fact, dependence on hydrocarbon exports, foreign loans and foreign technology has been one of the main reasons Russia's economy has started to contract in 2014-2015. Country's scientific base has not developed much since the fall of the Soviet Union and little is being done to incorporate scientists into the management teams of different infrastructural projects. Nevertheless, despite the administrative control crisis and Human Resource Management crisis, Russia's strategic move to the East is certain. In other words, the Russian government is resolutely committed to develop country's eastern regions.

Russia's economic vulnerability. The sanctions from the West were particularly painful for Russia because their aim was to exploit Russia's main weakness: not self-sufficient economy and dependence on the Western (EU and US) banks and engineering firms that provide cheap loans and necessary technology for various projects. The breakdown of the Soviet Union was followed by a massive decline in production and deindustrialization of Russia. The transition from socialist system to capitalist system was a very painful process, in which whole industries were destroyed due to their lack of competitiveness, compared to Western counterparts. Out of the few industries that continued to exist oil and natural gas are the most notable. Thus, the Russia ended up being financially and technologically dependent on the West. Even though with Putin in power the process of reindustrialization has started taking place with many new factories and industries re-starting their operations and hiring new workers, the process is quite slow and is still very far from turning Russia into economically and technologically self-sufficient modern state. To summarize Russia's economic vulnerability comes from the fact that Russia has a commodity based economy.

Figure 37



Another serious problem that Russia faces is the maturity of its oil fields. In West Siberia and Volga regions exists a problem of mature oil fields from which not so much oil can be gathered and there seems to be no new potential oil fields that can be developed. **There are two ways that Russian oil companies could deal with this problem: use special technology to enrich mature oil fields, so that they become economically viable again or develop new oil fields in the Arctic or East Siberia regions. The former solution requires superior technology and the latter one – availability of substantial funds and superior technology. At this point of time Russia lacks both.**

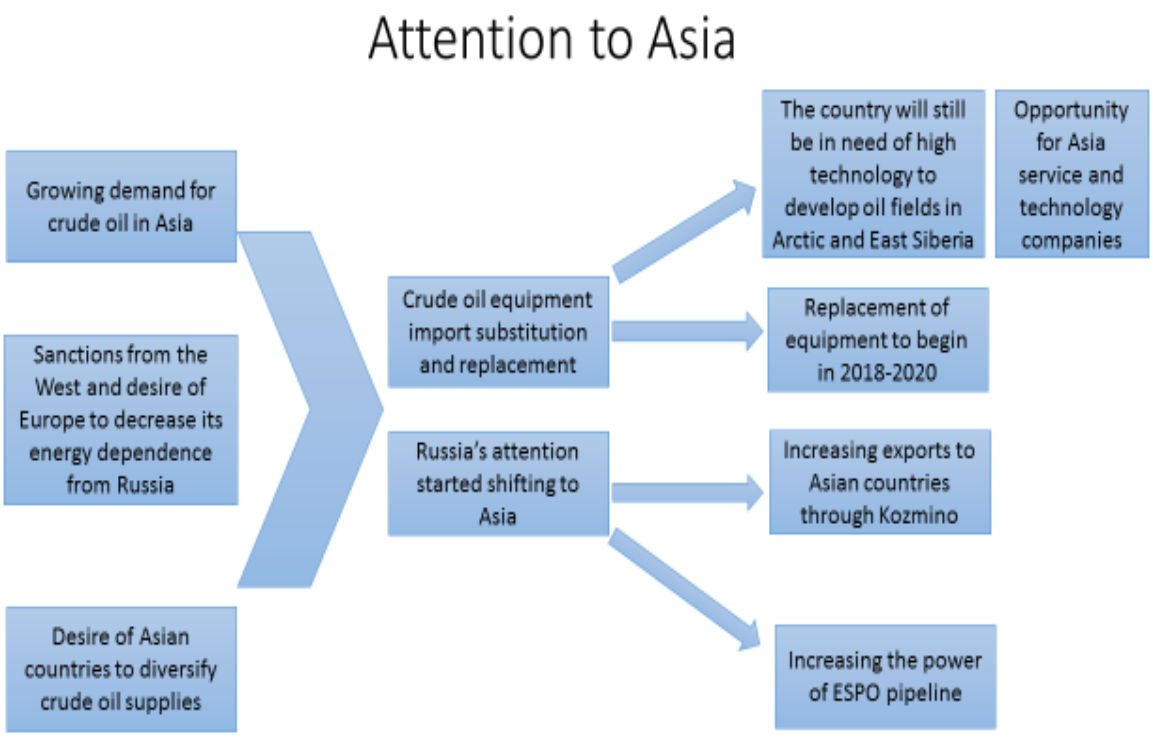
To sum up, the overall vulnerability of Russia's economy has been the main cause of crisis and GDP decrease in 2014-2015. The Western sanctions have revealed Russia's technological and financial dependence on Europe, whilst the fall in oil prices due to the influx of shale oil into the market revealed country's dependence on oil sales. **This crisis and the consequent budget deficit, as well as isolation from the Western world, has weakened Russia's negotiating position in joint development of oil and gas fields and made the country's oil majors more willing to sell exploration and extraction rights to foreign oil companies**. This is particularly true when dealing with Asian partners as most of the countries in Asia are not politically agitated when it comes to building trade ties with Russia – a quality strongly appreciated by the country's government and, in particular, Putin. The same cannot be said about European countries especially after events in Ukraine, as many of the Western European countries were ready to seriously damage trade ties that they have built with Russia over a long period of time, for the sake of showing how resolute they are to "stop Russia's aggression in Ukraine".

To sum up, the answer to the first question will be yes, it is possible for Japanese companies to take part in joint development projects in East Siberia and acquire exploration and extraction rights to the oil fields in the region. Even though such possibility has always existed, the events of 2014-2015, when relations between Russia and the West have started to suddenly decline, have increased this possibility as the country's oil and gas market has become more open to foreign investments (especially from Asia) and its bargaining power has become much weaker, implying that a better and a more favourable deal(for Japanese oil and engineering companies) can be made.

Shift from Europe to Asia.

The diagram below explains why there has been a strategic shift from Europe to Asia. Not to say that Russia is completely abandoning its interests in Europe and focusing only on its Eastern neighbours. Whilst trying to keep its economic ties with Europe as stable as possible, the Russian government is looking for new sources of growth – the Asian market.

Figure 38



The need to develop this tremendous region and provide its integration into regional economic processes is essential for the Russian government. It would not be an exaggeration to say that development of Siberia and Far East regions is and has been an existential matter for all the Russian leaders. Nowadays in particular the region is facing numerous problems including corruption, lack of jobs, drugs, local mafia, and population migration to Central Russia etc. The leader who will be able to solve these problems and seriously progress in developing this region would have his name inscribed in the history of Russia. Obviously, Russia cannot develop this region on its own and desperately needs foreign direct investment as well as technological support from its neighbours. This means that Russia wants engineering and oil companies to invest in the region. Therefore, it is possible for different companies that have enough capital and engineering know-how to participate in joint development projects.

Conclusion. Thus, having looked at**:**

- **Russia's economic and technological weaknesses**
- **Current poor state of trade ties between Russia and Europe**
- **Russia's desperate need to develop its eastern regions**
- **Russia's strategic move from Europe to Asia**

I can conclude that the Russian government is ready to accept foreign investment, joint development and

acquisition of extraction and exploration rights to oil and gas fields, especially if it is a technologically advanced country like Japan.

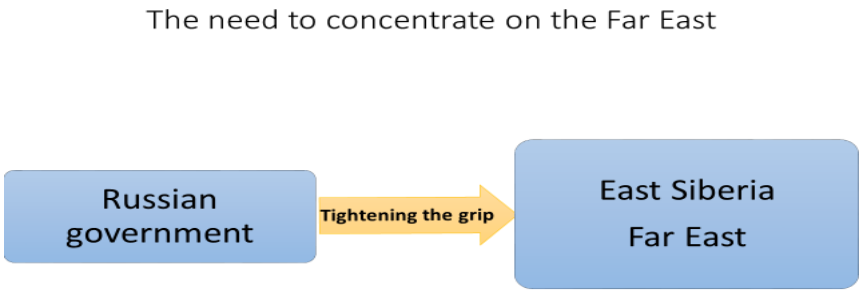
In fact, if we look at the speech of Igor Sechin, CEO of national oil giant Rosneft and an extremely influential person in Russia, in "Power Bridge Russia-Japan" (June 2015) we can see that Rosneft has offered Japanese companies around 12 upstream projects at various stages of development, from exploration level to industrial production. According to Mr. Sechin, the Russian side has created in elaborated legal environment and offered standardized and approved terms of capital participation. In other words, it becomes apparent that the Russian government will not only allow the Japanese companies to participate in different oil projects, but will also welcome them to do so and will guarantee favourable conditions.

East Siberia, Far East regions and long term prospect of Japan-Russia energy cooperation

Even though energy cooperation between Russia and Japan is possible, it does not mean that it is beneficial for the Japanese companies. Analysing the long-term potential of Japan-Russia energy cooperation and benefits from joint development of oil and gas fields in East Siberia will be the main objective of this part.

Far East (resources, current state and policies). The development of the eastern regions and their economic integration into Russian economy is one of Putin's key strategic goals. This fact already attributes certain significance to East Siberia and the Far East. The natural resource potential of this region is tremendous: oil, gas, coal, natural water, wood (forest), gold, diamonds, and metals– **resources that Japanese economy needs.** Furthermore, this rich region happens to be geographically close to Japan, China and South Korea – key economic powers in Asia Pacific region. Despite its huge potential and favourable geographic position, the region has been neglected for a very long time.

Figure 39



Recently, however, the development of this region has become top priority of Russia's central government.

Currently, the Far East region is considered to be Russia's leading region in terms of development. This tells us two things:

- A lot of money and power is being invested into various projects in the region;
- Being left behind for a long period of time, Far East has become considerably underdeveloped compared to other parts of Russia.

Deindustrialization, consequent job deficit, massive migration of population to Central Russia has negatively affected the region in 1990's. Thus, compared to Moscow, Saint Petersburg and even West Siberia, there is a relatively high poverty rate throughout the whole region. In a way poverty coexists with opportunity, since population is highly educated, but there are simply not enough jobs in the area. During the Soviet times the region was considered as country's "eastern stronghold" and many military objects were constructed including bases, missile defence systems etc. At the same time, social infrastructure was seriously lagging behind. Once the Soviet Union finished its existence and demilitarization and modernization became inevitable, many factories and whole industries were forced to close down leaving many men and women out of work. High unemployment level explains why the GRP (gross regional product) is so low in the region. Even though poverty was relatively quickly overcome in different parts of the country, in the Far East region it is still a serious issue. **Poverty and high opportunity implies that much can be achieved by paying relatively small amount of money as wages are not that high.**

High per capita FDI is another distinct feature of the region. This is due to high number of investment opportunities and low population density of the region, only 6 million people live in Russia's Far East. Sakhalin island development projects, construction of new ports, factories, power plants, pipeline systems and roads, development of social infrastructure in the cities – all this activity stimulates new investments into the region. **Fast growth of the region is its biggest asset, because it promises profits to the investors.** The fast growth is supported by growing level of competition between the regions when it comes to receiving Federal Funds. Russia's regional administration system is built in such a way that most of the finances that reach the region come from the Federal centre in Moscow. In other words, the Federal centre acts as a distributor of country's wealth. To receive more federal funds the regions must compete with each other in terms of their investment attractiveness i.e. the more attractive is the region the more federal funds it will receive. Besides the presence/absence of abundant natural resources, the investment attractiveness is determined by level of corruption, level of pressure on small medium-size business by the local administration, property rights etc. Despite some corruption scandals, **overall the Far East is regarded as a region that has a high business climate score i.e. high investor attractiveness.**

Finally, geographical position has always made this region very foreign-oriented, since the growth, development and business opportunities in the region have always depended on the neighbouring China, Japan and South Korea. Whether it is the import of foreign cars, export of petroleum products or building of new factories, the region takes account of the movements in these countries, as its economy is firmly tied

to them. In fact, when you visit the city of Vladivostok, one of the main cities in the region, you can see and feel that this city is very Asia-oriented: number of Asian restaurants, Asian hotel chains, overwhelming number of Chinese tourists, public schools where Japanese and Chinese languages are being taught etc. The same trends can be seen in other parts of the region. **This "foreign-orientedness" of the Far East makes it even more attractive to the foreign investors, especially the ones coming from Asia.**

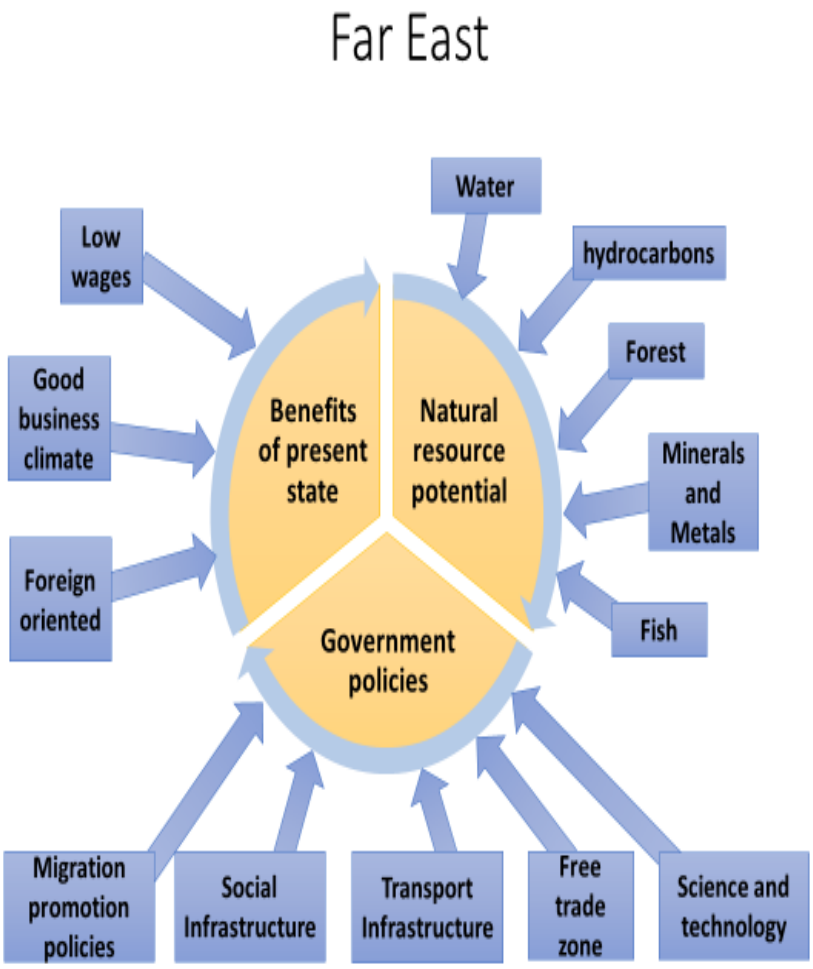
Nevertheless, sitting there and relying on foreign capital to solve all the problems is not enough – the government intervention is required. By implementing several economic, social and environmental policies the Federal government strives to bring life into the region, stimulate internal migration and attract foreign investors. One of the main aims of Kremlin is to turn the region into a free trade zone that would encourage influx of foreign capital and speed up the development. Giving Vladivostok a status of free port is a serious step towards trade liberalization. **Issuing visas at the border, fast system of border crossing, reduction of tax inspection delays, low tax on income for the investors, no tax on property for 5-10 years, low social welfare contributions –** these measures were carried out to create an investor friendly environment and integrate Primorskiy Krai in the world transportation system. On top that, Federal government has invested substantial funds into infrastructure projects: construction of roads, bridges and new international airport terminals. **By doing so the Russian government shows that it is committed to develop this region and provide all the necessary conditions for foreign investors.**

The government also pledges to improve healthcare, education and culture in the region. This would show that Primorskiy Krai is not only a place that attracts foreign business, but also an important part of Russia, with its own scientific and cultural life. Such policies could help stop massive migration from the region as local citizens would be incentivized to stay, rather than move. Completion of brand new campus of Far Eastern State University and Vostochny Cosmodrome symbolizes Russia's desire to develop its science and aerospace. Even though such large-scale projects remind the Soviet times, they play a significant role in attracting young talented people to this unique region and solving the problem of low population density. In fact, population density in the Far East is so low that it threatens Russia's authority in the region, especially keeping in mind how overpopulated are the neighbouring Chinese provinces with population over 100 million. In attempt to solve this problem as well as indirectly promote small, medium-size business activity, **the Russian government has passed a very peculiar bill that gives away one hectare of farmland and forest in the Far East for free to any Russian citizen who is willing to take it and move to the region. It is expected that due to this policy the population will increase six-fold i.e. from 6 million to 36 million.**

Finally, much is being done to protect the environment of this unique region and ensure that it does not get polluted. Protecting the forest, preventing the poachers and saving species that are about to get extinct – this is one of the few policies that are being carried out in this region. Not only does this activity improve the lives of local people, but also attracts many tourists from China, that just want to breath fresh unpolluted air, drink clean water and consume fresh food products. Especially after the fall of ruble the number of Chinese tourists flowing over the border just to buy food in Russian supermarkets has rapidly increased.

Even now when many new projects are being realized and new factories are being built, the government strictly controls that no serious damage to the environment is being made. In other words, environment, has become a very important asset of this region that contributes to its tourist/investor attractiveness.

To summarize, the Far East is a region that has substantial natural resource potential. This potential is still far from being completely realized – a unique business opportunity for Japanese companies. Considering high level of education, low wages, high business climate scores and "foreign-orientedness" of the region, the natural resource potential becomes even more attractive from the investment point of view. In recent years' government policies that aim to liberalize trade and speed up the development of the region have served as an evidence to foreign investors that Russian government is strongly committed to boosting this region and making it one of the most progressive areas in the country. Infrastructure, science & technology, small & medium size business and environment – are the main pillars on which the region is expected to flourish. **In other words, Russian government shows its readiness to play long, enrich the region and integrate it into Asia-Pacific Economy**, **rather than playing short, making quick profits and abandoning the region. This should further encourage FDI, especially the one that is aimed at long term oil and gas projects.**

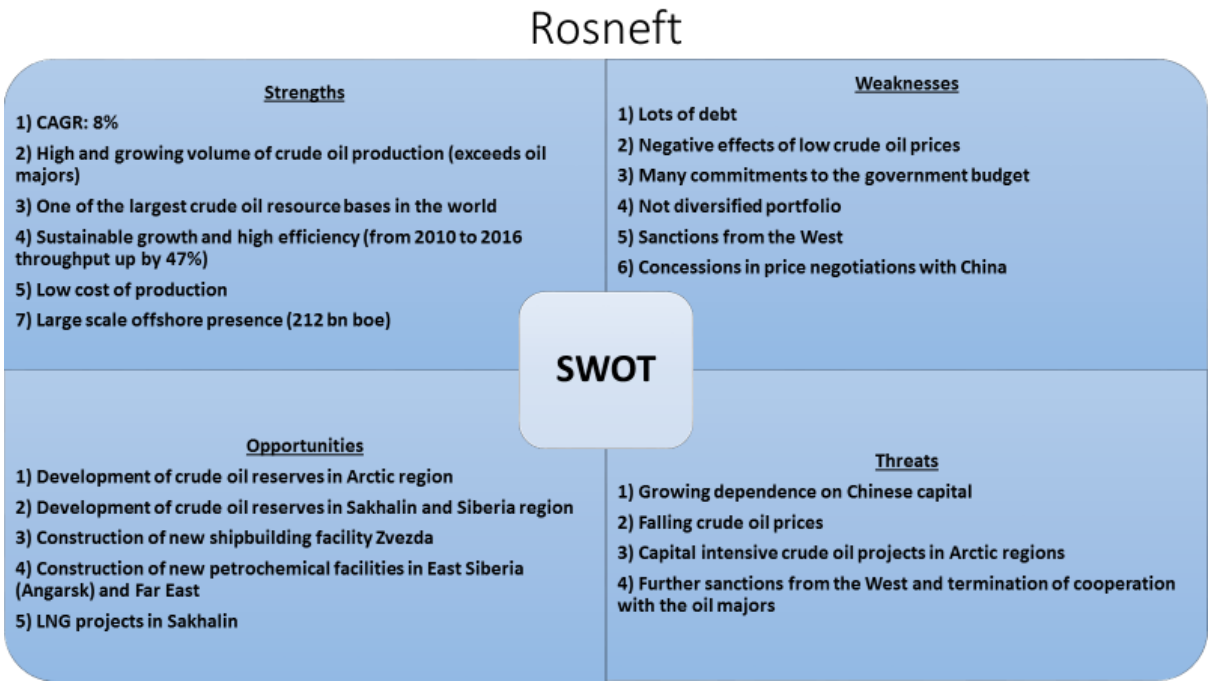


Oil and gas projects in the Far East; partnership with Rosneft

At the present time, East Siberia oil fields are being developed at a very quick pace. The speed can be explained by the need to fill the ESPO pipeline and supply hydrocarbons to the Asian economies. The more hydrocarbons the region supplies to China, Japan, South Korea, ASEAN etc. the faster it will grow. Most of the Far East and East Siberia crude oil field exploration and extraction rights are under control Russia's oil major Rosneft. The company is also in charge of two petrochemical clusters in East Siberia (Angarsk Polymer Plant) and Far East (Eastern Petrochemical Plant). Rosneft's contribution to regional GDP is 25% i.e. the company produces a quarter of all the products in the region. Since Rosneft plays key role in the region, it has expanded its activities beyond the core business and is now in charge of such projects as LNG production and export in Sakhalin-I and shipbuilding/oil platform building facility "Zvezda". The development of Arctic oil reserves in the Kara Sea is also under Rosneft's control. Therefore, I can conclude that East Siberia and Far East crude oil, petrochemical and some gas assets are under control of one company that represents interests of the Russian government and plays an active role in the region's growth. The head of the company is Igor Sechin, a very close friend of Putin and one of the most influential people in Russia.

To give the reader a very clear understanding of the company, below is a SWOT analysis or Rosneft.

Figure 40



To conclude Rosneft is a company with one of the World's largest oil resource bases; a company that plays

an active role in ensuring the growth and enrichment of the region. In other words, if you are a foreign company willing to invest in Russia, then Rosneft will be the company to deal with. **Foreign company that has strong trust relationship with Rosneft will be able to ensure that its rights and interests in Russia are thoroughly protected.** Even though a system that is based on personal contacts might seem a little primitive, it guarantees that no pressure or blackmailing will come from the local administrative or legal authorities.

Many oil and gas projects in the region require cooperation between Rosneft and other foreign investors, because oil business is risky and capital-extensive enterprise. Thus, to ensure success and reduce the risk, it is a common practice to make sure that foreign investors participate in the projects. Lack of investors would imply that the projects are not economically viable (not enough oil reserves) or that the local partners are not trustworthy e.g. break promises, change terms of contracts, use connections in local administration to put pressure on foreign investors etc. There was only one Western company that decided to sell its stake in joint venture with Rosneft and leave Russia (2014): ConocoPhillips. However, the main reason for abandoning the Russian market was pressure from the U.S. president's administration when economic sanctions on Russia were imposed after events in Crimea. All other oil majors like BP, ExxonMobil, Royal Dutch Shell, Total etc. managed to keep and even expand their oil assets in Russia despite the numerous warnings from US and European governments. This suggests that oil majors find the business environment in Russia favourable and cooperation with Rosneft – productive. On top of that BP holds 20% of Rosneft's shares implying that strategic partnership exists between the two companies. **Therefore, judging from cooperation with international oil majors, Rosneft is a strategic partner that can be trusted and the benefits of investing in Russia outweigh economic and political risks. Furthermore, we can assume that most of oil projects in Russia are profitable enough for these companies to continue and even expand their operations.**

What about national oil majors of such countries like China or India? Let us have a look at some of Rosneft's oil projects:

Figure 41

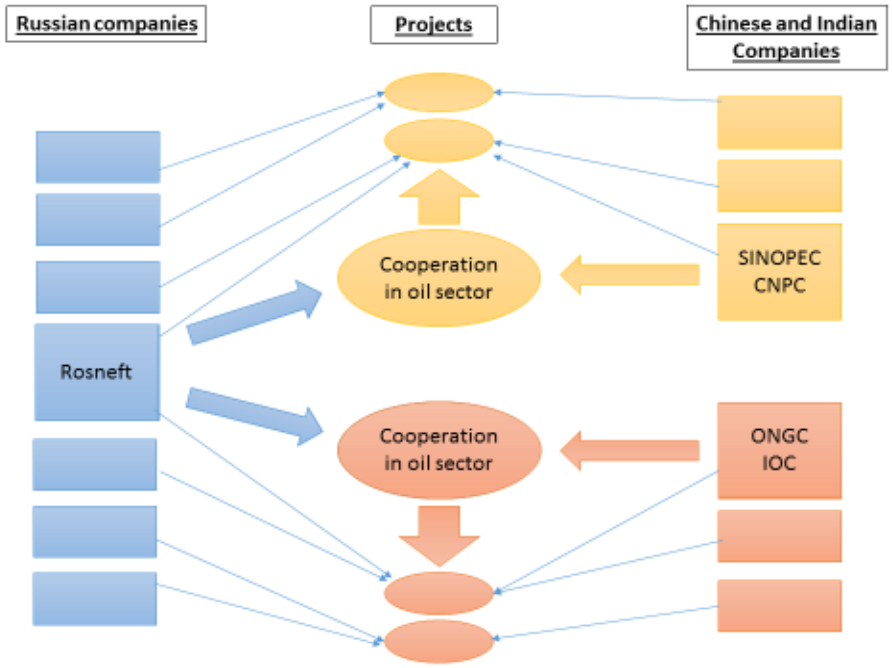
Project Name	Company in charge	Foreign capital	% of Foreign Capital
Sakhalin-I	Rosneft	ONGC Videsh	20%
Sakhalin-I	Rosneft	SODECO	16%
Udmurtneft	Rosneft	Sinopec	49%
Vostok Energy	Rosneft	CNPC	49%
S-3 Veninsky	Rosneft	Sinopec	25%
Fepco (Nakhodka)	Rosneft	ChemChina	20%
Yurubchen, Rus	Rosneft	Sinopec	49%
Vankor Oil Field	Rosneft	ONGC Videsh	26%
Taas Yuryakh	Rosneft	BP	20%
Taas Yuryakh	Rosneft	IOC, OIL	29%

The results speak for themselves. National oil majors of India and China happen to own shares in most of Rosneft's oil projects in Far East and Siberia regions. This suggests that these companies have substantial strategic interests in the region. Furthermore, they regard Siberian and Arctic oil projects as economically viable, otherwise they would not be investing and consequently expanding their stakes in them. For these companies the fall of ruble and Russia's move to the Asia is great opportunity to strike a deal and buy as many assets as possible, since they believe the value will grow in the future as the field output will increase. For Sinopec and CNPC it is strategically and politically important to invest in Russia's oil fields since Russia is a neighbouring country, the resources of which will guarantee China`s energy safety in the future(Khudainatov, 2012). In other words, there might exist reasons to oversee economic viability of these projects as geopolitical aspects matter more. **For India, a country that has no border with Russia, this is obviously not the case. The fact that Indian companies invest in East Siberian projects and consequently expand their share proves that the projects are economically viable and guarantee large supplies of crude oil and sufficient returns. It also shows that Rosneft provides favourable conditions for investors, especially for the investors that fall into category of strategic partners.**

It seems that Sinopec, CNPC, IOC and ONGC have managed to establish strong trust relationship with Rosneft and they are not afraid to invest into large-scale oil projects in East Siberia and Sakhalin and they are sure that their interests will be protected. It is also worth noting that committing to oil projects in Russia benefits other spheres of bilateral cooperation. For example, we can see that Sinopec and CNPC investments in oil fields and petrochemical projects, have facilitated other important deals between Rosneft and Chinese engineering and shipbuilding companies i.e. one deal has created trust relations and these trust relations have led to other deals that benefited Chinese companies. By fulfilling numerous contracts these companies increased their exports to Russia. On the other hand, strong trade ties with India oil companies like IOC and ONGC has allowed Rosneft to enter India's gas station market and start building its own gas station network. **It is evident that cooperation between Rosneft and Chinese/Indian companies in the Far East has brought**

many benefits to both sides. In fact, cooperation does not stop at a single project, but expands to other projects and even other sectors. In this way, it can be stated that cooperation with Rosneft in oil sector will guarantee many opportunities in either engineering, petrochemical or even shipbuilding sectors, especially since the company is committed to very laborious and technologically difficult development of Arctic oil project.

Figure 42



Opportunities and personal contacts. Separate explanation must be given about the importance of personal contacts when it comes to making business in Russia. Even though connections help to solve problems and make agreements in different parts of the world, in Russian Federation this tendency is particularly strong. The only way for foreigners to establish these connections is to build trust relations with the top authority in this country. The presidents of the national oil and gas majors are in fact clear representatives of this authority. Successful joint development projects in oil and gas sectors will open doors to numerous business opportunities in Russia. Having gained Rosneft's and, personally, Igor Sechin's support, a foreign company can safely participate in any investment project in East Siberia or Russia that it finds interesting. Rosneft's patronage is a sort of guarantee that the company will not be subjected to any sort of pressure from legislative or administrative organs. Such simple and to some extent primitive decision mechanisms, in which essential role is attributed to patronage of powerful nomenclature, will alarm some investors and stop them from investing in Russia. However, this is the only scheme that works in Russian Federation and the foreign companies that followed this scheme benefitted a lot, the ones didn't despite having a chance – missed out.

What are these unique investment/cooperation opportunities and where do they originate from?

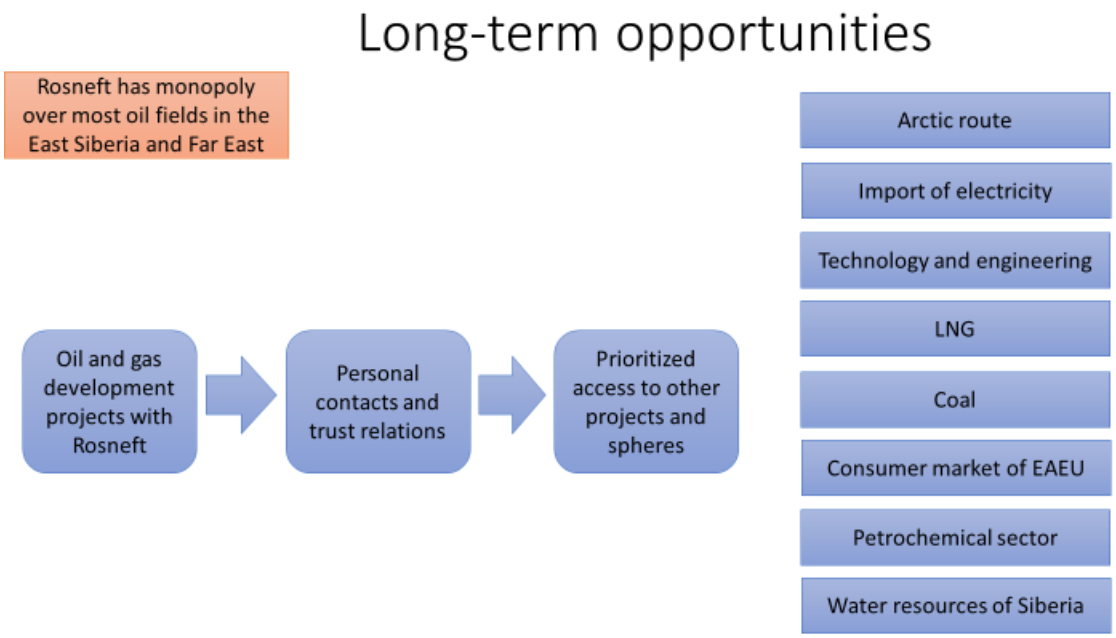
First type of opportunities to look at are the opportunities in the natural resource business. Hydrocarbons are abundant in Russia, especially in Siberian region. Drilling, mines, factories, refineries, shelf etc. all these projects are linked to the hydrocarbon industry and not all the equipment used in construction, operation and improvement of this industrial infrastructure is necessarily Russian. This creates a great opportunity for technology and engineering companies as they can increase their exports. The resources are not limited to hydrocarbons, there are reserves of gold, diamond, metals and forest in the region, the discovery, extraction and processing requires very fine technology, some of which Russia federation does not have. This is another window of opportunity for technology exporters. Export of technology will ensure preferential treatment when it comes to deciding which country gains the access to the natural resources. Finally, natural water and fishing reserves. As most of you know, in the near future humanity faces lack of natural drinking water, in fact the population in some parts of the world is already suffering from this problem. In Gulf States, drinking water costs more than crude oil. The fight over the water reserves will continue to escalate. Siberia has one of the world's largest reserves of natural water – this is one of the most valuable strategic assets of the region. This asset can be turned into hydroelectric power and represent a never-ending supply of drinking water. **Commercializing the natural water resources of Siberia will provide many business opportunities.** Foreign companies that will help Russian partners implement these plans will be in a beneficial position when importing this water to their own countries.

The Chinese, Japanese, South Korean and Indian investments imply that the economy of the region is expanding and the market is growing. Consequently, the region is experiencing a serious transformation: from a god-forgotten region on the outskirts of Russian Federation with falling population to a quickly growing, developing region that is completely integrated into Asia Pacific economic zone. The surge in FDI from abroad, and serious influx of tourists from China has brought more life into the region, created jobs and business opportunities and stimulated growth that did not stop even during the economic fall in 2014-2015. Therefore, foreign investments independent of which sector of the economy they are directed at (natural resource, tourist, industrial etc.) play a crucial role in creating a consumer market. From this point of view, Far East is not only a place that has resources that need to be extracted and transported, but it is a substantial consumer market. The creation of consumer market in the Far East, will imply many opportunities for Asian producers that seek to find new destinations for their products: cars, electronics, food, toiletry, healthcare etc. **The faster the producer enters and conquers this regional market, the easier will it be to create a loyal customer in the region.**

Finally, there are other opportunities, which are more grand and long-term. First, the access to Arctic passage – the shortest possible way from Asia to Europe. The Arctic passage goes through Russian territorial waters. For ships to pass through this passage throughout the whole year atomic ice breakers are required – special ships that will break the ice and allow the transport vessels to pass through. Currently China is seriously working with the Russian government trying to figure out how to effectively utilize the Arctic Sea Route. Since the access to this route depends on the presence of atomic ice breakers, it is highly unlikely

that all freight ships will be able to access this route at any time implying that a competition between regional players is probable. Quick access to Western ports and reduced transportation costs are the biggest advantages of the Arctic Sea Route. The commercialization of it will have a revolutionary effect on transportation of goods between Europe and Asia. Another very big opportunity of investing in Russia and forming alliances with oil and gas majors is access not only to the Russian market, but also to EAEU markets i.e. Kazakhstan, Belarus, Armenia and Kyrgyzstan. Even though none of these countries can be considered a modern economy with developed consumer market, all of them have high growth potential, natural resources and combined population on 176 million. Being able to easily access these markets will help foreign companies to gain more customers. In fact, this is exactly what Chinese business is doing now, heavily investing in different strategic projects in Belarus and Kazakhstan, trying to drain as many resources as possible from these countries.

Figure 43



The reader can now have an idea of what are the long-term benefits of cooperation with Russian national oil and gas companies in the development of the Far East. The question then arises: “Are the Japanese oil and trade companies utilizing the full potential of trade cooperation with Russia, creating more opportunities for the Japanese business to enter the market?” – not exactly. The next part of the chapter will be devoted to closely looking at Japan-Russia cooperation in oil sectors.

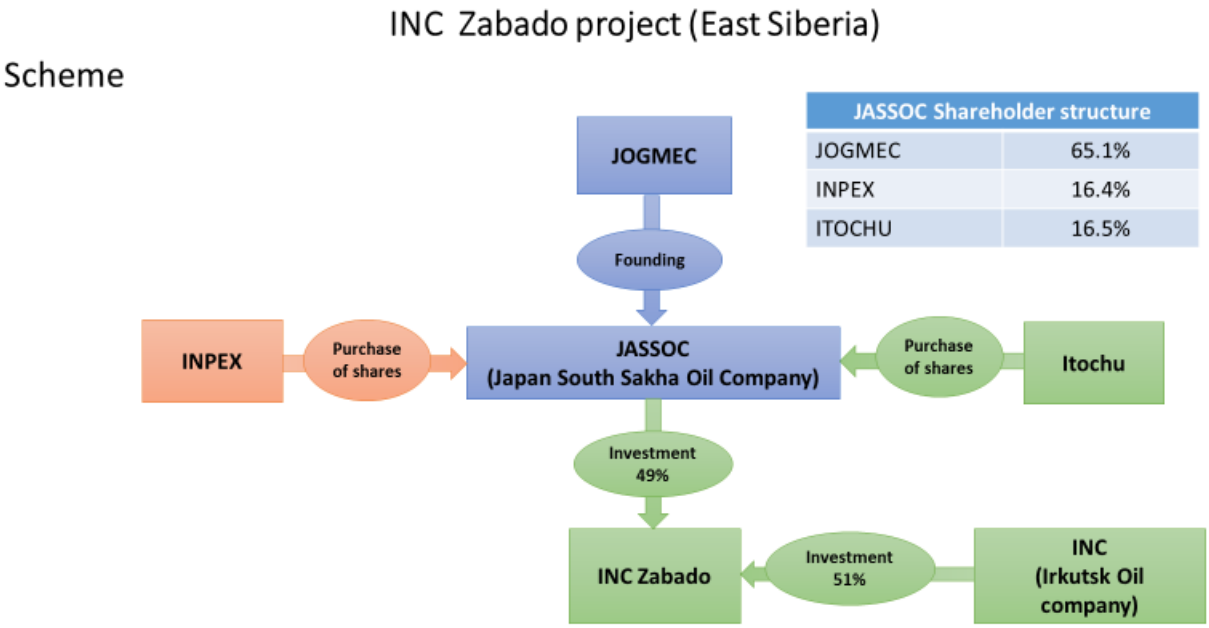
Current state of Japan-Russia cooperation in the oil sector

On October 13th, I managed to interview Keisuke Yano, a person working in Public Relations department of

INPEX, a Japanese oil company that actively participates in upstream oil projects around the world, drilling and extracting crude oil to be consumed in Japan. The interview was very informative as it revealed various specifics of the business. To find out more about cooperation between Japanese and Russian oil/natural gas companies in other projects I also contacted JOGMEC information bureau and got all the information I needed.

At first, I would want to give a short summary of the joint project, in which INPEX, JOGMEC, ITOCHU and Irkutsk Oil Company have participated in. The project of Zabado oil field development was the first oil project in East Siberia, in which Japanese company took an active part. INPEX has entered the project with Itochu Corporation and JOGMEC organization(智裕)(智裕). JOGMEC has founded JASSOC, Japan and South Sakha Oil company, and both Itochu and Inpex bought shares of the company (16.5%) and became co-owners of it. JASSOC created a joint venture company with Irkutsk Oil Company (INC), a medium-size, regional oil producer. The name of this joint venture is **INC Zabado.** JASSOC owned 49% of shares and INC – 51% of shares. Besides the oil exploration, the project also involved building a pipeline, that linked the extracted crude oil to ESPO pipeline to be delivered to port Kozmino from where it can be exported to Japan. Thus, the project had a strategic significance to Japan as it provided the crude oil that would be refined and consumed in the country.

Figure 44

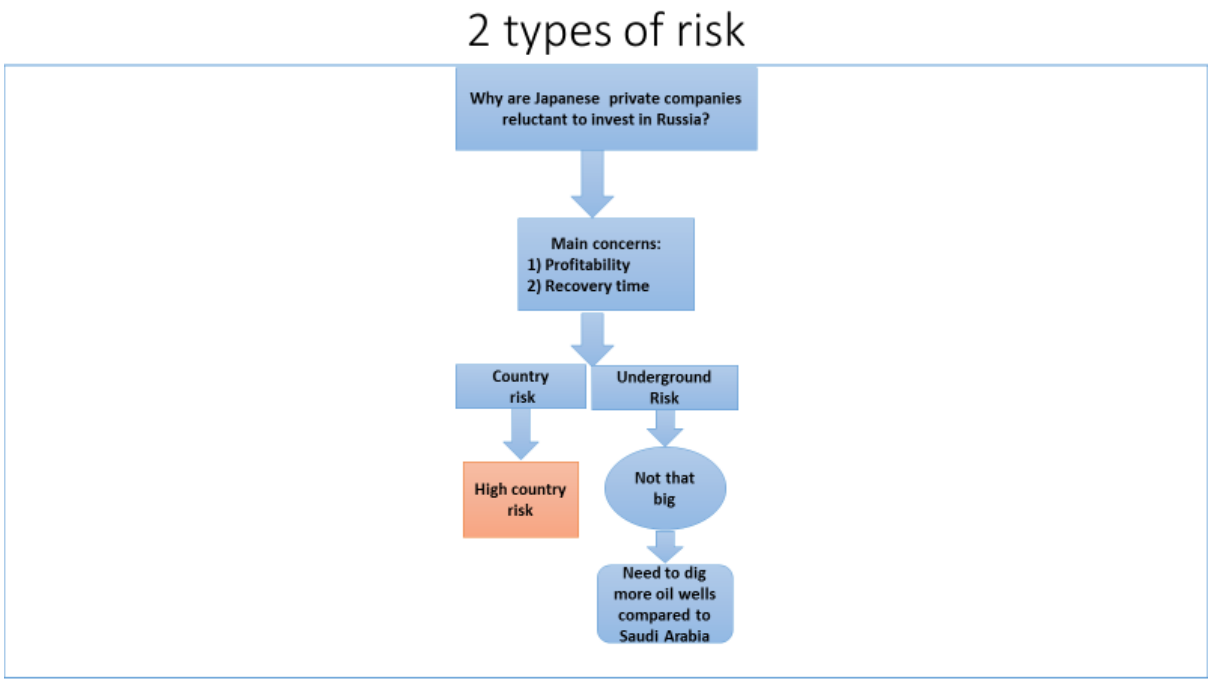


At first Mr. Yano stressed on the fact that INPEX is a private company and it is responsible for profitability of its projects in front of the shareholders. Therefore, when investing into oil/gas development projects around the world, one of the primary concerns of the company is how fast can it recover the invested capital: **the faster the bette**r. Here one can notice two major barriers to successful long term operations in Russia:

- **The company had no intention to engage in long term strategic cooperation with Russian crude oil companies, because otherwise it would have chosen a large-scale oil project that had substantial oil reserves (the oil potential of this project is very modest)**
- **By choosing medium-size oil producer, Irkutsk Oil Company, Inpex could not establish serious trust relations with national oil major Rosneft, that could guarantee it participation in other oil development projects in the region with high reserve potential.**

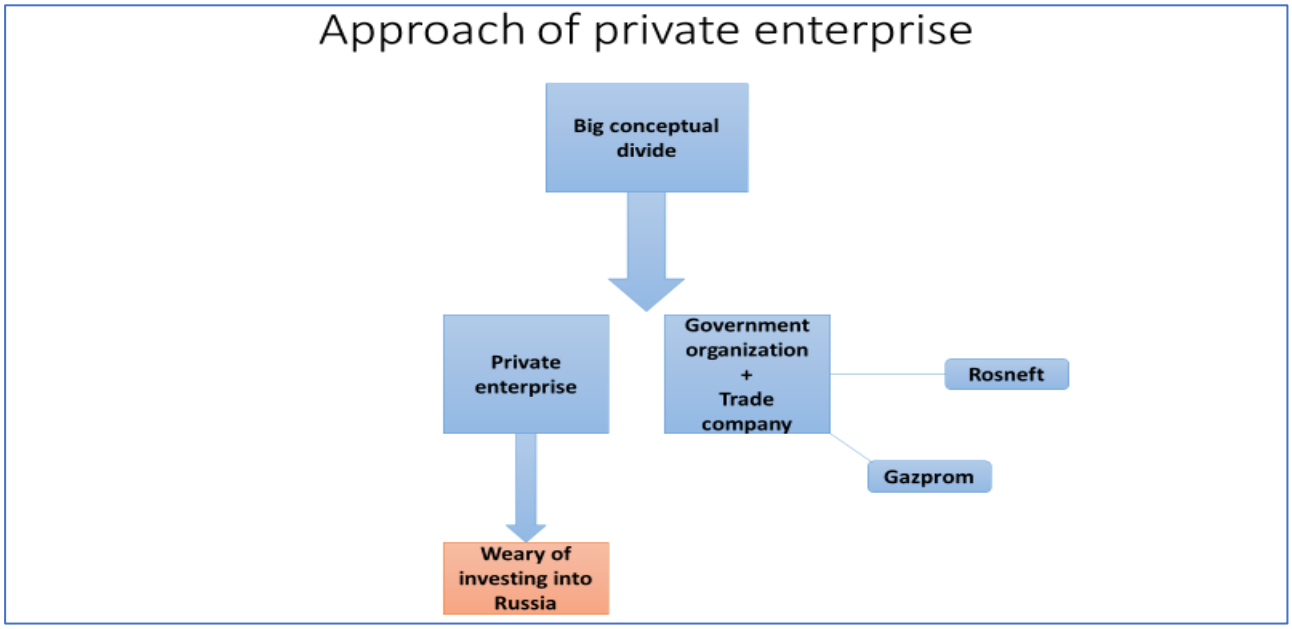
In other words, Inpex chose a short-term approach: just invest in a single project and no full-time commitment to East Siberian oil fields. Therefore, putting itself in this situation Inpex regarded Zabado project as one of its assets that it needs to make profitable in a very short period of time in order to please the shareholders. Thus, instead of looking at long-term strategic meaning of East Siberia oil fields, it will look at short-term political and ground risks. This explains why according to Mr. Yano the company is very wary to invest in Russia due to high political risks. To be more specific, in Mr. Yano's opinion, Russia has a very high country risk. By high **country risk**, Mr. Yano implied a very unclear judicial system that can be influenced by bribes or by the will of the superior authority. On top of that, the rules of the game are very unclear as they keep on changing every now and then. All this does not allow the company to plan for 10-20 years ahead, the average time it takes to bring an upstream project into life. The situation is further aggravated by lack of decent roads and infrastructure as well as technological difficulties of working in extreme cold weather of East Siberia. Underground risk denotes the risk of not being able to excavate sufficient amounts of crude oil due to poor geological expertise or difficult excavation conditions. In case of East Siberia oil projects, underground risk is not critical.

Figure 45



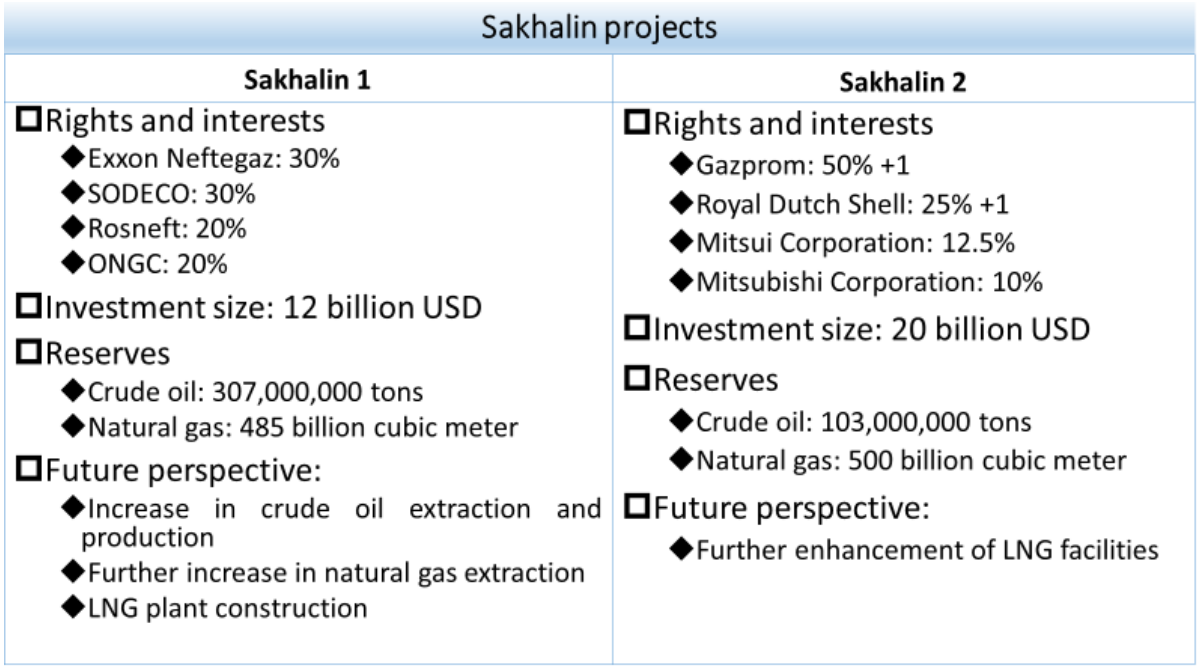
Obviously, the top management of the company will have a very hard time trying to explain the shareholder why they have decided to invest in an oil project that is so hard to lift, from both technological and financial points of view. On the other hand, the government represented by JOGMEC has no need to explain to shareholders how many short-term profits can a project guarantee, because the government's main concern is Japan's hydrocarbon self-sufficiency, not the shareholder satisfaction. **Here we can see the key difference between upstream oil projects that guarantee quick profits and upstream oil projects that have a significant strategic meaning for the country.**

Figure 46



Having looked at the project, involving participation of Japanese private oil company, lets now observe projects with JOGMEC and Sogo Shosha (Japanese trading company involvement). Both projects are located on the Sakhalin island. Here is a quick summary of these projects:

Figure 47



This time the scale of the projects is substantial and interest in them is also very high. The Russian side is represented by Rosneft and Gazprom, the main players in the Russian market. Oil majors like Exxon Mobil and Royal Dutch Shell as well as India' s multinational company, ONGC, are among the participants in the project. These enterprises are expected to grow in capacity and the total production of oil/gas is expected to increase. **There is a considerable difference between Sakhalin projects and Inpex East Siberia project: strategic significance and resource potential of the former is much greater.** What is it that JOGMEC and Sogo Shosha have (and INPEX doesn't have) that allowed JOGMEC and Sogo Shosha to get involved in the project?

- Connections of Sogo Shosha in Russia; Mitsui and Mitsubishi have strong ties with both Russia business and government. The same refers to JOGMEC
- The size of Sogo Shosha/JOGMEC, which is incomparably greater than INPEX
- Access to cheap financing through government subsidies (JOGMEC) or through Keiretsu system (Mitsui, Mitsubishi9
- No need to report to the shareholders

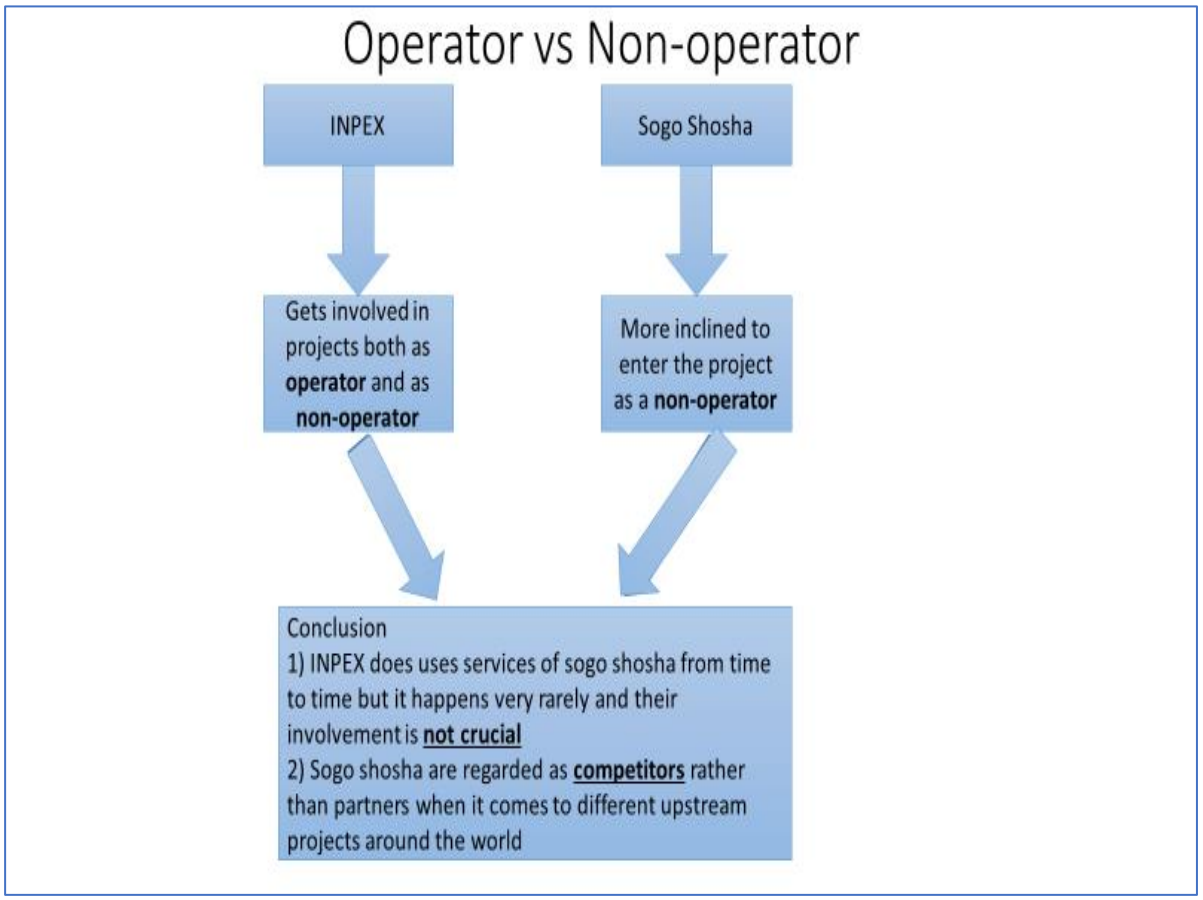
Operator vs Non-operator

According to Mr. Yano there is one more significant difference between Inpex and Sogo Shosha when it comes to their involvement in the oil projects: Inpex tends to fulfil the role of **project operator** more often than Sogo Shosha.

What is a difference between operator and non-operator?

Oil projects where only one single company is involved are quite rare. In the case when you have more than one company involved, it is usually decided who becomes an operator. The decision of who becomes an operator takes place on the spot and as a result of an open tender. Only the companies who win the original bid are allowed to participate in the tender. The difference between operator and non-operator is quite substantial. Operator has full control of the project and is in a position to make all the crucial decisions. Mining, extraction, working with local government etc. lies on operator's shoulders, thus the workload of operator is higher than that of non-operator. Among all companies participating in the project only one can become an operator. On the other hand, non-operator usually plays the role of an investor i.e. it invests in the project and usually gets revenue from it. Therefore, non-operator participation is limited to only few decisions regarding the project.

Figure 48



Conclusion of part 5

Economic viability and political risk

Nevertheless, on overall the participation of Japanese oil companies and sogo shosha as both operator and non-operator in the Russian oil projects is very limited. **In fact, despite Rosneft offering around dozen projects for Japanese companies to participate in both upstream and downstream sectors, so far, their involvement in the Russian market has been limited to only two projects**. At the same time, Japanese companies participate in around nineteen US and Canada oil/gas projects developing extremely capital-intensive deposits: oil sand and shale oil (Sechin, 2015). The efficiency of these projects is quite low; Japanese firms ended up writing off 6 billion USD due to bad investments. With shale oil and shale gas losing their economic viability because of low oil prices, the situation is expected to aggravate even further. On top of that, Russian projects are geographically closer to Japan, which suggests lower transportation costs and faster access to resources. The economic viability and crude oil potential of Siberian regions is also very high and population density is extremely low implying that the locals will not be negatively affected by the drilling or exploration. The same cannot be said about shale oil projects that damage the surrounding environment, pollute the water and cause many inconveniences to the citizens of the neighboring regions. To sum up, **Japanese oil companies and sogo shosha refrain from participating in Russia oil projects, giving their preference to less economic viable and more capital intensive in Canada and United States.**

Furthermore, unlike oil projects in United States and Canada where there are many interested parties, oil projects in Russia, especially ones where Rosneft is in charge, guarantee participation in other oil projects and sectors, as final decision is made by a limited amount of people. There are several areas with high potential of cooperation between Russian and Japanese businesses. In Russia, there are many oil wells that require regeneration and gas wells where deeper development is possible – this is a business opportunity for Japanese technology and oil service companies, which offer high class engineering solutions to this problem. Furthermore, geographical closeness of two countries makes electricity transmission between the two countries (from Russia to Japan) possible. Since electricity costs in Russia are much lower than in Japan, this could help the latter reduce its electricity costs. Finally, there are numerous other investment opportunities from Arctic exploration to development of social infrastructure in the Far East. **Though there are several investment opportunities, the Japanese oil companies (and Japanese companies in general) seem to refrain from investing in Russia. It appears that the main justification for not investing in Russia are political and structural risks.** What are the political risks of investing in Russia? How is the Russian government and business addressing these risks? What are the limitations of these actions? What remains to be done? All these questions will be answered in the next chapter of the diploma.

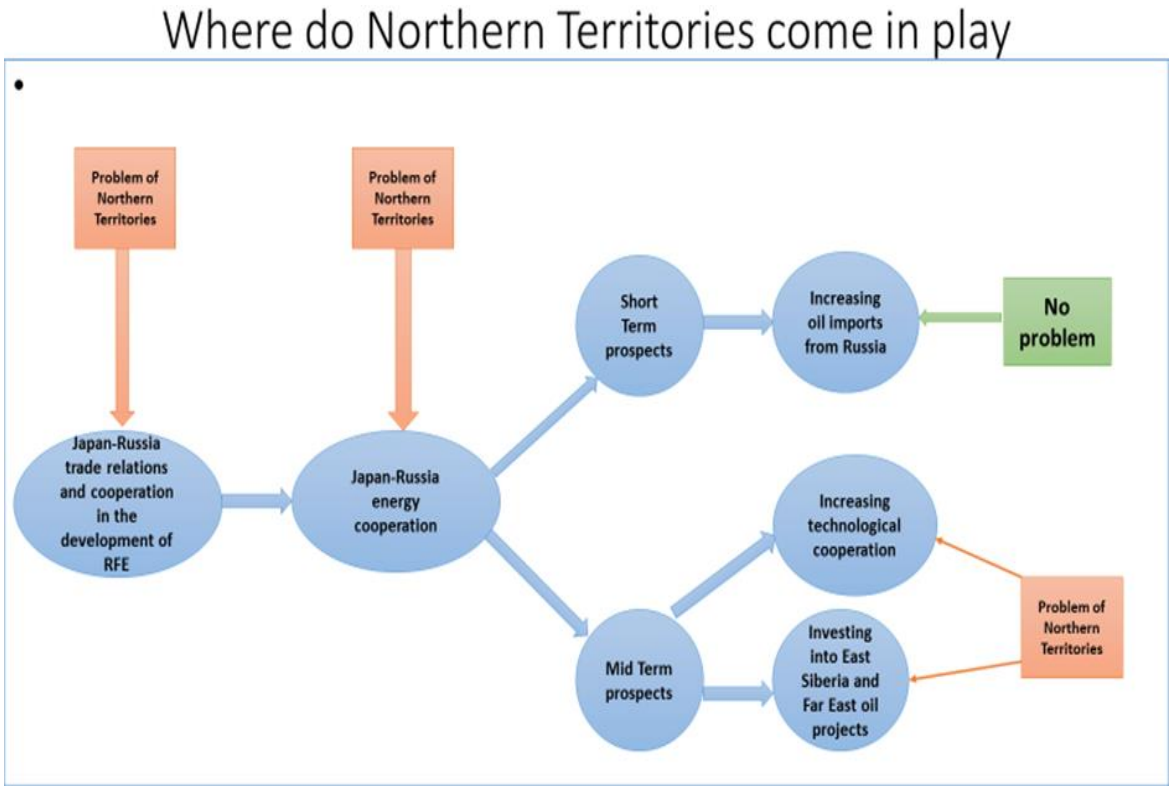
The problem of Northern Territories

Although I mentioned in the beginning that I would avoid talking about the problem of Northern Territories in this diploma, I cannot avoid mentioning the problem of Northern Territories at some point as the failure of both Russia and Japan to solve the territorial dispute and sign the peace treaty is one of the major hindrances to strong bilateral relations. From the standpoint of the Japanese government and Japanese

companies the more they invest in Russia, the stronger will be Kremlin's negotiating position, as the economies of the two countries will be strongly intertwined. In other words, the chances of signing the peace treaty and getting the four islands will become slimmer. The Russian point of view is quite the opposite. For Russia go give up the four islands, it must be sure that there is a strong strategic/trade alliance between Russia and Japan and there are strong trust relations between the two countries. There is no other way the government could possibly give away its territory without its reputation being seriously damaged. Since two sides have completely different approaches towards the same problem it will be very difficult to find compromise and sign the peace agreement. **Thus, the problem of Northern Territories can be considered a serious hindrance to Japan-Russia long term cooperation in East-Siberia oil field development.** The longer it takes to sign the peace treaty the slimmer are the chances of full-fledged Japan-Russia energy and trade collaboration in East Siberia, as the time works against Japan-Russia partnership and for China-Russia partnership i.e. there might be nothing to catch for Japanese companies in East Siberia by the time the peace agreement is signed.

Even if the problem of Northern Territories represents a barrier to long-term Japan-Russia energy cooperation, it shouldn't stop Japanese companies from buying more East Siberian crude oil and strengthening short-term energy cooperation.

Figure 49



Lost opportunity

I can conclude that there are many investment opportunities in the Russian oil sector. These opportunities are being efficiently used by the Chinese and the Indian companies, but no by the Japanese oil companies. Japan's oil companies and sogo shosha regard Russia's political and systematic risks as too high for any sort of long term investment in the country. Even though Russian political, economic, social and judicial systems are old fashioned and not very suited to attracting foreign direct investment, Chinese and Indian oil companies continue investing because for them it is important to cooperate and expand cooperation with Russia in oil and other sectors, as they consider it beneficial from economic and strategic points of view. Chinese companies are very active as they try buying up all the assets in East Siberia for a relatively low price through series of tough price negotiations. Since there are no other big players in the region that are ready to invest in Russia's oil assets, Russian government and Russian businesses have no other choice but to sell oil and oil exploration rights to Sinopec, CNPC etc. Even if at some point in the future Japanese companies will reach a conclusion that cooperating with Russia in the oil sector (as well as other sectors) is beneficial for Japan and the benefits from that cooperation outweigh all the disadvantages and political risks etc. **it might be too late as by the time such conclusion is reached there is a high chance that all the oil assets of East Siberia would be in China's hands and most of the oil being produced in the region will be delivered to PRC**. From this standpoint, in my opinion it is vital for Japanese oil companies to reconsider their approach to oil cooperation with Russia and realize all the strategic gains that can be achieved from cooperation with Rosneft, Gazprom, Novatek, Sibur etc. in development of East Siberia oil fields.

Part 6: Political and structural problems of Russia

In the previous part, I concluded that Japanese companies refrain from investing into Russia and keep joint oil and gas fields development projects to the minimum. The main argumentation for such behaviour is lack of political stability and unfair legal system in the country. This part will be devoted to analysing what issues negatively affect Russia's investment climate and force foreign investors, particularly Japanese oil companies, choose oil projects in other countries over Russia. Different problems will be listed and their effects evaluated. Next, I will carefully look at how these problems are being addressed by the Russian side: government policies, their results and limitations. Having analysed the limitations, I will move on to looking at strong and progressive points of oil/gas industry in Russia. In the end the reader should be persuaded that even though political risks from investing in Russia's oil/gas projects do exist, these risks are being adequately handled and the country is gradually moving towards a stable political system with clear and fair legislation.

Political and structural risks that Japanese companies bear when investing in Russia

Investing in Russia, is certainly a risky enterprise. Out of various risks that exist, the political risk seems to be the most substantial. Hydrocarbons fall under the category of strategic resources, implying that a certain political risk will always be associated from investments into oil and gas sector – country exporter will be reluctant to allow outside players access to its strategic resources. That is also the case for Russia as natural resources (majority of which are hydrocarbons) make up 70% of Russia's total exports.

Nevertheless, when it comes to investing into Russia, other important factors come in play and significantly add to the country's political risk. First, there is much uncertainty about the future direction of the country – no one can possibly predict which economic, political and social model the top authority will choose. Currently, there is strong divide in the government between liberal and conservative factions. Putin balances between these factions, leaning towards the conservative wing. What will happen after Putin leaves the presidential post remains unclear. Will the top authority in the country still try to find compromise between factions? Will the fight between two wings of power ever finish and how? **If any of the factions will start dominating, drastic changes within the country can be expected.**

Yet another serious barrier to foreign investment is lack of any administrative mechanisms or fair legal system that would protect the rights of business, especially small and medium-size enterprises, as they end up being the most vulnerable. In general, the business in Russia feels quite unprotected and often becomes the target of blackmail from regional authorities and law enforcement organizations. Many businessman feel that they can't rely on the country's judicial system, as it is generally unfair and will never take the side of the business. Thus, they are left with no other choice, but to bribe the authorities to guarantee

continuance of their business activities. **Thus business, in particular, small and medium-size, in Russia is often considered as one lacking rights and being pressured by corrupt administrative and law enforcement system.** Needless to say, that in many cases business also becomes part of the corrupt mechanism and in a way, supports the existence of it.

Other set of risks of investing in Russia are less broad and are more directly related to Japan-Russia relations. The incident in Sakhalin-II project when Gazprom backed up by the Russian government has forced Royal Dutch Shell, Mitsui and Mitsubishi to reduce their stakes in the projects and sell remaining shares to Gazprom. In other words, the interests of foreign investors were completely neglected and their business rights violated, since they had nothing else to do, but to give in to pressure. Even though Gazprom used harm to the surrounding environment as an excuse, the main intention was to gain access to sophisticated shelf technology. This incident has been very damaging to Russia's reputation and negatively affected Foreign Direct Investment flow into the country. The companies would be very reluctant to invest into a country where the government can intervene at any time and easily neglect the rights of foreign investors. T**he rules are very unclear and they are constantly subject to change depending on circumstances.** Fortunately, these incidents happen very rarely these days.

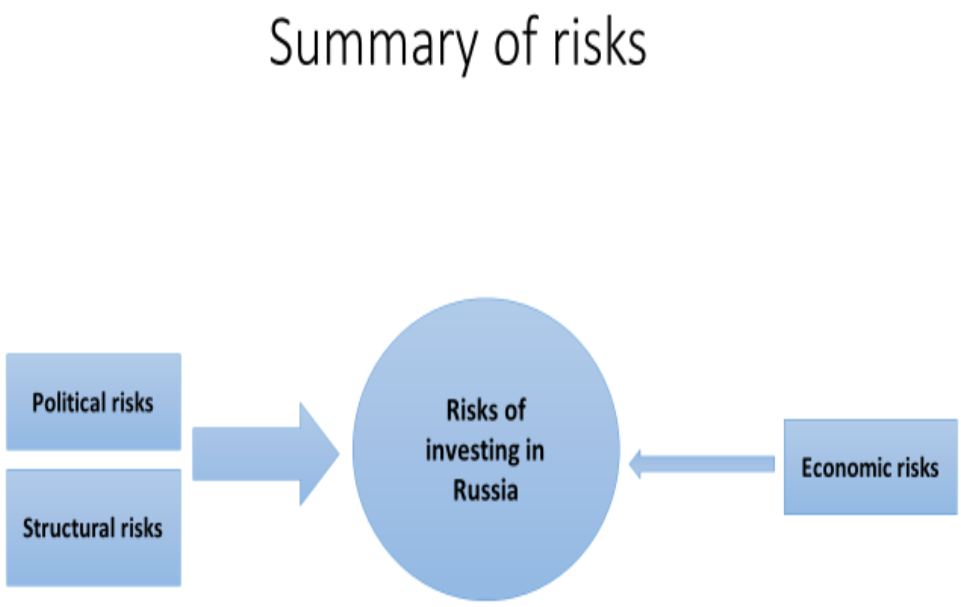
There is also a set of political obstacles. First, there is a serious problem of Northern Territories. One of the reasons Japanese businesses are reluctant to invest in Russia, because they think that trade interdependence will give Russia upper hand in peace treaty negotiations. **By helping Russia develop East Siberia and becoming economically self-sufficient, Japanese business will further strengthen Russia's negotiating position and the 4 islands will never be under Japan's jurisdiction.** Finally, Japan's strategic and military alliance with United States will always hinder strong trade and regional ties between Moscow and Tokyo. The reason for that is US desire to dominate in the region and make everyone else follow the rules it created. This is something that neither Russia, nor China will ever be able to accept, as they regard the world as multipolar entity where interests of different parties must be respected. Such similarities in geopolitical views and approaches, positively contribute to stronger strategic ties between Russia and China. Thus, geopolitically Japan and Russia end up being on the opposite side of the barricade. Even though this does not directly hamper Japan-Russia trade relations, it restrains them to a certain extent.

Obviously, there are numerous economic risks that Russia bears, like dependence of the country on natural resource export, absence of high quality infrastructure, deindustrialized economy after the breakup of the Soviet Union etc. **Yet I intentionally chose not to stress on them as they in my opinion played a minor role compared to structural and political risks in Japanese oil companies' decision not to invest in the Russia oil projects**. Most of the countries, where Japanese oil companies operate, are oil producing countries, the economies of which are not stable and heavily depend on oil price fluctuation, no less than Russia. Therefore, the statement that Japanese oil companies refrain from investing in Russia crude oil projects due to economic risks involved, would be contradictory, because the same Japanese oil companies invest in oil and gas projects in Venezuela, Saudi Arabia and UAE, economies of which are far more dependent on export of

hydrocarbons than Russia. In fact, unlike many oil producing countries, fall in Brent price does not affect political stability in the country or undermine the position of the present leader. The recent fall in Brent price (2014-2015) has clearly demonstrated the ability of Russian economy to survive tough times without undergoing any shock therapies like in 1992 and 1998. **In other words, the country's economy and financial system has become more stable and more mature than before.**

These are the risks that Japanese companies must deal with when entering the Russian market. Being forced in this type of environment and not being able to address all potential problems and queries, Japanese companies decide to invest in crude oil projects in other countries. The centre of all problems is the legislative system and interaction between government and private business.

Figure 50



Evaluation of business climate in Russia.

Japanese companies view Russia as a market that has a lot of political risk. What about the general/global investor view of Russia? Well according to doing business ranking made by the World Bank, Russia is on th**e 40th place** (year 2016), which is not that high. Even though, it is a significant improvement compared to previous years, the business climate in the country has lots of room for improvement.

Having a look at Ernst and Young report on how easy it is to do business in Russia, it does seem that foreign investors consider the country's administrative and legislative systems to be the key impediments to smooth flow of foreign capital into the country. Out of the foreign investors that took part in the survey **77%** find regulatory system to be the biggest hurdle to doing business in Russia and **90%** find the current state of affairs in Russia challenging. The results speak for themselves, it seems that complicated administrative procedures and excessive bureaucracy lie at the root of all the problems related to business climate. Domestic and overseas businessmen recognize that to turn the situation around, the government needs to implement several important policies that would attract not only short term, but also long term investments. **The ideal outcome of these policies would be drastic reduction in bureaucracy, elimination of selective application of laws and simplification of migration laws.** This would also contribute to reducing the level of state control and help to further enforce progressive judicial and legal reforms {LLC., 2015 #84}.

Below is the list of means of communication between the government and business

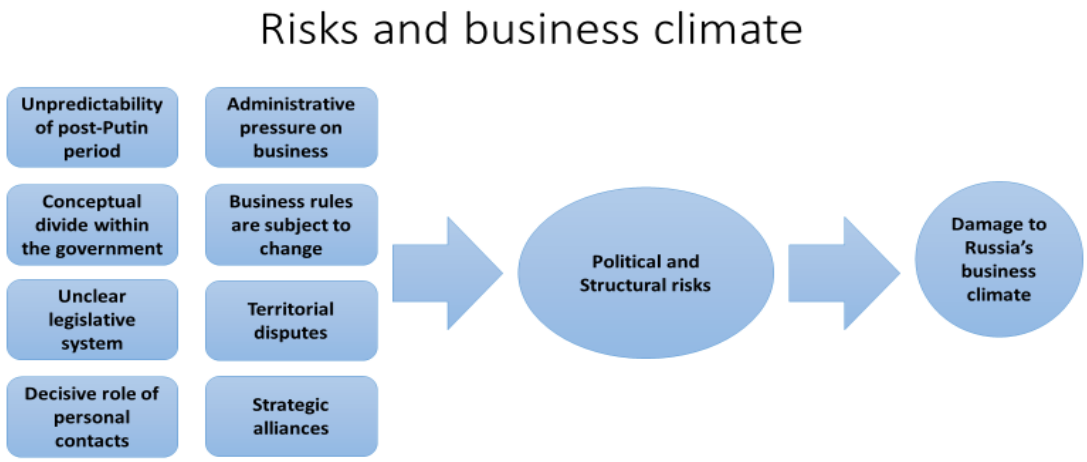
Table 77

Personal contacts	**75%**
Advisory bodies	**63%**
Business associations	**53%**
Participation in impact of laws	**44%**
Working in regional commissions	**9%**
Public outreach and networking	**6%**

It seems that personal connections and professional representatives seem to be the main means of communication between the government and the business. Relying on such old-fashioned methods of correspondence implies that there are not enough platforms for dialogue between government and investors/entrepreneurs. Ergo, there is a limited number of opportunities for business to reach out to the government (both regional and federal) and explain how it is doing and what troubles it the most. **Because of this miscommunication, you end up getting a government that does not understand, nor care for business climate in the country,** not realizing that good business climate is one of the main characteristics of a successful and progressive economy.

There exists a certain political risk when it comes to investing in Russia. The foreign business simply feels that its rights are not properly protected and there is a high degree of distrust to country's legislative and administrative systems of control. The situation is further aggravated by no one being able to predict what will happen to the country after Putin's presidency. **Thus, the business climate in Russia remains on a relatively modest position in the global ranking.** Having said that the situation has been gradually improving over the recent years despite the economic crisis and the sanctions from the West.

Figure 51



Laws and measures aimed at reducing political and structural risks

It would be wrong to assume that nothing is being done in Russia to tackle the problem of poor investment climate. In fact, the government has taken several measures aimed at reducing political and structural risks in the country. Stringent financial situation and economic sanctions served as a good impulse for improving the current situation.

What has the Russian government done in recent years to tackle the problem?

First, it managed to pass several laws, the aim of which was to promote small and medium-size businesses and improve the business climate in the country. Here is a list of some of these laws:

- Adoption of Customs Union's Customs Code
- Introduction of electronic communication system
- The law on Rapid Growth regions
- Promotion of long term contracts
- The use of financial incentives to support investors

Adoption of Customs Union's Customs Code. The application of this law has led to several positive results. As the trade barriers between members of EAEU have disappeared, the distribution market for Russian and foreign producers has started to gradually expand. Furthermore, lifting travel/work restrictions between the countries has increased the mobility of the union citizens that can now travel and work in every part of EAEU, they wish to. This has led to better utilization of labour force potential.

Introduction of electronic communication system law; Promotion of long term contracts. These laws have simplified bureaucratic procedures, and contributed to tackling corruption. Success of different administrative procedures started to rely less on the human factor.

Creation of regions of rapid growth. This law has stimulated regional authorities in different parts of Russia to compete with each other in creating favourable conditions for investors. The governors understanding that their performance is being strictly observed and analysed by the federal centre in Moscow, do their best to make sure that corruption is reduced to the minimum and that the regional administration does not try to blackmail the business. The system works the following way: the more investors the region attracts the more funds it will receive from the federal government. The local authorities in the regions that fail to attract investors due to clear administrative barriers or spread corruption will be judged as incompetent, replaced and sometimes even put to jail. Such inevitability of punishment plays an important role in tackling corruption. Thus, Russia's investor attractiveness has started to gradually rise.

Publicity and control over the government spending have also played a positive role in improving business climate and reducing political and structural risks. Special organizations controlling regional and federal spending have been created (e.g. All-Russia People's Front). The purpose of these organizations is to track local and federal government spending and make sure that there are no excesses, violations or unjustified spending. **This was a serious blow to corruption, as no longer local authorities were incentivized to steal public money by artificially raising the government spending.** In general, the access to all sorts of information has become much easier and the corruption schemes have become very difficult to hide. Internet and higher publicity has started to strongly influence and even form public opinion. **The government has become a subject to strict public scrutiny and corruption has become less tolerable in the Russian society.**

As was mentioned before, sanctions and tough economic situation have stimulated these changes. The crude oil profits have fallen and Russian economy ended up no longer having any **financial buffer** that would guarantee it stable growth without implementing any serious structural changes. **In other words, the necessity to change was one of the main reasons behind the government's attempts to reform its administrative and legislative systems as having oil and gas was no longer enough to attract foreign investors.**

Did these changes succeed in attracting foreign investors?

Effects and limitations of new laws and measures on the business climate in Russia.

According to Ernst and Yong report (2016) foreign businessmen have positively assessed the reforms

implemented by the Russian government. In fact, in their opinion recent measures have led to the following positive changes:

- The access to federal government has eased
- Russian partners have become ready to learn to provide better service
- Investment climate in the regions has risen with local governors fighting over which region can attract more investors
- There have been positive changes in financial and customs regulation

It is apparent that foreign investment highly evaluates Russian government's attempts to improve the business climate in the country. **The investors positively evaluate government's attempts to tackle corruption and protect investor rights.**

Yet there are several limitations to the new laws and policies. The bureaucratic layer of the society is still significant and must undergo further reduction. The workers in administrative organs must become more qualified and competitive. The selective application of laws must be annihilated to restore trust in the judicial system. Migration laws must be simplified so that it would be easier for the foreigner to get into the country. Even though, much has been done already to reduce the level of state regulation, there is still room for improvement. Thus, the government needs to continue implementing further administrative and judicial reforms, to improve investment climate in the country and reduce political/structural risks that businesses face, when they plan to invest in Russia.

Laws that had negative effects. At the same time, in the opinion of foreign businessmen numerous laws have been passed that affected their activities in an unfavourable manner. These laws include: personal data protection law, law on undesirable organizations, tighter alcohol sales control, sharp fluctuation in refinancing rate, the ban on food imports. These laws create barriers for investors and negatively influence bilateral trade relations between countries. **Yet it is worth noting that these laws had no effects on Japanese business in Russia.**

There are several reasons why I decided to mention the unpopular laws in my thesis. After the Western sanctions the government has started take serious steps to ensuring that Russia's agricultural sector grows and becomes more competitive. To ensure the competitiveness and provide it with favourable growth conditions, protectionist measures were carried out. **Ergo, the ban on food imports**. These measures have had their positive effects as farmers (both Russian and foreign) have started to actively use Russia's agricultural potential.

Such laws like alcohol sales control and data protection laws, hint on strong influence of conservative elements inside the Russian government. The conservative block is less concerned about Russia's investor attractiveness, which in its opinion is a matter of secondary importance. This block is more preoccupied

with protecting the country against foreign influence and foreign threats and controlling all economic activity inside the country. Despite not being able to raise competitiveness of the country's economy and even damaging it at times, this wing has had surprisingly strong influence within the government. Tightening on alcohol sales simply means that the government is trying gain extra profits to balance the budget after falling oil price. The main intent of **Data protection law** is prevention of any terrorist activity in Russia. However, the main side effect of this law will be the increase of government control over lives of Russian citizens. **The foreign investor needs to understand that there are strong reactionist groups inside the government and these reactionist groups have strong influence on the decision making.** This in turn explains Russia's relative inability to raise its global competitiveness and reluctance to implement measures that would attract more foreign direct investment.

Nevertheless, the country continues to attract foreign direct investment. How is that possible?

Commitment of foreign investors. The reader can see that not all changes that take place in the Russian government are positively influencing the investment climate. Moreover, there is still doubt whether the government is actually committed to pursue its trade liberalization policies and protect the foreign investors. Be that as it may, the foreign businessman keep on investing in Russia and the overall sum of their investments continues to grow. Oil majors, like ExxonMobil, BP, Shell etc. continue to actively invest and participate in the country's oil and gas sector, despite economic sanctions imposed by the governments of EU and US. The same refers to Chinese and Indian oil companies, assets of which have been steadily growing in recent years. Finally, many different companies in Asia Pacific (including ASEAN) region have been showing interest and will to cooperate with Russian companies in different spheres. **It seems that potential benefits of investing in Russia and cooperating with Russian companies in different areas clearly outweigh political risks for many investors around the world.**

In fact, according to Ernst and Yong report on investment climate in Russia, we can observe that 78% of foreign companies currently working in Russia plan to continue their business operations and more than half of them plan to expand their activity. Many foreign businessman regard taxation system in the country as favourable. On top of that, more than 50% of respondents claim that regional authorities play a positive role in attracting investments. **The foreign investors seem to believe in the potential of the Russian market and actively invest in it, despite political and structural risk. These investors welcome and highly evaluate attempts of the Russian government to improve the business climate in the country.** This brings me to the following two questions: What attracts foreign businesses to investing in Russia? What are the advantages of the Russian economy?

Strengths and advantages of Russia. Foreign and domestic investments keep on flowing into the Russian economy despite all the barriers imposed either by Russia or by outside circumstances. This suggests that Russia as an investment destination has some substantial strengths and advantages, at least in comparison to other crude oil producers. Let us have a careful look and understand what these strengths are.

Russia can be regarded as a mature country. This maturity implies political, economic and social stability. Let's start with political stability, compared to most of oil producing countries, Russia has a stable political system. **Present political system, military strength and natural resources allow Russia to pursue a relatively independent foreign and domestic policies** i.e. the decisions of the Russian president or parliament cannot be influenced by any foreign government. Long history of interaction between Russia and Europe has allowed the country to build strong trade relation with various powers in the West. Even though some might disagree, but when two countries share a long history of diplomatic and trade relations, it becomes much easier to build on this experience and avoid making mistakes that were made before. Thus, diplomatic and trade ties that have been gradually developing between Russia and Europe (including Turkey) over last 300 years is a serious asset, that many oil producing countries do not have. Furthermore, domestic support for president Putin (support rate 85%) implies that despite some ideological differences the government and the country in general is united and there is very little possibility of internal conflict. Putin's authority and reputation holds together a multinational and multi-religious country and ensures political stability. **The only question that remains unanswered: "Who will come to power in Russia after Putin?"**

Relative economic stability is another important strength of Russia that is worth mentioning. Russian economy is no longer as fragile and vulnerable as it was back in 1998 when debt crisis has seriously hit the country. Despite serious fall in oil prices, collapse of ruble and budget deficits, the country's financial system survived and all the foreign debt was repaid on time. Furthermore, the government continuous to improve environment for foreign and domestic business. At the same time, some steps have been taken to reduce the country's dependence on oil imports. Even though the results are still modest and the process is quite slow, **there remains no doubt that serious transformations are taking place, whilst Russia's economy continues to slowly modernize, becoming more open and more stable.**

Finally, there is **social stability in Russia.** Compared to other oil producing countries, Russia has a strong private sector and government does not completely control the lifestyles of people. There is a strong and sound public opinion and relative freedom of speech. No one is being repressed due to his/her political or religious belief. There are many way in which citizens can communicate their problems to the government. Despite massive corruption there is a secular judicial system that is not influenced by religious groups. The population in Russia is on general well educated and the literacy rate is also very high – legacy of the Soviet Union. On top of that there is a completely new young generation ready to embrace new thoughts, ideas and lifestyles. This generation is surprisingly different as it does not remember, nor miss the Soviet Union. This new generation is more Europe-oriented and outgoing. **This new generation will bring stability to Russia and make it even more open and modernized.**

The reader can now understand that Russia is a mature and stable country. Can the same be said about other major oil producers? Well in case of United States and Canada – yes; however, since most of attention in these countries is devoted to shale oil which is not economically viable especially when crude oil prices

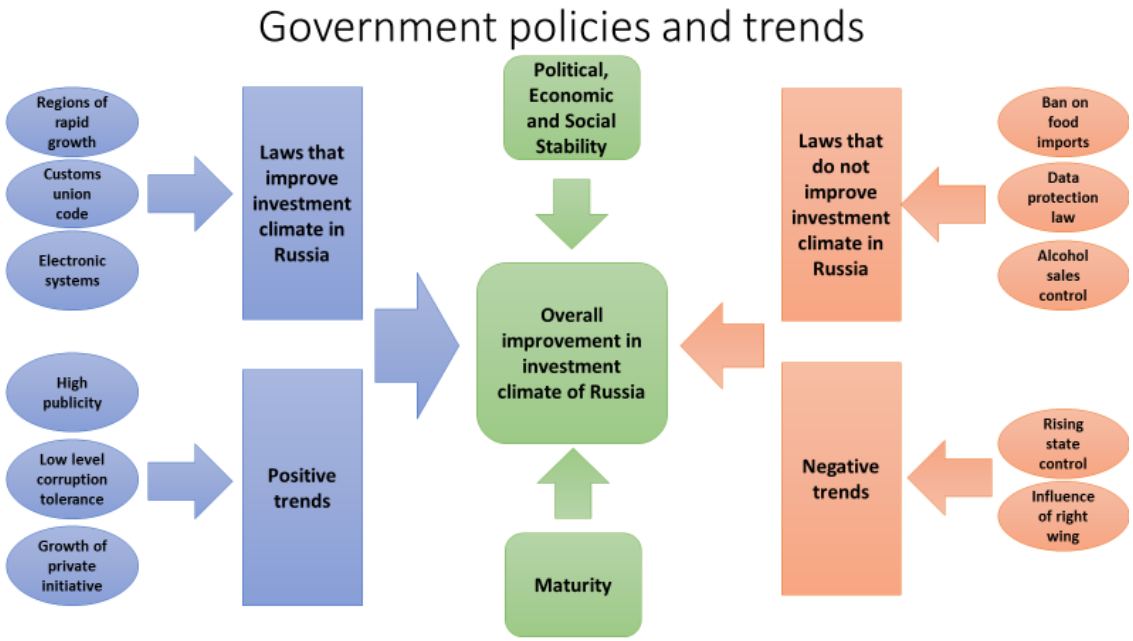
are low, I will not concentrate on these countries for now. What about countries in OPEC? Neither of the OPEC countries can be considered mature from historical point of view, nevertheless some of the countries like UAE and Kuwait are politically and economically stable. However, the game rules in OPEC and especially in the Arab peninsula are being decided by the Saudi Arabia – monarchy, where judicial and administrative systems are build based on Sharia Law. Rigid religious control over all layers of society, unclear system of power transfer within the ruling family, discrimination of other religions groups suggests that political and social situation in the country might become unstable in the near future. Such monarchies usually lose their ability to control the population once they start experiencing budget difficulties, as not everything can be achieved through violence and repression. For a country, as dependent on crude oil exports as Saudi Arabia this is particularly the case. Most of Monarchy's population being employed in the public sector (i.e. employed by the government) only aggravates the situation. Saudi Arabia has a strong influence on oil producing Gulf States. This negatively reflects on political, economic and social stability in the region. Other member of OPEC, like Nigeria, Iran and Venezuela each have serious problems of their own. In Nigeria, there is an extremely fast growing population, high level of aggression between Muslims and Christians and horrendous corruption. Iran's economy requires a certain period to recover from economic sanction and modernize. However, influence of fundamental Islam followers within Iran cannot be underestimated. Finally, Venezuela, a failed state, with powerful black economy and unsuccessful attempts to build socialism.

All these countries can in no way be compared to Russia in terms of political, economic and social stability.

Conclusion of Part 6

To conclude, we can see that the Russian government has taken some serious steps at improving investment climate in the country. Even though these steps were limited and even counterbalanced by some reactionary laws, this was a strong enough signal for to ensure foreign investors that their rights will be protected, especially in the oil and gas sector. European, American, Chinese and Indian investors seem to be persuaded by these reforms and continue operating their businesses in Russia and even increasing their assets. The same cannot be said about the Japanese companies that remain wary of investing in Russia. There is no denying that **political risks from investing in Russia do exist, nevertheless they might be slightly exaggerated by the Japanese side.**

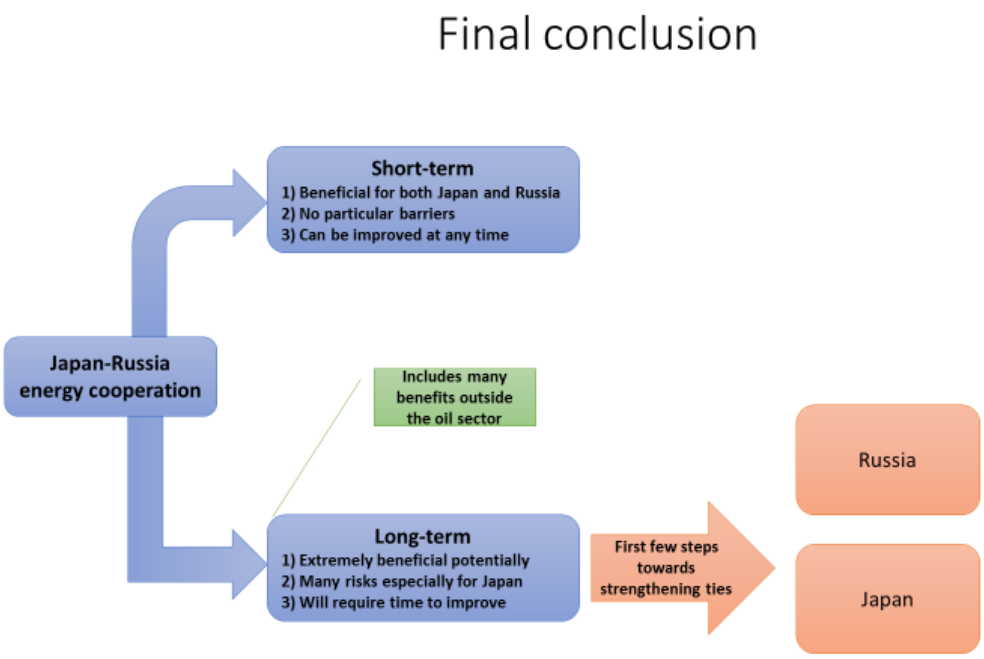
Figure 52


Government policies and trends
Regions of rapid growth
Customs union code
Electronic systems
Laws that improve investment climate in Russia
High publicity
Low level corruption tolerance
Growth of private initiative
Positive trends
Political, Economic and Social Stability
Overall improvement in investment climate of Russia
Maturity
Laws that do not improve investment climate in Russia
Ban on food imports
Data protection law
Alcohol sales control
Negative trends
Rising state control
Influence of right wing

Part 7: Final conclusion & first steps that can be taken by both sides

Final conclusion

Figure 53



Cooperation in the energy field is very beneficial to Japan and Russia from both strategic and economic points of view. In the short term the benefits are more certain, tangible and there exist almost no political or structural barriers preventing the two countries from strengthening their energy cooperation. In fact, in my opinion it is a matter of time until two countries will start strengthening their short-term cooperation in the crude oil sector. As the crude oil production in East Siberia and the Far East will rise, infrastructure develop and ESPO transportation power increase the crude oil (and potentially petroleum products) trade between Japan and Russia will continue to increase. This will allow Japan to reduce its dependence on crude oil imports from the Middle East without becoming over-dependent on crude oil imports from Russia (maximum 20%). Furthermore, increasing crude oil imports from Russia will make Japan's oil industry more competitive as many costs will be greatly reduced. This could potentially allow Japanese oil companies to minimize downsizing despite decreasing domestic demand for petroleum products as its ability to export petroleum products would rise.

When looking at long-term prospects of cooperation between the two countries, the situation becomes rather complex as geopolitical and political factors come into play. The developments in the Middle East, China and Europe all point to the fact that both Japan and Russia will be better off if they manage to build strong economic and trade relations in the Far East region. For the Russian side the benefits are quite clear:

new investments and new technologies will help develop infrastructure, industrial and social sectors in the Far East ad Siberian regions. On top of that it will help Russia avoid dependence on the Chinese economy. For Japan, the reasons might not be as clear, they are just as important. First, Japan will be able to reduce its crude oil dependence from Middle East in long term. Secondly, by building long-term trust relations with Russian government and Russian companies, Japanese infrastructure, technology and resource companies can have a preferential access to large-scale projects and natural resource base in East Siberia, Far East and even Arctic regions. Finally, by improving trade and economic ties with Russia, Japan can stop Russia from getting economically and strategically close with China – relationship that can endanger Japan's position in the region. Nevertheless, despite all the benefits of Japan-Russia long-term energy cooperation, the current situation is quite far from perfect. There are many reasons why the trade relations are so underdeveloped, however the main ones are the following:

- Unresolved problem of Northern Territories
- Structural and political risks of investing in Russia

I intentionally avoided touching the problem of Northern territories as my strong belief is that strong political will of the leaders of the two countries as well as ability of two sides to find compromise is the only solution to this problem; any other comments on this problem would be a mere speculation. The political and structural risks however can be and are being currently addressed by the Russian side. Several measures are being taken by the government and the government run companies to improve business climate in the country and attract foreign investments in different sectors of the country's economy. The is particularly the case for the Far East and East Siberia region, where free trade zones and zones of rapid development have been created. This is further supported by positive regional and domestic trends such as development of Eurasian Economic Union and tighter control over corruption leading to large-scale staff changes. On top of that there is a promising young generation that has started to play a more active role in Russian political and economic life.

Nevertheless, these reforms are incomplete and the new positive trends are counterbalanced by reactionary trends and strengthening positions of Russia's Orthodox Church. Therefore, there are still many things that can be done to improve the business climate in the country and increase Russia's investment attractiveness. At the same time, Japanese companies and Japanese authorities can be more active in showing and proving their commitment to projects in Russia, thus providing themselves with a preferential treatment and guaranteeing access to the most strategically important and economically beneficial projects in Russian Federation. I will only touch upon this topic, just mentioning first few steps that both sides could take to improve trade and economic relations between Russia and Japan. I will not go deep into this topic, leaving space for future research.

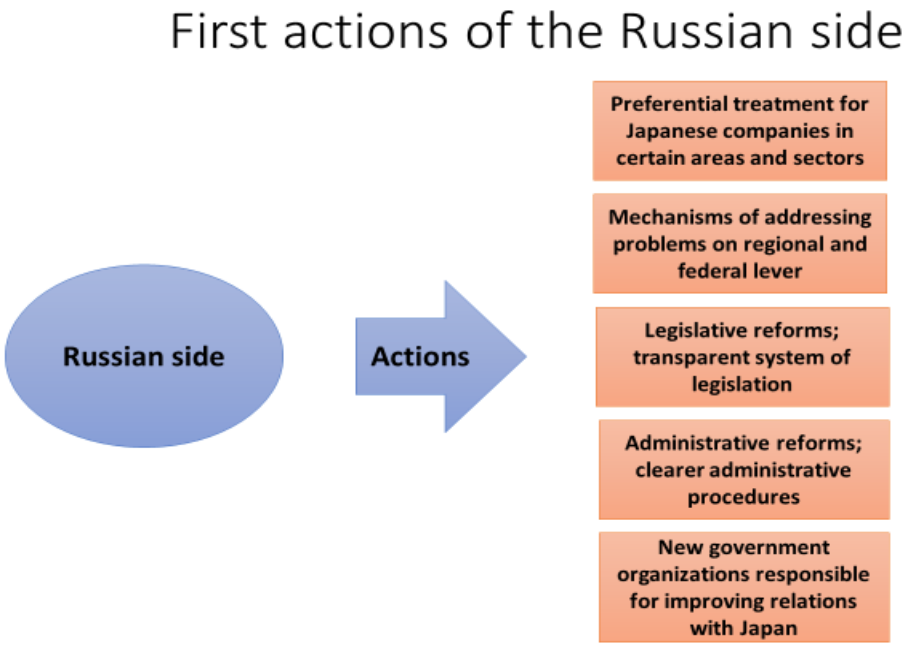
Actions of Russia

The Russian side should continue reforming and improving its legislative and administrative institutions providing clear and fare environment for the foreign investors. The bureaucratic machine, especially regional bureaucratic machine, should be simplified and reduced. The government should continue tackling corruption by using carrot and stick approach, relentlessly punishing corrupt officials and increasing the official salary of government statesmen. Special mechanisms should be worked out allowing foreign investors to constantly communicate their problems to regional and federal authorities. Responsibility of the regional authorities would be to address and deal with these problems diligently ensuring that both domestic and foreign investors are provided with everything they need for successful operations of their business. The government could go even further and create a special analytical centre that would analyse all the investor data pinpointing the main problems that investors face. Knowing the problems would allow the centre to create several algorithms of dealing with different problems that investors can have. The legislative reforms should make Russia's legislative system clearer, more transparent and easy for investors (both home and abroad) to understand.

Another useful step that Russian side could do is to create a special government committee (or even a ministry) on Japan. This committee should include specialists in Japanese culture and business, representatives of government, business and science. The main job of this committee would be finding ways of improving economic, strategic and scientific cooperation between the two countries. The financing should come from the Russian government and national oil and gas majors like Gazprom and Rosneft. This would help businesses in both sides to understand each other as well as determine the roots of misunderstanding between the two countries. Similar organization but in the sphere of education would also be useful. This organization would organize and promote exchange programs (language, science, engineering and humanities) between the two countries.

Finally, legal and financial guarantees should be given to Japanese companies functioning in Russia, especially in the oil, gas and technology sector. In some cases, even preferential treatment is acceptable. For example, before the problem of Northern Territories between Russian and Japan is completely solved, no companies except Japanese companies should be allowed to invest in infrastructural or business projects on the four islands.

Figure 54



Actions of Japan

Since Russia's Far East and Siberia are the areas where the future investments are to be made most of the improvements that can to be made are addressed to the Russian side. Nevertheless, there are few things that Japanese businesses and Japanese government can do to improve trade ties Russia.

First, as strange as it sounds, Japanese government and Japanese companies must show their commitment to bringing up their business projects in Russia and their readiness to work in the country. In this way, they would be able to ensure that trust relationships with Russian companies are built and in long-term perspective these ties can become strategic business partnerships. One method of solving this problem would be to understand Putin, to get to know his set of values and beliefs. If the Japanese businesses could find a way of getting on Putin's good side and gaining his trust, they could ensure that their interests in Russia would be strictly protected and in the end of the day, they will win more than they will lose.

Figure 55

Chinese businesses have so far been successful in getting on Putin's good side since they have shown and proven to him their commitment of investing in Russia and building long-term economic partnerships with Russian companies. On top of that Chinese government did not support US economic sanctions against Russia, that both Japan (only on paper) and Europe have supported. Hence economic commitment backed up by political neutrality and possibly friendship can be very helpful in gaining Putin's trust. One thing that Japanese experts and economists must understand is that once trust/friendship relationship has been established, Putin will keep to it until the very end and will never pull back or betray. In my opinion, until now Japanese businesses and the Japanese government have been reluctant to accept this fact.

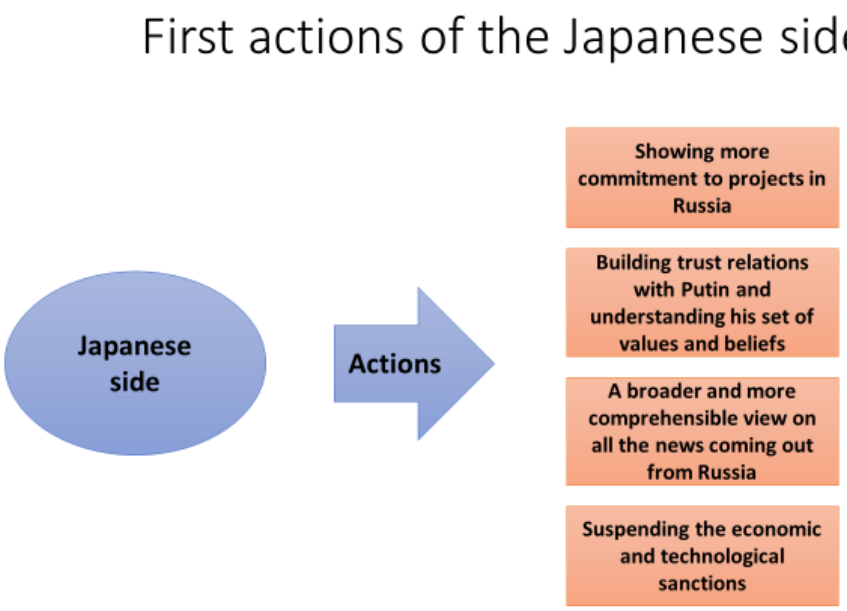
The Levada Centre public opinion polls in 2010s has showed that 68-82% of Russian citizens have favourable attitudes towards Japan and Japanese people, whilst in Japan the same polls showed that only 16.2% have favourable attitudes towards Russia. I am not trying to say that public opinion is something that the government or the media can completely control, but they certainly have tools to influence it. Most of news that come out in the Japanese newspapers and TV programs about Russia seem to undergo a certain American/European filter and are mostly negative and have hints of bias. Working for a Japanese news agency operating in Russia, I got the same impression – most of the news related to Russia is being presented to the Japanese public in a manner where Russia is depicted as a backward, underdeveloped and brutal country. In some cases, it might be true, but not always. Therefore, until the information on Russia will continue being presented to the Japanese public under a certain angle, the negative/semi-negative attitudes towards Russia will prevail in Japan.

How can the current situation be improved?

Increasing exchanges programs (language, science) between the two countries, bringing up specialists on

Russian culture and trying to provide a broad spectre of news regarding Russia, not only concentrating on reports that have a negative effect.

Figure 56



In the end of the day, there is no easy way for the two countries to build strong trade and economic ties, as the differences are quite substantial and many problems have piled up until today. And yet, cooperation in business sphere promises substantial benefits for the both sides. Therefore, the two countries should do their best and approach these issues diligently.

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Appendix

1) Chow Test

Chow Test in SPSS (Exports of Petroleum Products)

Attached Materials_Table 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.776[a]	.602	.578	429.521567

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50282216.52	11	4571110.593	24.777	.000[b]
	Residual	33207979.77	180	184488.777		
	Total	83490196.30	191			

a. Dependent Variable: ExportPetroleumProductsTotal

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 3

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1716.138	342.509		5.010	.000
	Brunei_imports	-1.862	.560	-.195	-3.325	.001
	Malaysia_imports	-1.268	.480	-.136	-2.641	.009
	Indonesia_imports	-.741	.180	-.243	-4.111	.000
	Russia_imports	.393	.089	.316	4.426	.000
	Saudi Arabia	.030	.049	.034	.600	.549
	Kuwait_imports	-.120	.095	-.068	-1.263	.208
	Qatar_imports	.255	.090	.150	2.823	.005
	UAE_imports	.055	.056	.064	.986	.325
	Iran_imports	-.142	.060	-.193	-2.378	.018
	Iraq_imports	.147	.125	.059	1.175	.242
	CrudeOilProduction	3.744	3.809	.069	.983	.327

a. Dependent Variable: ExportPetroleumProductsTotal

dummy2009 = .00

Attached Materials_Table 4

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816[b]	.665	.627	393.475481

a. dummy2009 = .00

b. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 5

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29511701.45	11	2682881.950	17.329	.000[c]
	Residual	14863003.63	96	154822.955		
	Total	44374705.08	107			

a. dummy2009 = .00

b. Dependent Variable: ExportPetroleumProductsTotal

c. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 6

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1739.994	478.509		3.636	.000
	Brunei_imports	-1.858	.666	-.195	-2.790	.006
	Malaysia_imports	-1.370	.563	-.158	-2.432	.017
	Indonesia_imports	-.497	.215	-.158	-2.311	.023
	Russia_imports	1.282	.196	.477	6.530	.000
	Saudi Arabia	.072	.053	.098	1.354	.179
	Kuwait_imports	-.138	.115	-.077	-1.197	.234
	Qatar_imports	.398	.131	.192	3.030	.003
	UAE_imports	.046	.073	.043	.628	.532
	Iran_imports	-.261	.076	-.231	-3.411	.001
	Iraq_imports	.141	.156	.055	.903	.369
	CrudeOilProduction	-2.899	5.503	-.049	-.527	.600

a. dummy2009 = .00

b. Dependent Variable: ExportPetroleumProductsTotal

dummy2009 = 1.00

Attached Materials_Table 7

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.568[b]	.322	.219	351.665426

a. dummy2009 = 1.00

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 8

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4231848.969	11	384713.543	3.111	.002[c]
	Residual	8904137.188	72	123668.572		
	Total	13135986.16	83			

a. dummy2009 = 1.00

b. Dependent Variable: ExportPetroleumProductsTotal

c. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 9

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2903.524	514.737		5.641	.000
	Brunei_imports	.057	.857	.007	.067	.947
	Malaysia_imports	-.979	.692	-.154	-1.415	.161
	Indonesia_imports	-.483	.282	-.199	-1.713	.091
	Russia_imports	.097	.105	.109	.930	.356
	Saudi Arabia	-.012	.089	-.017	-.135	.893
	Kuwait_imports	.122	.140	.101	.871	.387
	Qatar_imports	.142	.100	.167	1.428	.158
	UAE_imports	.061	.098	.068	.620	.537
	Iran_imports	.300	.120	.431	2.498	.015
	Iraq_imports	.282	.187	.179	1.506	.136
	CrudeOilProduction	-21.699	6.012	-.688	-3.609	.001

a. dummy2009 = 1.00

b. Dependent Variable: ExportPetroleumProductsTotal

F-value (observed) = 5.56 > 2.185 (at 1% significance level) therefore we reject the Null Hypothesis i.e. there is structural change

Chow Test in SPSS (Production of Petroleum Products)

Attached Materials_Table 10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.909[a]	.826	.816	828.018626

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 11

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	586758306.6	11	53341664.23	77.801	.000[b]
	Residual	123410672.0	180	685614.844		
	Total	710168978.6	191			

a. Dependent Variable: ProductionPetroleumProductsTotal

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 12

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5115.379	660.279		7.747	.000
	Brunei_imports	.476	1.080	.017	.441	.660
	Malaysia_imports	.318	.926	.012	.343	.732
	Indonesia_imports	1.597	.347	.180	4.598	.000
	Russia_imports	.447	.171	.123	2.608	.010
	Saudi Arabia	.288	.095	.113	3.022	.003
	Kuwait_imports	1.066	.183	.207	5.818	.000
	Qatar_imports	.638	.174	.129	3.658	.000
	UAE_imports	.570	.108	.228	5.303	.000
	Iran_imports	.952	.115	.443	8.255	.000
	Iraq_imports	.157	.241	.022	.653	.514
	CrudeOilProduction	26.046	7.343	.165	3.547	.000

a. Dependent Variable: ProductionPetroleumProductsTotal

dummy2009 = .00

Attached Materials_Table 13

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.855[b]	.731	.700	789.954019

a. dummy2009 = .00

b. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 14

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	162778703.6	11	14798063.97	23.714	.000[c]
	Residual	59906625.82	96	624027.352		
	Total	222685329.5	107			

a. dummy2009 = .00

b. Dependent Variable: ProductionPetroleumProductsTotal

c. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 15

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4134.900	960.670		4.304	.000
	Brunei_imports	.202	1.337	.010	.151	.880
	Malaysia_imports	3.215	1.131	.166	2.843	.005
	Indonesia_imports	1.773	.431	.251	4.110	.000
	Russia_imports	-.486	.394	-.081	-1.233	.220
	Saudi Arabia	.310	.107	.187	2.888	.005
	Kuwait_imports	.951	.232	.238	4.104	.000
	Qatar_imports	.974	.264	.210	3.697	.000
	UAE_imports	.457	.146	.190	3.120	.002
	Iran_imports	.727	.154	.288	4.734	.000
	Iraq_imports	-.066	.314	-.011	-.209	.835
	CrudeOilProduction	45.264	11.048	.345	4.097	.000

a. dummy2009 = .00

b. Dependent Variable: ProductionPetroleumProductsTotal

dummy2009 = 1.00

Attached Materials_Table 16

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.878[b]	.771	.736	697.099603

a. dummy2009 = 1.00

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 17

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	117786056.3	11	10707823.30	22.035	.000[c]
	Residual	34988245.64	72	485947.856		
	Total	152774302.0	83			

a. dummy2009 = 1.00

b. Dependent Variable: ProductionPetroleumProductsTotal

c. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 18

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4969.250	1020.353		4.870	.000
	Brunei_imports	-.896	1.699	-.034	-.527	.600
	Malaysia_imports	-3.863	1.372	-.178	-2.815	.006
	Indonesia_imports	.798	.559	.097	1.429	.157
	Russia_imports	.895	.207	.294	4.320	.000
	Saudi Arabia	.338	.176	.143	1.918	.059
	Kuwait_imports	.884	.277	.216	3.194	.002
	Qatar_imports	.521	.198	.179	2.635	.010
	UAE_imports	.461	.195	.151	2.371	.020
	Iran_imports	.313	.238	.132	1.315	.193
	Iraq_imports	.848	.372	.158	2.282	.025
	CrudeOilProduction	50.930	11.918	.473	4.273	.000

a. dummy2009 = 1.00

b. Dependent Variable: ProductionPetroleumProductsTotal

F-value (observed) = 4.21 > 2.185 (at 1% significance level) therefore we reject the Null Hypothesis i.e. there is structural change

Chow Test in SPSS (Demand for Petroleum Products)

Attached Materials_Table 19

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.869[a]	.755	.740	1343.558353

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 20

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1000771408	11	90979218.89	50.400	.000[b]
	Residual	324926828.7	180	1805149.048		
	Total	1325698237	191			

a. Dependent Variable: DemandPetroleumProductsTotal

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 21

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4165.613	1071.381		3.888	.000
	Brunei_imports	4.512	1.752	.119	2.576	.011
	Malaysia_imports	1.162	1.502	.031	.774	.440
	Indonesia_imports	3.471	.564	.286	6.160	.000
	Russia_imports	.665	.278	.134	2.393	.018
	Saudi Arabia	.271	.155	.078	1.748	.082
	Kuwait_imports	1.273	.297	.181	4.283	.000
	Qatar_imports	.029	.283	.004	.102	.919
	UAE_imports	.493	.174	.144	2.823	.005
	Iran_imports	1.124	.187	.382	6.004	.000
	Iraq_imports	-.229	.391	-.023	-.587	.558
	CrudeOilProduction	44.297	11.915	.205	3.718	.000

a. Dependent Variable: DemandPetroleumProductsTotal

dummy2009 = .00

Attached Materials_Table 22

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.838[b]	.702	.668	1291.461989

a. dummy2009 = .00

b. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 23

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	377850785.5	11	34350071.41	20.595	.000[c]
	Residual	160115910.7	96	1667874.070		
	Total	537966696.3	107			

a. dummy2009 = .00

b. Dependent Variable: DemandPetroleumProductsTotal

c. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 24

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1907.339	1570.558		1.214	.228
	Brunei_imports	3.671	2.186	.111	1.679	.096
	Malaysia_imports	4.089	1.849	.135	2.212	.029
	Indonesia_imports	3.103	.705	.283	4.399	.000
	Russia_imports	-2.631	.644	-.281	-4.083	.000
	Saudi Arabia	.097	.175	.037	.552	.583
	Kuwait_imports	1.265	.379	.203	3.337	.001
	Qatar_imports	.171	.431	.024	.397	.693
	UAE_imports	.366	.239	.098	1.526	.130
	Iran_imports	1.284	.251	.327	5.117	.000
	Iraq_imports	-.538	.514	-.060	-1.048	.297
	CrudeOilProduction	98.857	18.063	.484	5.473	.000

a. dummy2009 = .00

b. Dependent Variable: DemandPetroleumProductsTotal

dummy2009 = 1.00

Attached Materials_Table 25

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.845[b]	.714	.670	981.509026

a. dummy2009 = 1.00

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 26

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	172958635.3	11	15723512.30	16.322	.000[c]
	Residual	69361917.71	72	963359.968		
	Total	242320553.0	83			

a. dummy2009 = 1.00

b. Dependent Variable: DemandPetroleumProductsTotal

c. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 27

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2567.277	1436.647		1.787	.078
	Brunei_imports	.842	2.392	.025	.352	.726
	Malaysia_imports	-3.421	1.932	-.125	-1.771	.081
	Indonesia_imports	2.720	.787	.261	3.458	.001
	Russia_imports	1.369	.292	.357	4.693	.000
	Saudi Arabia	.427	.248	.144	1.720	.090
	Kuwait_imports	.653	.390	.127	1.676	.098
	Qatar_imports	.146	.278	.040	.526	.601
	UAE_imports	.492	.274	.128	1.797	.077
	Iran_imports	-.144	.335	-.048	-.431	.668
	Iraq_imports	.381	.523	.056	.729	.469
	CrudeOilProduction	89.392	16.780	.660	5.327	.000

a. dummy2009 = 1.00

b. Dependent Variable: DemandPetroleumProductsTotal

F-value (observed) = 4.166 > 2.185 (at 1% significance level) therefore we reject the Null Hypothesis i.e. there is structural change

Chow Test in SPSS (End Stock Petroleum Products)

Attached Materials_Table 28

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.603[a]	.363	.324	1164.927524

a. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 29

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	139380428.1	11	12670948.01	9.337	.000[b]
	Residual	244270104.5	180	1357056.136		
	Total	383650532.7	191			

a. Dependent Variable: EndStockPetroleumProducts

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, Iraq_imports, Malaysia_imports, Qatar_imports, Kuwait_imports, Saudi Arabia, Brunei_imports, UAE_imports, Russia_imports, Iran_imports

Attached Materials_Table 30

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12267.493	928.937		13.206	.000
	Brunei_imports	.860	1.519	.042	.566	.572
	Malaysia_imports	-.420	1.302	-.021	-.323	.747
	Indonesia_imports	-.304	.489	-.047	-.622	.535
	Russia_imports	-1.081	.241	-.405	-4.483	.000
	Saudi Arabia	-.049	.134	-.026	-.362	.718
	Kuwait_imports	.306	.258	.081	1.186	.237
	Qatar_imports	.145	.245	.040	.591	.555
	UAE_imports	.164	.151	.089	1.086	.279
	Iran_imports	.330	.162	.209	2.032	.044
	Iraq_imports	.208	.339	.039	.613	.541
	CrudeOilProduction	-18.257	10.331	-.157	-1.767	.079

a. Dependent Variable: EndStockPetroleumProducts

dummy2009 = .00

Attached Materials_Table 31

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.472[b]	.222	.133	1151.016902

a. dummy2009 = .00

b. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 32

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36375917.15	11	3306901.559	2.496	.008[c]
	Residual	127184631.1	96	1324839.908		
	Total	163560548.3	107			

a. dummy2009 = .00

b. Dependent Variable: EndStockPetroleumProducts

c. Predictors: (Constant), CrudeOilProduction, Iraq_imports, Brunei_imports, Kuwait_imports, Qatar_imports, Malaysia_imports, UAE_imports, Iran_imports, Indonesia_imports, Saudi Arabia, Russia_imports

Attached Materials_Table 33

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	15737.673	1399.761		11.243	.000
	Brunei_imports	2.848	1.948	.156	1.462	.147
	Malaysia_imports	-1.242	1.648	-.075	-.754	.453
	Indonesia_imports	-.408	.629	-.068	-.649	.518
	Russia_imports	1.985	.574	.385	3.455	.001
	Saudi Arabia	.159	.156	.112	1.017	.312
	Kuwait_imports	.416	.338	.121	1.231	.221
	Qatar_imports	.200	.384	.050	.522	.603
	UAE_imports	-.021	.213	-.010	-.100	.920
	Iran_imports	-.201	.224	-.093	-.899	.371
	Iraq_imports	.151	.458	.031	.330	.742
	CrudeOilProduction	-61.408	16.098	-.546	-3.815	.000

a. dummy2009 = .00

b. Dependent Variable: EndStockPetroleumProducts

dummy2009 = 1.00

Attached Materials_Table 34

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.624[b]	.389	.296	746.144452

a. dummy2009 = 1.00

b. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 35

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25560028.36	11	2323638.941	4.174	.000[c]
	Residual	40084671.10	72	556731.543		
	Total	65644699.45	83			

a. dummy2009 = 1.00

b. Dependent Variable: EndStockPetroleumProducts

c. Predictors: (Constant), CrudeOilProduction, Indonesia_imports, UAE_imports, Brunei_imports, Kuwait_imports, Malaysia_imports, Russia_imports, Qatar_imports, Iraq_imports, Saudi Arabia, Iran_imports

Attached Materials_Table 36

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12784.431	1092.141		11.706	.000
	Brunei_imports	-1.448	1.818	-.084	-.796	.428
	Malaysia_imports	.415	1.469	.029	.283	.778
	Indonesia_imports	-.262	.598	-.048	-.438	.663
	Russia_imports	-1.033	.222	-.517	-4.656	.000
	Saudi Arabia	.154	.189	.099	.815	.418
	Kuwait_imports	.256	.296	.095	.863	.391
	Qatar_imports	-.035	.212	-.018	-.164	.870
	UAE_imports	-.249	.208	-.125	-1.197	.235
	Iran_imports	.410	.254	.264	1.611	.112
	Iraq_imports	1.052	.398	.299	2.647	.010
	CrudeOilProduction	-22.840	12.757	-.324	-1.790	.078

a. dummy2009 = 1.00

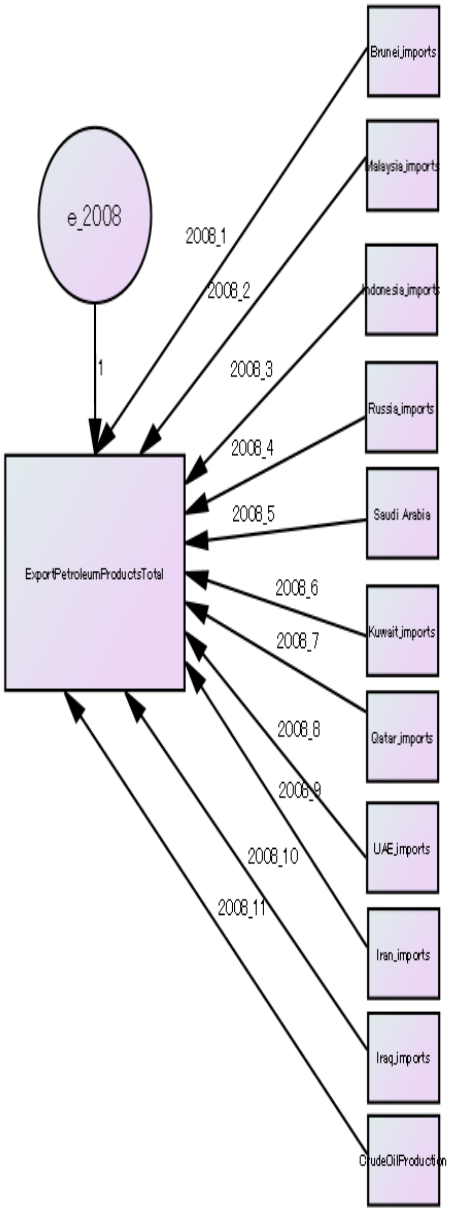
b. Dependent Variable: EndStockPetroleumProducts

F-value (observed) = 8.21 > 2.185 (at 1% significance level) therefore we reject the Null Hypothesis i.e. there is structural change

2) Structural Equation Modelling (AMOS)

SEM (Export of Petroleum Products)

Attached Materials_Figure 1



Model Comparison

ﾓﾃﾞﾙ Hetero は正しいという仮定の下で:

Attached Materials_Table 37

ﾓﾃﾞﾙ	自由度	CMIN	確率	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2

Homo	11	62.913	.000	.104	.127	.031	.040

Model Compatibility

ﾓﾃﾞﾙ適合の要約

CMIN

Attached Materials_Table 38

ﾓﾃﾞﾙ	NPAR	CMIN	自由度	確率	CMIN/DF
Homo	35	518.509	121	.000	4.285
Hetero	46	455.597	110	.000	4.142
飽和ﾓﾃﾞﾙ	156	.000	0		
独立ﾓﾃﾞﾙ	24	604.818	132	.000	4.582

RMR, GFI

Attached Materials_Table 39

ﾓﾃﾞﾙ	RMR	GFI	AGFI	PGFI
Homo	31741.337	.694	.606	.538
Hetero	28388.301	.711	.590	.501
飽和ﾓﾃﾞﾙ	.000	1.000		
独立ﾓﾃﾞﾙ	30027.395	.644	.580	.545

基準比較

Attached Materials_Table 40

ﾓﾃﾞﾙ	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Homo	.143	.065	.178	.083	.159
Hetero	.247	.096	.302	.123	.269
飽和ﾓﾃﾞﾙ	1.000		1.000		1.000
独立ﾓﾃﾞﾙ	.000	.000	.000	.000	.000

倹約性修正済み測度

Attached Materials_Table 41

ﾓﾃﾞﾙ	PRATIO	PNFI	PCFI
Homo	.917	.131	.146
Hetero	.833	.206	.224
飽和ﾓﾃﾞﾙ	.000	.000	.000
独立ﾓﾃﾞﾙ	1.000	.000	.000

NCP

Attached Materials_Table 42

ﾓﾃﾞﾙ	NCP	LO 90	HI 90
Homo	397.509	330.840	471.728
Hetero	345.597	283.490	415.260
飽和ﾓﾃﾞﾙ	.000	.000	.000
独立ﾓﾃﾞﾙ	472.818	400.187	552.987

FMIN

Attached Materials_Table 43

ﾓﾃﾞﾙ	FMIN	F0	LO 90	HI 90
Homo	2.729	2.092	1.741	2.483
Hetero	2.398	1.819	1.492	2.186
飽和ﾓﾃﾞﾙ	.000	.000	.000	.000
独立ﾓﾃﾞﾙ	3.183	2.489	2.106	2.910

RMSEA

Attached Materials_Table 44

ﾓﾃﾞﾙ	RMSEA	LO 90	HI 90	PCLOSE
Homo	.131	.120	.143	.000
Hetero	.129	.116	.141	.000
独立ﾓﾃﾞﾙ	.137	.126	.148	.000

AIC

Attached Materials_Table 45

ﾓﾃﾞﾙ	AIC	BCC	BIC	CAIC
Homo	588.509	599.866		
Hetero	547.597	562.522		
飽和ﾓﾃﾞﾙ	312.000	362.617		
独立ﾓﾃﾞﾙ	652.818	660.606		

ECVI

Attached Materials_Table 46

ﾓﾃﾞﾙ	ECVI	LO 90	HI 90	MECVI
Homo	3.097	2.747	3.488	3.157
Hetero	2.882	2.555	3.249	2.961
飽和ﾓﾃﾞﾙ	1.642	1.642	1.642	1.909
独立ﾓﾃﾞﾙ	3.436	3.054	3.858	3.477

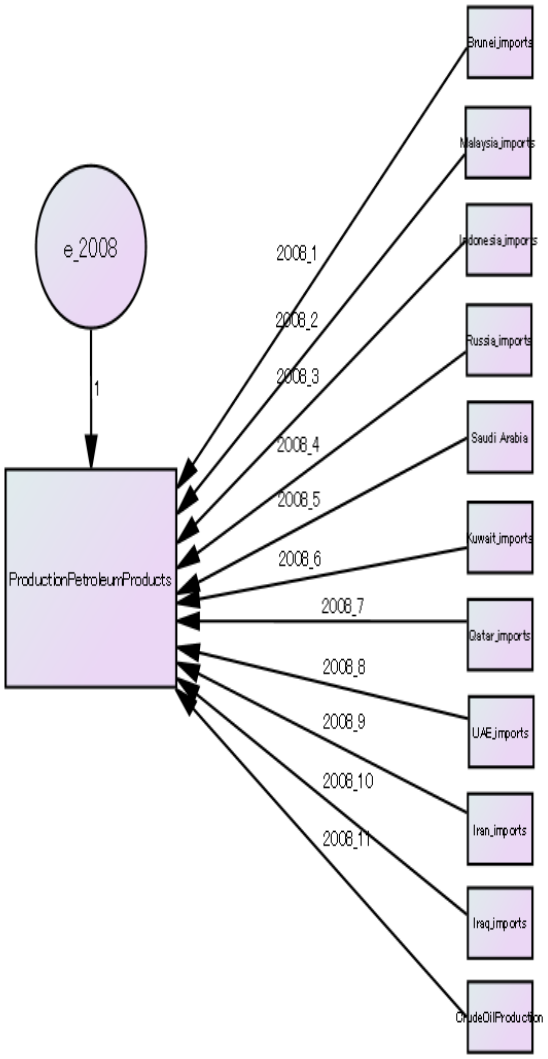
HOELTER

Attached Materials_Table 47

ﾓﾃﾞﾙ	HOELTER .05	HOELTER .01
Homo	56	60
Hetero	58	63
独立ﾓﾃﾞﾙ	52	56

SEM Production of Petroleum Products

Attached Materials_Figure 2



Model Comparison

ﾓﾃﾞﾙ Hetero は正しいという仮定の下で:

Attached Materials_Table 48

ﾓﾃﾞﾙ	自由度	CMIN	確率	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Homogenous	10	39.317	.000	.055	.065	-.003	-.004

Model Compatibility

ﾓﾃﾞﾙ適合の要約

CMIN

Attached Materials_Table 49

ﾓﾃﾞﾙ	NPAR	CMIN	自由度	確率	CMIN/DF
Homogenous	36	494.914	120	.000	4.124
Hetero	46	455.597	110	.000	4.142
飽和ﾓﾃﾞﾙ	156	.000	0		
独立ﾓﾃﾞﾙ	24	718.443	132	.000	5.443

RMR, GFI

Attached Materials_Table 50

ﾓﾃﾞﾙ	RMR	GFI	AGFI	PGFI
Homogenous	85775.365	.697	.606	.536
Hetero	81786.051	.711	.590	.501
飽和ﾓﾃﾞﾙ	.000	1.000		
独立ﾓﾃﾞﾙ	90276.145	.604	.532	.511

基準比較

Attached Materials_Table 51

ﾓﾃﾞﾙ	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Homogenous	.311	.242	.374	.297	.361
Hetero	.366	.239	.432	.293	.411

モデル	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
飽和モデル	1.000		1.000		1.000
独立モデル	.000	.000	.000	.000	.000

倹約性修正済み測度

Attached Materials_Table 52

モデル	PRATIO	PNFI	PCFI
Homogenous	.909	.283	.328
Hetero	.833	.305	.342
飽和モデル	.000	.000	.000
独立モデル	1.000	.000	.000

NCP

Attached Materials_Table 53

モデル	NCP	LO 90	HI 90
Homogenous	374.914	310.046	447.338
Hetero	345.597	283.490	415.260
飽和モデル	.000	.000	.000
独立モデル	586.443	506.130	674.263

FMIN

Attached Materials_Table 54

モデル	FMIN	F0	LO 90	HI 90
Homogenous	2.605	1.973	1.632	2.354
Hetero	2.398	1.819	1.492	2.186
飽和モデル	.000	.000	.000	.000
独立モデル	3.781	3.087	2.664	3.549

RMSEA

Attached Materials_Table 55

ﾓﾃﾞﾙ	RMSEA	LO 90	HI 90	PCLOSE
Homogenous	.128	.117	.140	.000
Hetero	.129	.116	.141	.000
独立ﾓﾃﾞﾙ	.153	.142	.164	.000

AIC

Attached Materials_Table 56

ﾓﾃﾞﾙ	AIC	BCC	BIC	CAIC
Homogenous	566.914	578.595		
Hetero	547.597	562.522		
飽和ﾓﾃﾞﾙ	312.000	362.617		
独立ﾓﾃﾞﾙ	766.443	774.230		

ECVI

Attached Materials_Table 57

ﾓﾃﾞﾙ	ECVI	LO 90	HI 90	MECVI
Homogenous	2.984	2.642	3.365	3.045
Hetero	2.882	2.555	3.249	2.961
飽和ﾓﾃﾞﾙ	1.642	1.642	1.642	1.909
独立ﾓﾃﾞﾙ	4.034	3.611	4.496	4.075

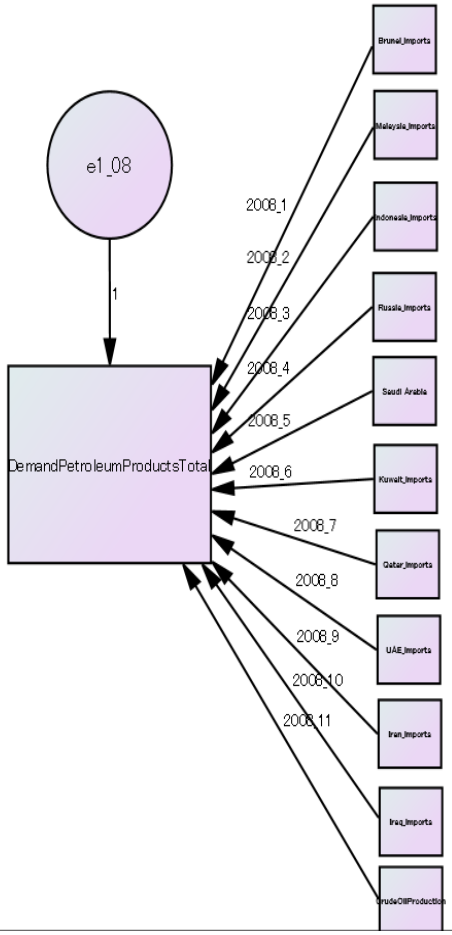
HOELTER

Attached Materials_Table 58

ﾓﾃﾞﾙ	HOELTER .05	HOELTER .01
Homogenous	58	63
Hetero	58	63
独立ﾓﾃﾞﾙ	44	47

SEM_Demand for Petroleum Products

Attached Materials_Figure 3



Model Comparison

ﾓﾃﾞﾙ Hetero は正しいという仮定の下で:

Attached Materials_Table 59

ﾓﾃﾞﾙ	自由度	CMIN	確率	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Homo	11	66.526	.000	.097	.115	.033	.041

Model Compatibility

ﾓﾃﾞﾙ適合の要約

CMIN

Attached Materials_Table 60

ﾓﾃﾞﾙ	NPAR	CMIN	自由度	確率	CMIN/DF
Homo	35	522.123	121	.000	4.315
Hetero	46	455.597	110	.000	4.142
飽和ﾓﾃﾞﾙ	156	.000	0		
独立ﾓﾃﾞﾙ	24	689.101	132	.000	5.220

RMR, GFI

Attached Materials_Table 61

ﾓﾃﾞﾙ	RMR	GFI	AGFI	PGFI
Homo	127158.492	.690	.600	.535
Hetero	91296.016	.711	.590	.501
飽和ﾓﾃﾞﾙ	.000	1.000		
独立ﾓﾃﾞﾙ	108372.574	.618	.548	.523

基準比較

Attached Materials_Table 62

ﾓﾃﾞﾙ	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Homo	.242	.173	.294	.215	.280
Hetero	.339	.207	.403	.256	.380
飽和ﾓﾃﾞﾙ	1.000		1.000		1.000
独立ﾓﾃﾞﾙ	.000	.000	.000	.000	.000

倹約性修正済み測度

Attached Materials_Table 63

ﾓﾃﾞﾙ	PRATIO	PNFI	PCFI
Homo	.917	.222	.257

ﾓﾃﾞﾙ	PRATIO	PNFI	PCFI
Hetero	.833	.282	.316
飽和ﾓﾃﾞﾙ	.000	.000	.000
独立ﾓﾃﾞﾙ	1.000	.000	.000

NCP

Attached Materials_Table 64

ﾓﾃﾞﾙ	NCP	LO 90	HI 90
Homo	401.123	334.177	475.617
Hetero	345.597	283.490	415.260
飽和ﾓﾃﾞﾙ	.000	.000	.000
独立ﾓﾃﾞﾙ	557.101	478.703	643.014

FMIN

Attached Materials_Table 65

ﾓﾃﾞﾙ	FMIN	F0	LO 90	HI 90
Homo	2.748	2.111	1.759	2.503
Hetero	2.398	1.819	1.492	2.186
飽和ﾓﾃﾞﾙ	.000	.000	.000	.000
独立ﾓﾃﾞﾙ	3.627	2.932	2.519	3.384

RMSEA

Attached Materials_Table 66

ﾓﾃﾞﾙ	RMSEA	LO 90	HI 90	PCLOSE
Homo	.132	.121	.144	.000
Hetero	.129	.116	.141	.000
独立ﾓﾃﾞﾙ	.149	.138	.160	.000

AIC

Attached Materials_Table 67

ﾓﾃﾞﾙ	AIC	BCC	BIC	CAIC
Homo	592.123	603.479		
Hetero	547.597	562.522		
飽和ﾓﾃﾞﾙ	312.000	362.617		
独立ﾓﾃﾞﾙ	737.101	744.889		

ECVI

Attached Materials_Table 68

ﾓﾃﾞﾙ	ECVI	LO 90	HI 90	MECVI
Homo	3.116	2.764	3.509	3.176
Hetero	2.882	2.555	3.249	2.961
飽和ﾓﾃﾞﾙ	1.642	1.642	1.642	1.909
独立ﾓﾃﾞﾙ	3.879	3.467	4.332	3.920

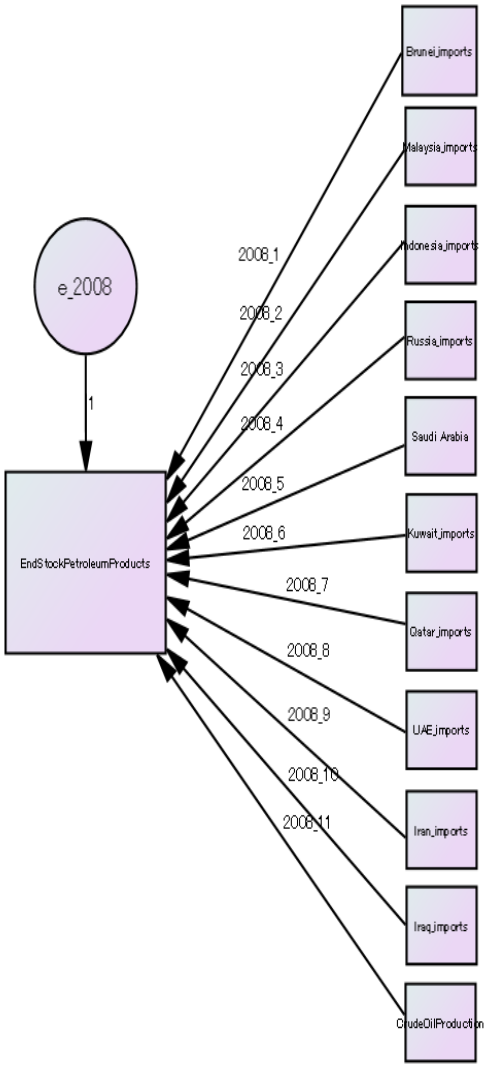
HOELTER

Attached Materials_Table 69

ﾓﾃﾞﾙ	HOELTER .05	HOELTER .01
Homo	55	60
Hetero	58	63
独立ﾓﾃﾞﾙ	46	49

SEM End Stock of Petroleum Products

Attached Materials_Figure 4



Model Comparison

ネストしたモデルの比較

モデル Hetero は正しいという仮定の下で:

Attached Materials_Table 70

ﾓﾃﾞﾙ	自由度	CMIN	確率	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Homo	11	38.363	.000	.073	.093	-.015	-.020

Model Compatibility

ﾓﾃﾞﾙ適合の要約

CMIN

Attached Materials_Table 71

ﾓﾃﾞﾙ	NPAR	CMIN	自由度	確率	CMIN/DF
Homo	35	493.960	121	.000	4.082
Hetero	46	455.597	110	.000	4.142
飽和ﾓﾃﾞﾙ	156	.000	0		
独立ﾓﾃﾞﾙ	24	523.483	132	.000	3.966

RMR, GFI

Attached Materials_Table 72

ﾓﾃﾞﾙ	RMR	GFI	AGFI	PGFI
Homo	37529.352	.701	.614	.543
Hetero	49541.923	.711	.590	.501
飽和ﾓﾃﾞﾙ	.000	1.000		
独立ﾓﾃﾞﾙ	35529.668	.684	.627	.579

基準比較

Attached Materials_Table 73

ﾓﾃﾞﾙ	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Homo	.056	-.029	.073	-.039	.047
Hetero	.130	-.044	.164	-.059	.117
飽和ﾓﾃﾞﾙ	1.000		1.000		1.000
独立ﾓﾃﾞﾙ	.000	.000	.000	.000	.000

倹約性修正済み測度

Attached Materials_Table 74

ﾓﾃﾞﾙ	PRATIO	PNFI	PCFI
Homo	.917	.052	.043
Hetero	.833	.108	.098
飽和ﾓﾃﾞﾙ	.000	.000	.000
独立ﾓﾃﾞﾙ	1.000	.000	.000

NCP

Attached Materials_Table 75

ﾓﾃﾞﾙ	NCP	LO 90	HI 90
Homo	372.960	308.208	445.271
Hetero	345.597	283.490	415.260
飽和ﾓﾃﾞﾙ	.000	.000	.000
独立ﾓﾃﾞﾙ	391.483	324.860	465.667

FMIN

Attached Materials_Table 76

ﾓﾃﾞﾙ	FMIN	F0	LO 90	HI 90
Homo	2.600	1.963	1.622	2.344
Hetero	2.398	1.819	1.492	2.186
飽和ﾓﾃﾞﾙ	.000	.000	.000	.000
独立ﾓﾃﾞﾙ	2.755	2.060	1.710	2.451

RMSEA

Attached Materials_Table 77

ﾓﾃﾞﾙ	RMSEA	LO 90	HI 90	PCLOSE
Homo	.127	.116	.139	.000
Hetero	.129	.116	.141	.000
独立ﾓﾃﾞﾙ	.125	.114	.136	.000

AIC

Attached Materials_Table 78

ﾓﾃﾞﾙ	AIC	BCC	BIC	CAIC
Homo	563.960	575.317		
Hetero	547.597	562.522		
飽和ﾓﾃﾞﾙ	312.000	362.617		
独立ﾓﾃﾞﾙ	571.483	579.270		

ECVI

Attached Materials_Table 79

ﾓﾃﾞﾙ	ECVI	LO 90	HI 90	MECVI
Homo	2.968	2.627	3.349	3.028
Hetero	2.882	2.555	3.249	2.961
飽和ﾓﾃﾞﾙ	1.642	1.642	1.642	1.909
独立ﾓﾃﾞﾙ	3.008	2.657	3.398	3.049

HOELTER

Attached Materials_Table 80

ﾓﾃﾞﾙ	HOELTER .05	HOELTER .01
Homo	58	63
Hetero	58	63
独立ﾓﾃﾞﾙ	60	64