

Challenges in the Mexican Petroleum Sector

-The Mexican struggle for Foreign Direct Investments

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This thesis was written as a part of the siviløkonom-degree program. Neither the institution, the advisor, nor the sensors are – through the approval of this thesis- responsible for neither the theories and methods used, nor results and conclusions drawn in this work.

1 Preface

The fall semester of 2005 I participated in the exchange program at Instituto Tecnológico Autónomo de México, ITAM in Mexico City. This gave me the inspiration to write a thesis focusing on Mexico.

Like Norway, Mexico is an important producer of oil and gas. A large part of the Mexican petroleum reserves is located in the Gulf of Mexico. Therefore Norway and Mexico have a lot in common when it comes to the technical challenges of offshore exploration. I thought it would be interesting to look at the Mexican petroleum sector since a lot of Norwegian companies have an interest in this field and what happens in Mexico.

At the end of my stay in Mexico I got in touch with Statoil Mexico. They were very positive about the idea of writing a thesis about the Mexican Petroleum sector and immediately offered to assist me in the writing process and suggested possible topics. Although the final product does not focus on Statoil's situation in particular, it deals with a situation that is very much present for Statoil Mexico AS. They have assisted me with information and have been available for questions. I would like to thank Knut Henrik Jakobsson at Statoil's office in Mexico City and Berit Tvedt at Statoil's office in Huston for their assistance during the writing process.

I would also like to thank my teaching supervisor, dr. oecon Hans Jarle Kind at the Norwegian School of Economics and Business Administration for encouragement, motivation and good professional advice during the process.

I wish you a delightful reading.

Bergen, August 10th 2006,

Inger Johanne Krohn

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2 Introduction

Mexico is one of the largest producers and consumers of oil and gas in the world. A systematic fall of proven reserves and the absence of significant discoveries the last 25 years have made Mexico incapable of meeting the local demand of gas. The Mexican petroleum industry is strongly regulated by the governmental Oil and Gas Company Pemex and does not allow private investment on upstream activities. Pemex does not have the financial capital, the experience or the technical capacity to explore the deeper waters in the Gulf of Mexico. The possibility of making major discoveries here is high, but Pemex need to attract private capital in order to explore the area. Pemex have been offering private investors Multiple Service Contracts, but these have been of moderate success. The large multinational petroleum companies are hoping for a change in the constitution to allow private investors to participate in upstream activities.

This thesis is divided in two parts. The first part gives a presentation of the situation in the Mexican petroleum sector. In order to get a good understanding of the situation and challenges that Mexico is facing today, it is important to look at the economic situation today, but also to look at the development of the country's modern history and its petroleum sector. Finally the presidential election 2006 is described briefly and how this may affect the future situation.

The second part of the thesis presents theory that can help explain some of the problems Mexico is facing when it comes to attracting private capital and turning the situation in the petroleum sector. Dunning's OLI framework identifies what kind of factors needs to be present in order to make it attractive for a Multinational Enterprise to produce internationally. In the extension of this framework, the Investment Development Path (IDP) shows the 5 stages a country goes through in developing an increased level of inward and outward foreign direct investments (FDI). This tries to explain why some countries are more successful than others in attracting FDI.

The Real Options Approach to investment is a new way of approaching an investment decision by looking at an investment like a financial call option. This approach shows the value of waiting for more information when making investments under high uncertainty.

Finally, the coordination problem and cluster effects look at how agglomeration forces may influence the choice of localization for multinational enterprises and the effect of coordinating investment decisions.

Third part is just some concluding remarks and thoughts about the future investments in the Mexican petroleum sector. In this chapter the situation in Mexico is seen in the light of the presented theory.

2.1 Approach to the problem

The 2nd of July 2006 a new president was elected and the new government will take over the 1st of December. The outfall of this election has been expected to affect the economic policy in Mexico and has given potential private investors hope of a liberalization of the petroleum sector. How has the Presidential Election of 2006 affected the private participation in the Mexican petroleum industry and how will it affect it in the future? The historical development of Mexico and the petroleum sector is relevant in order to understand today's situation. How has this affected Mexico's ability to attract FDI? And what factors must be present in order to attract foreign investors and what may be causing this to fail?



3 Presentation of Mexico

	Mexico	Venezuela	Brazil
Population	107,449,525 (July 2006 est.)	25,730,435	188,078,227
Population growth	1.16% (2006 est.)	1.38%	1.04%
Age structure			
0-14 years	30.6%	29.1%	25.8%
15-64 years	63.6%	65.7%	68.1%
65 years and over	5.8% (2006 est.)	5.2%	6.1%
Religion	Roman Catholic 89%, Protestant 6%, Other 5%		
Languages	Spanish, various Mayan, Nahuatl, and other regional indigenous dialects		
Governmental type	Federal republic	Federal republic	Federal republic
Legal structure	Mixture of US constitutional theory and civil law system; judicial review of legislative acts; accepts compulsory ICJ jurisdiction, with reservations.	Open adversarial court system	Based on roman codes; Has not accepted compulsory ICJ jurisdiction
GDP (Purchasing power parity)	\$1.067 trillion (2005 est.)	\$153.7 billion	\$1.556 trillion
GDP (official exchange rate):	\$693 billion (2005 est.)	\$106.1 billion	\$619.7 billion

GDP - real growth rate:	3% (2005 est.)	9.3%	2.4%
GDP – per capita (PPP):	\$10,000 (2005 est.)	\$6,100	\$8,400
GDP - composition by sector:			
Agriculture:	3.8%	4%	8.4%
Industry:	25.9%	41.9%	40%
Services	70.2% (2005 est.)	54.1%	51.6%
Inflation (consumer prices)	4%	16%	6.9%
Public debt (of GDP)	17.4%	34.2%	51.6%
External debt	\$137.2 billion	\$41.51 billion	\$188 billion
Proved oil reserves	33.31 billion bbl (2005 est.)	75.59 billion bbl	15.12 billion bbl
Oil production	3.42 million bbl/day (2005 est.)	3.081 million bbl/day	2.01 million bbl/day
Labor force	43.4 million (2005 est.)	12.31 million	90.41 million
Labor force – by occupation:			
Agriculture:	18%	13%	20%
Industry:	24%	23%	14%
Service:	58 % (2003)	64%	66%
Unemployment rate:	3.6 % plus underemployment of perhaps 25% (2005 est.)	12.2%	9.8%
Population below poverty line:	40 % (2003 est.)	47% (1998 est.)	22% (1998 est.)
Currency	Mexican Peso MXN	Boliviar	Real (BRL)
Exchange rates (USD)	10.898 (2005)	2,089.8	2.4344

(Source: The World Factbook, 2006)

The table above shows key economic figures from the Mexican economy. In order to get a better impression of these figures they are compared to figures from Brazil and Venezuela. Since the focus in this paper is on the petroleum industry in Mexico, it could be interesting to look at the figures in relation to two other oil-producing countries in Latin-America.

Brazil is pursuing industrial and agricultural growth and is in possession of great natural resources. The exploiting of these resources and a large labour pool makes Brazil the leading economical power of South America and a regional leader.

Venezuela is an economy highly dependent on the petroleum sector. This sector counts for about one third of the country's GDP, 8% of its exports earnings and half of the governments operating revenues. Apart from the oil-income, tax revenues are the primary source of income, representing 53% of the budget. A national strike in the national oil industry from

December 2002 to February 2003 temporarily halted the economy. Like Mexico, Venezuela represents an important source of oil import to the US market. Inflation and unemployment represent fundamental problems (The world factbook, 2006)

Mexico is the fifth largest country in the Western Hemisphere and is rich on natural resources such as petroleum and natural gas. Although the Mexican economy has been struggling, great efforts have been made in order to modernize its economy. The economic crisis in 1994 caused by the devaluation of the peso resulted in the worst recession in over half a century. The country has made a remarkable recovery and is currently one of the 15 largest economies in the world measured in GDP.

The efforts made in order to modernize the economy have been slowed down by the nation's rugged terrain, rapidly growing population and economic crises (Msn Encarta, 2006). The presidential election held in 2000 was the first free and fair election in the independent history of Mexico. For the first time since the 1910 Mexican Revolution the opposition defeated the party in government, the Institutional Revolutionary Party, which had dominated the economy for seven decades (The world factbook, 2006 & Msn Encarta, 2006).

Mexico has a free market economy that recently entered in the trillion dollar class. The economy basically consists of a mixture of modern and traditional industry and agriculture. Although the state is dominating the industry sector, especially in electricity, telecommunication and oil, the private sector has increasing influence. Most of the GDP stem from the service sector and tourism represents an important part of Mexico's foreign exchange. The service sector increased with 2.9% on average between 1990 and 2003 (Europa world Yearbook, 2005).

Mexican economy represents a GDP of 1.067 trillion USD. This makes Mexico the 13th largest economy in the world, yet the Brazilian economy with its GDP of 1.556 trillion USD is the largest economy in Latin America, ranked as number 11. Venezuela is not able to compete with the two. A GDP of 153.7 billion USD makes Venezuela the 54th largest economy in the world.

However, Mexico has the highest GDP per capita of the three countries with 10,000 USD, followed by Brazil's 8400 USD. The rate of inflation was very high in Mexico between 1990 and 2003, with an annual rate of 15.2% (Europa World Yearbook, 2005) but this has been

reduced to only 4% in 2005. Venezuela has a very high inflation rate of 16% while the Brazilian inflation is 6.9%.

Mexico has a much lower public debt than Brazil and Venezuela (17.4% of the GDP).

Mexico has the highest oil production, closely followed by Venezuela. These two countries represent the 7th and 9th largest producers in the world, only separated by Norway. Brazil is number 16 on the list of the world's largest oil producers.

The income per capita in Mexico is the highest in Latin America (6,770 USD in 2005). Still that is merely one fourth that of the US and the income distribution remains highly unequal (The world factbook, 2006).

3.1 History of the independent Mexico

In order to understand today's situation in the Mexican petroleum sector, one needs to take a look at the country's modern history. In this chapter the history of the independent Mexico is represented with the main focus on the development of the petroleum industry.

The history of the independent Mexico started with the War of Independence (1810-1821) when the Mexicans revolted against the Spanish rule in 1810. Until claiming its independence the country, had been under Spanish governance since 1521. After the war the first independent government was established. The independent Mexico was recognised internationally and different measures were taken on to ensure a more democratic society. In 1836 half the original territory was lost to the United States of America when the state of Texas declared its independence. A war broke out, and what is currently known as the states of California, Arizona, New Mexico and Texas were lost to the Americans. In 1859 a new Law of Reforms separated the Church and the State (www.mexican-emb.dk/history.html)

When the totalitarian dictator Porfirio Díaz became president in 1887 Mexico made enormous advances in economical and commercial development, and was very open to foreign investments (www.historychannel.com). Before the introduction of the Law of Reforms the Church played a very powerful role the Mexican society. The new laws later resulted in the privatization of territory formally belonging to the Church and the indigenous people, modernization of the infrastructure and improvement of the economic situation (Quintana,

1999). Due to its geographical proximity to the USA, Mexico was an attractive area to search for oil for the Americans and lucrative taxation policies made the country interesting for private investors. When the Constitution was changed in 1884 and everything under the surface of the earth was privatized, the interest was even higher. This led to an explosive growth in oil production at the beginning of the 1900s (Stokke Hall, 2004).

When the Mexican Revolution started in 1911, President Díaz was removed from the power as a result of social and political dissatisfaction. The privatizations and the right to own land was one of the issues in the revolution, and in 1912 the new president, Madero, made restrictions on oil mining and made it possible to tax foreign oil companies. In 1917 the new Constitution stated that everything under the surface of the earth belongs to the State. This Constitution is still one of the strongest national symbols of Mexico (Stokke Hall, 2004).

In 1929 the National Revolutionary Party (PNR) was created by former president Calles. This party, today known as the Institutional Revolutionary Party (PRI), dominated the Mexican politics for seven decades (www.mexican-emb.dk/history).

In 1936, during Lázaro Cárdenas' presidency an Expropriation Law allowed the government to expropriate private property whenever necessary for public or social welfare. In 1938 the entire oil industry was nationalised (www.historychannel.com). An article in the Constitution stated that this industry can not be acquired, owned or exploited by the private sector. The Mexican people's reaction was overwhelmingly positive, while foreign investors were not pleased. This resulted in a trade boycott of Mexico led by Standard Oil and Royal Dutch Shell who refused to buy Mexican oil and to sell important goods acquired in the oil production (Stokke Hall, 2004).

The 7th of June 1938, the governmental oil company Petróleos Mexicanos, Pemex, was created in order to manage and operate the nationalised oil industry. Pemex got a rough start because skilled workers had left the country as a consequence of the nationalization, but still managed to keep production up in all sectors except of exploration (www.pemex.com). In spite of the boycott Pemex developed into one of the worlds largest oil companies, and helped Mexico become one of the largest oil exporters in the world (<http://en.wikipedia.org/wiki/PEMEX>).

As Pemex was created President Cárdenas weakened the position of the federation unions in the oil sector and they had to fight with the government over the power of Pemex and the oil.

Even though the federation unions did not win the battle and had their position weakened utterly, they have still influenced the Mexican oil industry until today.

Pemex's search for oil increased dramatically when Antonio J. Bermúdez became general manager in 1947. Risk contracts with independent foreign oil companies gave private companies compensation for drilling costs at successful wells and a guaranteed profit between 15 and 18% over a period of 25 years of the following production income. In 1959 these contracts became illegal when the congress approved changes in the Constitution of 1917. The Constitution's article number 27 prohibits giving licences or contracts to private parties on exploitation of petroleum and hydrocarbons. Paragraph 4 gives Pemex the monopoly on exploration and exploitation of oil while paragraph number 6 opens for Pemex to sign service contracts with private companies as long as the payment is a fixed sum and there is no percentage of produced goods or parts of the results of the exploitations (Stokke Hall, 2004).

Mexico had a strong focus on its import competing sector since before World War I. Many Latin American countries conducted a policy of import substitution on consumption goods in order to become industrialized. After World War II this kind of policy was given the name Import-Substituting Industrialization (ISI) by the UN. The intention behind this trade policy is to raise the nations skill levels, bring terms-of-trade gains, and allow planners to economize on market information (Pugel, 2004). A strong national industry where the oil played an important role was the recipe for economic growth. The oil production was oriented towards the domestic market to avoid energy import while developing the domestic industry and agriculture. The Mexican oil policy's two main goals were to meet the need for petroleum in the domestic economy and to reduce the oil export to a minimum. The reason for reducing the oil export was to use the oil in the domestic industrial expansion.

Artificially low prices on oil and refined products gave Pemex few incentives to start searching for more oil. Between 1947 and 1957 the subsidies represented 9.1% of the total income of the company. While the general prices in Mexico increased with 459 percent between 1939 and 1958, the oil prices increased with only 185 percent. In order to provide Pemex with the necessary goods and to avoid imports, the refining capacity and a petrochemical industry was developed.

In 1958 a modification of the Constitution increased Pemex's monopoly to include the production and distribution of petrochemical basis products.

The period between 1950 and 1981 Mexico had its best growth ever in spite of the criticism of the economic policy. However, Pemex's strong growth led to problems like too many employees, inefficiency, incompetence and corruption (Stokke Hall, 2004).

Mexico was known for its growing economy after World War II. The economy went from being based on agriculture to being based on service and manufacturing. However, at the end of the 1960s the import substituting policy was in a crisis. The agriculture was declining and the national industry was "not strong enough to enter the next phase of industrialization in an international context". Mexico experienced a lower growth in the exploitation and refining of oil and at the same time the inflation and the national budget deficit increased (Sterri 2004).

This caused the government to borrow billions of dollars internationally and Mexico was once again a net importer of hydro carbons (Msn Encarta, Mexico, 2006).

Even though the oil price shock in 1973 hit Mexico hard, the import substitution policy was saved by new oil findings and changed lending policy from the US. From September 1974, Mexico was once again net exporter of oil (Stokke Hall, 2004).

Falling oil prices, higher world interest rates, rising inflation, a chronically overvalued peso and deteriorating balance of payments led to a massive capital flight in 1981 (<http://en.wikipedia.org>). The 13th of August the following year the Mexican government declared itself insolvent. The debt crisis was a fact and this was the end of the import substituting policy (ISI) in Mexico. This policy had been kept alive through loans and an explosive growth in the income from oil (Stokke Hall, 2004). Although this policy had protected the country's industry, it had also reduced the competition in the market. As a result, the Mexican economy with its governmental and private owned companies had become less efficient. In order to make the economy work more efficiently the government started an aggressive privatization policy. Governmental owned industry like banks, utilities, airlines and manufacturing companies were sold to the private sector. The only exception for this policy was the energy sector (Msn Encarta, Mexico 2006) .

Oil exports were kept high after 1981 in order to pay the debt, but the economic crisis in 1995 made the export increase drastically. In the end of the 80s and the beginning of the 90s the value of the Mexican peso dropped, which made private and foreign investors withdraw millions of dollars from the domestic economy. This caused the economy to start to collapse. In order to prevent this, the US and the World Bank gave Mexico emergency loans in 1995.

The economic crisis resulted in a serious recession of the economy and a large increase in extreme poverty.

In order to integrate its economy in the competitive global economy Mexico became member of the North American Trade Agreement (NAFTA) in 1994. Through this membership Mexico aims at free trade and eliminating tariffs among member nations (USA, Canada and Mexico).

Before the sitting President of today, Vicente Fox, representing the National Action Party (PAN) won the elections in 2000, Mexico had been governed by the Institutional Revolutionary Party (PRI). The victory in 2000 was a huge step towards democratic pluralism. However, political effectiveness has been hindered by a divided legislature and as a result reforms have been slow to progress (Economist 2006).

Mexico has shown strong economic growth since the economic crisis in 1995 (<http://odin.dep.no/ud>). Even though the economy has been strong at the beginning of the 21st century it is still very vulnerable to external factors, especially the US economy since they have a lot of trade and investments in the US (Msn Encarta 2006 Mexico).

Today, the biggest concern in the Mexican oil industry is declining oil reserves. The probability of findings on deep water is high, but Pemex does not have the economical or technological resources to search for oil. Adjustments will have to be made for the oil to be able to play an important role in the country's future.

3.2 Mexico's International Relationships

According to new information from the central bank of Mexico, Banco de México, growth forecasts for the end of this year is 4.0 to 4.5 percent. However, investors are cautious about the strong growth in fear of the situation in the US. The Mexican economy is vulnerable to changes in the US economy and private investors fear how a rise in the interest rates and slowdown in the American economy could affect the situation in Mexico (El Financiero, 1st and 4th of August 2006).

Between 1990 and 2003 the economy has been growing 2.8% annually on average. Since the presidential election in 2000 the economy grew by only 1.8% a year on average and fell from

the 9th to the 14th of the rankings of world economies (The Wall Street Journal). In 2003 it increased by only 1.2% (The Europa World Year book, 2005). Although the growth has recovered to a level of 3% according to 2005 estimates and is expected to grow further as mentioned, the slowing growth in GDP during Fox's presidency may be explained by the difficulties the Fox government has met in reaching agreements with the opposition-led Congress on key economic legislation. Several economic proposals made by the government have been blocked by the Congress, i.e. legislation to improve tax collection and to revitalize the energy industry (Nesteng, 2004). The next government, taking over the power in December 2006 is expected to meet the same challenges as the current government; boosting economic growth, improving the international competitiveness and reducing poverty (The World Factbook, 2006 Mexico).

Mexico's major export commodities are manufactured goods, crude petroleum, petroleum products, coffee and silver. The United States (79.9% in 2005), Canada (5.7%) and Spain (1.4%) are the most important partners for exports. The exports had an annual growth of 9.1% in 2005, which is less than the year before with 11.5% (www.worldbank.org). The Mexican exports depend heavily on the demand of imports in the US. A falling demand in the US market is bad news for Mexico. Lack of progress on structural reforms will probably retard the progress of the development of a more efficient and less costly infrastructure needed in order to compete with the Asian market (The Economist Intelligence Unit Ltd., August 4th 2006).

Major import commodities are metal working machines, steel mill products and agricultural machinery. Also when it comes to imports, the United States is the most important partner (59.4% in 2005). Other important partners are Germany (3.8%) and Japan (3.4%) (World Factbook 2006 Mexico). The imports had a growth of 7.3% in 2005 and were also declining from the year before of 10.2% (<http://web.worldbank.org>).

Since the membership in the North American Trade Agreement (NAFTA) in 1994 the trade with the US and Canada has tripled. In addition to NAFTA, Mexico has 12 free trade agreements with over 40 countries including Guatemala, Honduras, El Salvador, the European Free Trade Area and Japan. In fact 90% of its trade is put under free trade agreements (World Factbook 2006 Mexico).

Mexico is second to Brazil in receiving foreign direct investments (FDI) in Latin America. Foreign direct investments jumped significantly with 46% from 2003 to 2004 when they represented 16.6 billion USD. The improvement was mostly accounted for by the manufacturing and financial services sector. Most of the investments consisted of fresh investments (48% of the total FDI) and transfers between companies (22.1%), reinvested profits (14.9%), and transport and communication (16.2%). An estimated 48% of the foreign direct investments came from the US, followed by Spain (34.7%), Switzerland (7.2%) and Canada (2.1%).

Due to Mexico's membership in NAFTA the use of local content requirements have been phased out, with the exception of sensitive sectors like the energy sector. These requirements have been replaced with a "North American Content" as the key consideration (The Economist Intelligence Unit Ltd., 4th of August 2006).

The current account balance in 2005 was estimated to be -5.708 billion USD. The current account balance represents the country's net trade in goods and services plus net earnings from rents, interests, profits, and dividends, and the net transfer payments to and from the rest of the world (World Factbook 2006 Mexico).

The exchange rate of the Mexican peso per USD was 10.898 in 2005. It has been increasing steadily from 9.342 USD in 2001. The exchange rate plays an important role in the economy because the country is depending on higher depreciation of the currency in order to make the production more competitive in US dollar terms. However, the central bank does what it can in order to avoid depreciation because it is concerned about having a rebound in inflation. Other Latin American countries have had success with getting their currency to gain competitiveness by allowing them to float. The Mexican peso is pegged to the USD, which makes it very hard to gain competitiveness (Nesteng, 2004).

4 The petroleum sector

Mexico had the fourth proven crude oil reserves in the western hemisphere in 2004 after Canada, Venezuela and the US (Mexico Business forecast report). According to Pemex the proved crude oil reserves in 2005 was 16.470 billion barrels of crude oil equivalent, enough for 10 years production, at the rate of 2005 (www.pemex.com).

In 2004 Mexico produced about 3.8 million barrels per day of oil and gas liquids with net exported of about 1.9 million barrels per day, mostly to the US (Mexico Business Forecast report). There are six refineries in Mexico but the country is still depending on petroleum imports in order to meet the domestic demand because of insufficient refining capacity. However, thanks to expansion in the refinery activity these imports are decreasing.

The last 25 years there have been few significant discoveries and none in the giant class. However there is a possibility of doing new major discoveries, most likely on deep waters in the Gulf of Mexico that still remains unexplored. In order to maintain the current production and smoothen the decline of the mature endowment of proved reserves, extraordinary efforts will have to be made (Lajous, 2005).

Lacking investments in this industry causes the production of Oil and Gas to rise faster than new barrels are being discovered. In 2005 Pemex was expected to replace 50% of production via new discoveries. This figure is unlikely to improve since private capital is not accepted in the exploration and production sectors.

The natural gas reserves have declined since the 1990s, but the possibility of allowing international oil companies to develop gas deposits opens for a possible expansion over the next years.

Oil supply and demand

According to forecasts for 2008 the oil consumption is rising and Pemex is planning to increase crude oil production in order to achieve 100% reserves replacement. To achieve this goal Pemex will need large investments in exploration and production over the next years. Due to little sign of major investments this is probably an over optimistic goal.

Gas supply and demand

When it comes to gas, Mexico appears to have more success in boosting production, thanks to Multiple Service Contracts, MSC. These are pure service contracts that allow private contractors to participate in the downstream activities (distribution, storage and transportation) in the gas sector. These contracts will be explained in more detail later in this thesis. According to Business Monitor International's forecasts natural gas production will grow 9% annually on average until 2008. This number is based on the ambitious development programme and increased private sector participation in this sector.

The demand for gas is increasing quickly and is expected to play an important role in the future. "One of the government's main priorities in reforming Mexico's energy sector has been to increase domestic gas production in order to meet domestic demand and to stem the flow of imports from the US. The strategic gas plan, was first introduced in 2000, and calls for domestic gas supply to increase to 83 bcm by 2008" (Harvey, 2005: p 25).

The Pemex is planning to increase the infrastructure and capacity on the US boarder and to focus more on gas exploration and production activities. The reason for this is to meet the expected growth in demand for gas. 8% of Mexico's gas imports come from the US. According to the US Department of energy the gas consumption is expected to increase by 3.4% annually to 2020 and by 7% in the last part of this decade (Harvey, 2005).

Natural gas is the most liberalised part of the Mexican oil industry. Until 1995 both upstream and downstream activities was under Pemex's monopoly, but legislative reforms opened for private investments in downstream activities (distribution, storage and transportation) through Multiple Service Contracts. Another possibility for private investors is through participation in the development of Liquefied Natural Gas (LNG) projects building pipelines (Nesteng, 2004).

Refining and Oil products Trade

Due to the expected growth in the domestic and international oil market demand, Mexico is planning substantial refinery upgrades over the next ten years. This is a necessity for Mexico, who will become increasingly dependent on refined product imports (Harvey, 2005).

The petroleum sector is highly complex, and by observing it from different angles, it becomes more and more complex; the remaining resources are more difficult to discover, and once they are discovered production is more difficult and expensive. The deep water projects are examples of this. The petroleum industry is under constant change in order to meet the demand. The technical skills are constantly improving and the commercial part of the industry constantly has to prepare for unforeseen change in the market. What is considered to be of first class production today may be the second option tomorrow (Baker & Associates 2006).

In order to understand and meet the challenges in the Mexican petroleum sector, it is necessary to keep an open eye to what happens in the international petroleum industry in terms of regulating institutions, the observed practice and the technological development (Baker & Associates 2006).

There are three possible scenarios for the petroleum sector in the years to come. The first possible scenario is the status quo, where the situation remains the same as today. Alternatively Pemex tries to develop the petroleum sector on its own without interference from the private sector. The third possible scenario is where Pemex creates alliances with parties from the private sector. In this case private investors could help Pemex developing the industry through financing, technology of transfer and know how.

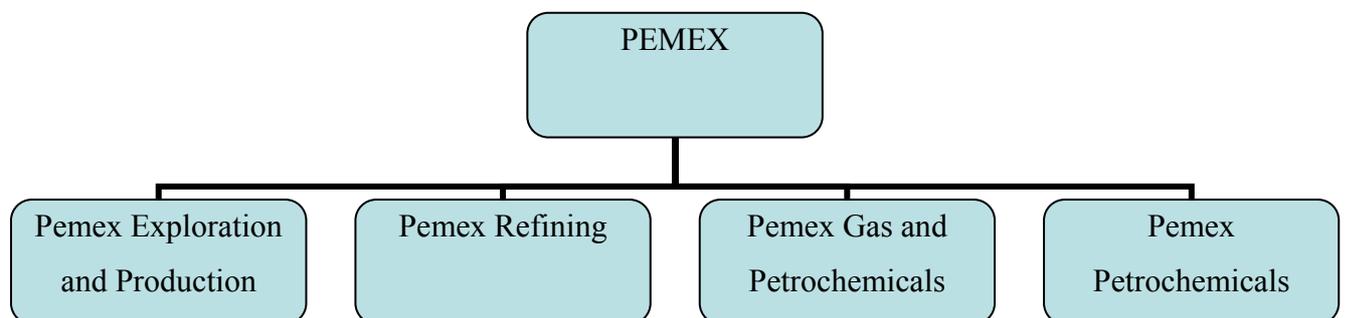
4.1 About Pemex

Petróleos Mexicanos, Pemex, was established in 1938 and is the national oil and gas company of Mexico. It is the country's largest company with 86 billion USD of total sales in 2005. It is the sole producer of crude oil and natural gas, and the sole producer of refined products and the only company in Mexico commercializing them. An average daily production of 3.3 million barrels makes Pemex the world's third crude oil producer, the first in offshore production and, the ninth integrated Oil Company (2005).

Pemex is responsible for developing the country's hydrocarbon resources and operates through four subsidiaries:

- **Pemex Exploration and Production** is responsible for exploring and developing Mexico's reserves of crude oil and natural gas.
- **Pemex Refining** is responsible for transforming the crude oil into gasoline, diesel and liquid gas to distribute and commercialize the products.
- **Pemex Gas and Petrochemicals** is processing natural gas and liquid natural gas; transporting, distributing and commercializing it in Mexico in addition to elaborating and commercializing a number of basic petrochemical products.
- **Pemex Petrochemicals** is producing and commercializing petrochemical raw material

(www.pemex.com).



Each of these four subsidiary entities are decentralized public entities of Mexico's federal government and are legally empowered to own property and carry on business in its own name (Nesteng, 2004).

Pemex runs a wide net of production processing, storage and distribution facilities. 742 operative wells and 116 drilling teams in 12 integral development sites and three region exploration sites are supporting Pemex daily production of 3.3 million barrels of oil and 4.8 billion cubic feet of gas (2005) (www.pemex.com).

Pemex's strength lays in being the largest company in Mexico and the support it gets from the government. In addition it is a well positioned player in the world oil market given the size of its hydrocarbon reserves; it's geographically proximity to the US and its long oil history. Pemex is the second largest supplier of oil to the US after Saudi Arabia. High costs and a weak financial situation is a weakness for Pemex. The last years it has had very high spending on installation on new offshore platforms and deepwater exploration programs. In addition to this, major refinery upgrades and expansion of the pipeline system have led to high costs. These are all part of a production growth objective. Together with a mounting debt this is causing a weak financial situation for Pemex at the moment. The returns will come over the long run, and the uncertainty of the cash flows is high. The Mexican Government ownership can also be seen as a weakness for the company. Under the Organic Law of the Constitution Pemex is given the exclusive right to produce on the reserves of the state and sell the production. However, exploration and development activities are limited to reserves located in Mexico. I have not been able to find what the reason is for this term. It might be in order to focus the use of resources used in this type of activities within Mexico to build a strong domestic petroleum sector. This is only speculation; however it is interesting to note that the Constitution includes this condition. Rising prices in the petroleum industry, rising demand and growth in offshore drilling are opportunity values for Pemex. The political situation can be seen as a threat. Pemex's financial situation is threatening the current production, and a political battle over taxation and privatization can have a negative impact on the company's future. Although the demand for petroleum products is growing, a shift in demand to other energy sources may cause trouble. Finally, the declining oil and gas reserves are a substantial threat. Assessments of the reserves show a sharp decline and are disturbing news for Mexico.

Oil and gas reserves declined from 57,741 barrels of oil equivalent (mboe) in 1999 to 48,041 mboe in 2004 (Datamonitor 2004).

According to the energy consultants Baker & Associates, Pemex's efforts in the exploration sector the last 25 years have been disappointing. The replacement of production with new discoveries was less than 15% of the proved reserves in 2004, which is under the global average in the industry. This has caused the reserves to reach a critical level. The Cantarell reserves, which represent more than half of Pemex's production, will start to experience a natural decline in the years to come (Baker & Associates 2006).

The estimated reserves on deep waters in the Gulf of Mexico could probably resolve Pemex's lack of reserves in the long run. The problem is that Pemex does not have the necessary knowledge, experience and technical capacity to perform these operations themselves (Baker & Associates 2006). Pemex's expenditures increased 11% from 2004 to 2005. 85% of the total capital expenditure was allocated to exploration and production projects (www.pemex.com).

When it comes to the financial situation, Pemex has higher debt than any other petroleum company in the world. The total debt is close to 100,000 million USD. This is one of the reasons why the administration of President Vicente Fox has started to the search of capital from both Mexican and international private companies (Baker & Associates 2006).

4.2 Regulation of the Mexican petroleum sector

The Oil and Gas industry in Mexico is closely regulated through the Mexican Constitution. According to the Constitution, all hydrocarbons located in the Mexican territory belong to the Nation. In petroleum matters the Nation is represented by Pemex.

Article 27 and 28 in the Mexican Constitution “reserve for the Nation the exploitation of hydrocarbons in every phase (liquid, gas or solid) as well as processing of basic petrochemicals, establishing them as strategic activities”. Only Pemex is allowed to perform the following activities:

- Exploration and exploitation of hydrocarbons
- Gas processing
- Basic petrochemicals processing
- Petroleum refining
- Transportation, distribution, and storage of hydrocarbons, *except natural gas* after first-hand sales

(Moreira, 2005)

Pemex is not allowed to enter into contract with 3rd parties other than through competitive bidding (with a number of exceptions). Competitive bidding is a bidding situation where companies are competing against each other, and the company that submits the “best bid” is the winner. In most cases it is the size of the bid that matters, either the highest bid or in some cases, like for Multiple Service Contracts, lowest bid is the winner. The contracts can only be honoured in cash and payments can not be success based. Any activity of a company in any part of the preparation of an invitation will prohibit this company from participating in the following phases. If this is the case, the contract will be annulled (Personal communication, Jakobsson, Statoil).

Natural gas is the most liberalized part of the Mexican energy sector. In 1995 downstream activities in the gas sector (distribution, storage and transportation) were liberalized by allowing private investors to participate. This was a part of the National Development Plan, creating a new legal framework for the industry in 1995 to 2000. The purpose was to create a more efficient and competitive gas market.

When it comes to further deregulation of the Gas sector the alternatives seem to be either to import Liquid Natural Gas through pipelines on the Gulf of Mexico and Pacific coast, and/ or allow foreign companies to participate in Natural Gas exploration and production contracts (Nesteng 2004).

In 1992 Pemex's monopoly in the market of gas stations was changed to a certain degree when private companies were allowed to run gas stations through franchises.

4.3 Mexico's contract regime

In year 2000 Pemex implemented "The Strategic Gas Program" in order to meet the expected shortfall of the energy production. The first phase of this program aimed at optimizing current gas fields and to intensify the exploration program. The second phase (2006 - 2015) is aiming at the development of new discoveries and extending the exploratory drilling program.

Despite the apparent need for more petroleum resources and Pemex's lack of financial resources, several political parties are still challenging the need for foreign investments and participation.

In order to obtain necessary foreign capital without breaching the Mexican regulation, Pemex is offering two kinds of contracts:

SC + ISC (Service Contracts and Integrated Service Contracts)

Pemex commonly use service contracts and integrated service contracts that regulate the contractual relationship between the company and the contractor. Services and goods rendered are paid in cash.

Multiple Service Contracts, MSCs

Multiple service contracts are introduced by Pemex in their onshore gas fields in the north of Mexico. These contracts are an expansion of the ISCs and allow the contractor to operate without the traditional bureaucracy imposed by Pemex and the officials. Even though the legality of these contracts is being questioned Pemex is pushing forward in spite of delays.

This allows the contractors to participate in downstream activities in the gas fields. Downstream activities are operations that are conducted after the oil and gas leaves the export terminal and up to the point where they reach the customer. Transport, refining and marketing are examples of this type of activities (www.statoil.com). These are not touched by the regulations of the Constitution because they are not involved in the exploration and exploitation activities.

These contracts gather a “package” of services. This reduces the costs and complexity of managing multiple contracts in addition to creating long term commitment from the suppliers. Through these contracts Pemex can develop gas fields without funding the project itself (Personal communication, Jakobsson, Statoil).

So far these contracts have not been popular among international oil companies and none of the Norwegian oil companies have accepted them. According to Statoil they do not meet their demand for operatorship, incentives and booking reserves. The contracts have not been popular among other international oil companies either. The fact that they cannot book reserves seems to be a big issue for many companies. This means that since the oil companies cannot own the reserves they are not able to write them into their accounting books as equities that they own. Normally, when an oil company discovers oil, the value of the discovery is estimated and this is booked as their equity reserves for this oil field. For a company that is on the Stock Exchange, its share price is dependent on how much reserves they have booked according to so called SEC standards (US Security and Exchange Commission) which is the quality brand of booked reserves. For many oil companies oil projects where they cannot book reserves is therefore not interesting. Further they are not popular because it is a pure service contract with no linkage to production. Companies are only paid for the work they are doing and their reward is not affected by Pemex’s discoveries or production. This makes them projects with low risk and low reward. In order to get a Multiple Service Contract, the companies are invited to bid on these contracts through the competitive bidding mentioned earlier. In this process companies bid on how much they will need as payment to take on the responsibility of developing a certain oil or gas field or drilling a certain number of wells. The company who offers to lowest bid is the winner and gets the contract. The private parties are responsible for 100 percent of the financing, but the natural gas produced still remains property of Pemex. According to a document from Statoil, companies “like a bit of risk”. This might sound peculiar, but what probably is the logic behind this is that oil companies prefer to

participate in high risk projects in order to take part of the upside rewards of successful projects (Nesteng, 2004).

Even though these projects offer little financial risk per se, they may offer political risk. Only the negative impact that political decisions can have on an investment in Multiple Service Contracts is of interest. Uncertainty concerning the positive impact a political decision can have on the situation is not of interest. The reason for this may be seen when applying the “bad news principle” of Real Option theory later.

Here are some possible scenarios that would make an investment in Mexico through MSC risky:

- Pemex does not pursue MSC model because of current political controversy. (Likelihood 0.5, Gravity 0.25)
- Pemex does not pursue MSC model because it does not believe MSCs are/ can be made legal under current Mexican law (Likelihood 0.25, Gravity 0.25)
- The oil company prepares a bid package, qualifies the initial bid round, and is invited to bid on only one or more blocks that are not of interest (Likelihood 0.25, Gravity 0.5)
- The oil company concludes a contract with Pemex that is then declared illegal by a Mexican court and nullified (Likelihood 0.25, Gravity 0.75)

(Personal communication, Jakobsson, Statoil).

4.4 Investment climate

Due to Constitutional regulations the private investments in the petroleum sector have been made through Multiple Service Contracts. These have been a moderate success for reasons mentioned above. The private sector is waiting for changes to be made in order to open up the petroleum sector for private investors.

The chances for an opening in the exploration and production side, especially related to non-associated gas (not dissolved in oil), are better now than at any time since the petroleum industry was nationalized in 1938. The pressing need for new non-associated gas reserves and

production and the expected increase in demand in the years to come is calling for an opening of the industry to private investors. Further, continued economic growth requires significantly new power generation capacity.

The sitting President Vincente Fox is currently terminating his 6 years period as president. During this time the Fox administration has not made any revisions of the Constitution in order to enable privatizing of the petroleum industry, but have expressed the need for private company involvement in non-associated gas E & P. In spite of massive support from the private sector, the opposition forces are strong (Blickwede, IHS Energy group).

When it comes to attracting foreign direct investments in general, Mexico is among the top emerging market performers. Due to its NAFTA membership Mexico is a lucrative place to invest for foreigners seeking a cheap manufacturing base for exporting to the US markets. However, rival emerging economies like China and India are a threat, making Mexico less of a magnet to foreign investors (Harvey, 2005).

5 Presidential Election 2006

The 12th of September 2005 the sitting president Fox made some proposals regarding the energy sector. Among these proposals two dealt with private investment. One offered to open private investment in the area of petroleum pipelines and storage facilities, since Pemex lacks the adequate investment budget in these areas, causing accidents and oil spills. The most controversial proposal was the one that advocated a constitutional reform to allow for private investment in natural gas exploration and production.

Fox's time as Mexico's president ends in December 2006. His proposals came late in his candidacy, and although no changes were made, his proposals gave private investors hope of a change in the near future.

The energy debate was one of the issues in the 2006 election. Still, this was a delicate matter as it is a generally accepted strategy of Mexican presidential candidates to avoid controversial policy questions related to the oil and power sectors. Above all, the so-called "p-word" (privatization) is avoided (Baker & Associates, 2005).

The presidential election of 2006 was a referendum on whether the country should put the brakes on the free-market reform and hand more power to the government. The debate has divided Mexico over the consequences of two decades of privatization, free trade and foreign investments. This has resulted in the longest stretch of economic stability since the 1960's but it has also caused social tensions by creating a new wealthy class and failing to improve the situation of the poor.

The election has therefore been a battle between the conservative party and a left-leaning rival. The two main opponents in the 2006 presidential election were Felipe Calderón from Fox's National Action Party (PAN) and Andrés López Obrador from the Revolutionary Democratic Party (PRD).

Calderón was energy minister in 2004 and wants to give a greater role to private companies so they can boost supplies. However, Calderón was mostly silent about the energy policy in his election campaign, probably due to the strategy of presidential candidates of avoiding controversial policy questions. On his webpage where a number of important topics are listed, the energy debate is not mentioned. However he has uttered a wish for Pemex to behave more

like a private company and opened for the possibility of allowing part of the company to float on the Mexican stock exchange (The Wall Street Journal, 1st of July 2006).

The opposing candidate, former mayor of Mexico City Lopez Obrador, stated more clearly that he would modernize the energy sector without privatizing either the electric or the oil sector (Energy Debate in the 2006 elections). He argued that monopolies will work more efficiently if the government would tighten its stewardship and attack corruption directly (The Wall Street Journal, 1st of July 2006).

After the Election Day, the 2nd of July 2006 the official results gave Calderón the victory by only half a percentage point. Obrador claimed he had been robbed of victory in the election by widespread fraud. EU monitors said they could not find irregularities, but this has caused enormous protests from the left side demanding for the 2nd of July poll to be recounted. A month after the election results were presented protesters still refused to accept it. The newspaper El Pais could report 1.2 million protesters in the capital during the first days of August. The protesters camped on the main boulevard of Mexico City, Paseo de Reforma, causing chaos and traffic jams. The protests so far have been have not been violent but the opponent side refuses to surrender and accept the results. On the 1st of August the presidential candidate from the left side, Obrador camped outside, sleeping alongside his supporter in the streets. The 31st of July he was given a boost when the Mexican Electoral Tribunal agreed to consider his request for a recount although this is not provided for under the election rules (<http://news.bbc.co.uk>, 2nd August 2006). The Federal Election Court now has until the 31st of August 2006 to rule on this request and until the 6th of September to declare a winner (El Pais, 2nd of August 2006). Meanwhile Obrador has encouraged his supporters to paralyze the capital until the votes are recounted.

6a Dunning's OLI framework

In order to identify what factors that lead firms to become multinational Dunning has developed an approach often referred to as the OLI-framework. In this framework the capital letters represent the main forces underlying the internationalisation of production (The **O**wnership advantage, the **L**ocation advantage and the **I**nternalisation advantage). According to Dunning's definition a Multinational Enterprise (MNE) is a company that has production or activities outside the country where it is incorporated. The advantage a firm possesses compared to local companies in the desired location determines the extent of foreign production (Dunning 1977).

This framework also gives us an understanding of why some countries do better than others in attracting foreign direct investments (FDI). In order to succeed in this, location advantages and the host country must be compatible with the ownership advantages and the internalisation of transactions of the potential investing firm (Bourguignon, Coyle et al, 2002).

Let us take a closer look at what these advantages are all about:

6.1 The Ownership Advantage (Firm Specific Advantage)

The Ownership Advantage looks at *why* companies choose to produce internationally and why some companies choose to become multinational (Halvorsen & Volle, 1997). An ownership advantage implies an exclusive ownership and right to use certain values (Dunning 1977 in Halvorsen & Volle, 1997). This can be tangible and intangible resources. According to Dunning a company has ownership advantage when it finds it more profitable to serve a market from a foreign location using the resources itself rather than serving the market from its domestic location or selling the rights to use the resources to another firm (Dunning, 1988).

Dunning distinguishes between three kinds of ownership advantages. The first one refers to *exclusive or preferential access to a particular input or market*. This gives the firm the option of leasing them to other firms either in its home country or abroad (Dunning, 1988). It may also refer to size, which may generate scale economies (Dunning, 1977). The second kind of ownership advantage is the *possession of a unique intangible asset*, for instance a patent or a trademark. These kinds of advantages are knowledge based and are often the result of its own research and development, marketing department, or the accumulation of managerial skills.

Although they tend to be locked into the firm they may be transferred to other firms through technical service agreements or managerial contracts where other firms can enjoy this advantage. The third kind of ownership-specific advantage reflects the *ability of hierarchies to organize related productive activities* more efficiently than the market. When several related transactions are under the same governance this may reduce transaction costs. There are several advantages of organizing activities this way; better information flows; economies of synergy and spreading of overhead costs; capacity to practice price discrimination; diversification of risk; ability to protect property rights; and efficient scheduling of production (Dunning, 1977).

6.2 The Localisation Advantage (Country Specific Advantage)

When we look at the Localisation Advantage, we look at *where* the MNEs make their foreign direct investments (FDI). The location specific advantages explain what a host nation can offer the company. In order for a company to find production abroad more interesting than serving the foreign market through exports, the host country must offer location advantages. Trade barriers, the importance of proximity to large local markets, pecuniary (market linked) and non-pecuniary externalities, taxes, and access to immobile production factors are examples of location specific advantages a country can offer a MNE (Bourguignon, Coyle et Al, 2002).

Low costs in a country are often important criteria for location decisions, especially production and transfer costs. Product costs depend on the difference in prices and productivity factor inputs, and transfer costs depend on distance, the nature of the product and governmental incentives and restrictions.

The advantage of being physically present in a market for strategy reasons is another reason to have plants in different countries. This may improve the company's competitive viability and make it more difficult for others to enter the market (Dunning, 1988).

According to CEPR (Centre for Economic Policy Research) access to host county markets and international factor prices have been particularly important when it comes to countries ability to attract FDI (Bourguignon, Coyle et Al, 2002).

6.3 The Internalisation Advantage

The internalisation advantage looks at *how* a company deals with the question of international production and how it can win compared to its competitors by investing abroad (Halvorsen & Volle, 1997). This kind of advantage is an extension of the two previously mentioned advantages which are interrelated (Dunning, 1977). It looks at what makes a company generate or exploit its ownership advantages internally instead of acquiring or selling them through the market. This is crucial in order to understand the extent and pattern of the foreign activities of a company (Dunning, 2003).

Internalisation of production means organising the production within the company's own affiliates instead of outsourcing them or buying inputs directly from the market. This can be linked to knowledge based capital (ownership advantage) because this often requires investments that are specific to the production activity. Transition costs can make it efficient to keep production within the company even when the location advantages are sufficient to ensure production in foreign locations.

The internalisation advantage can be a determinant factor for the firm's ability to survive the competition in a foreign market. It deals with how well the firm manages to protect its advantages from the competitors and how they manage to maintain their ownership advantages. Certain ownership specific advantages can be realized through internalisation. An example of this is technology that is not profitable in the original country but may be profitable in a bigger international market (Halvorsen & Volle, 1997).

6b The Investment development path (IDP) (Dunning & Narula, 1996)

In the extension of looking at what makes some countries more successful in attracting FDI than others, we shall look at the development a country goes through in developing an increased level of inward and outward foreign direct investments.

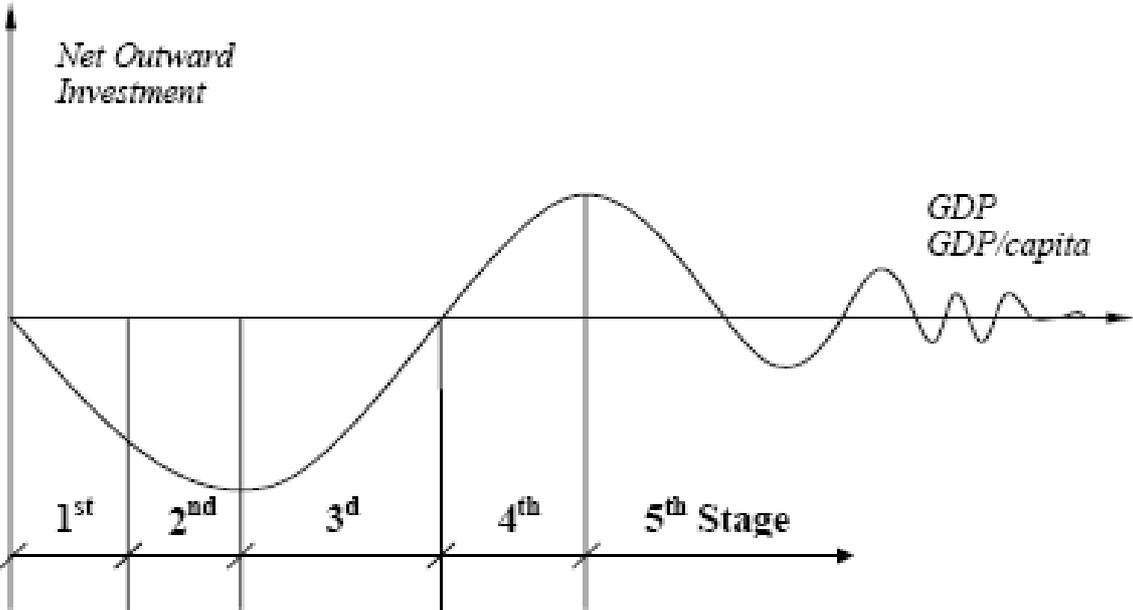
In the use of this model later the focus will be mostly on inward direct investments, but in presenting the model both sides will be commented.

The model of the Investment development path (IDP) shows how a country's inward and outward direct investment position is related to its economic development, relative to the rest of the world.

A country goes through five stages that each represents the country's inward and outward direct investments. The level of development depends on the ability of the domestic countries to exploit their competitive or ownership specific advantages relative to the foreign companies. It also depends on the competitiveness of the location-bound resources and capabilities of the country relative to other countries. Finally, it depends on how well local and foreign companies use their ownership specific advantages together with the location bound endowments and manage to internalise this in a cross-boarder market.

The diagram shows the net outward investment (NOI) position of a country as a continuous line. The net outward investment is the gross outward direct investment stock less the gross inward direct investment stock.

IDP Stages According to Dunning & Narula



Stage 1

In the first stage of the development path the location specific advantages are insufficient to attract inward direct investment. The exception here is investments arising from its possession of natural assets. The lack of localisation specific advantages may reflect a limited domestic market; inappropriate economic systems or government policies; inadequate infrastructure (transportation and communication facilities) and a poorly educated, trained and motivated labour force.

There is likely to be little outward direct investment because the ownership specific advantages of domestic firms are few. The lack of domestic technology causes few created assets.

At this stage governmental intervention normally take place in two forms. Through providing basic infrastructure and upgrading human capital (through education and training) the government can reduce market failure holding back the development. Secondly, import protection, domestic content policies and export subsidies can affect the structure of the market.

Stage 2

In the second stage of the development path inward direct investment starts to rise, while outward investment remains low or negligible. Improved domestic markets (size or purchasing power) make production more lucrative for foreign companies. At this stage import substituting manufacturing investments is common. This kind of production is based on possession of intangible assets like technology, trademarks and managerial skills.

Government intervention is common to stimulate inward FDI by imposing tariff and non tariff barriers. For export oriented industry dealing with natural resources and primary commodities, the infrastructure offered by the host nation is a decisive factor for success.

Location specific advantages are important in order to attract inward direct investments. However, the country's development strategy and the extent to which it prefers to develop technological capabilities of domestic firms determine whether foreign firms are able to exploit them.

At this point ownership specific advantages of domestic firms will have increased from stage 1 because of the development of support industries clustered around primary industries. As a result, production will move towards semi-skilled and moderately knowledge-intensive consumer goods.

At this stage outward direct investments emerge through strategic asset seeking, market seeking and trade related type of investments. Governmental intervention like export subsidies and technology development and acquisition determines the extent of outward and inward investments. However the rate of outward investments is likely to be insufficient to offset the rising rate of growth of inward direct investment.

Stage 3

At the third stage the rate of growth of inward direct investments gradually slows down, while the rate of growth of outward investments increases. The result is an increasing net outward investment (NOI).

Technology leads production towards standardized goods and the demand for quality goods increases with the rising income. This can be seen as a result of growing competitiveness among the supplying firms.

At this stage labour-intensive activities will no longer have the same competitive advantage. Local wages will rise and outward direct investments will be made in countries at a lower stage in IDP.

Foreign firms will no longer have the same ownership related advantages as before, since domestic firms at this stage have acquired their own competitive advantages and are able to compete with them in the same sectors. This is a result of increased spending on education and innovation in the host country. In order to compete with domestic firms, foreign firms will have to introduce new technological, managerial or marketing innovations. These tend to be based on intangible knowledge, and due to their public good nature foreign firms tend to prefer exploiting them through cross-boarder hierarchies.

Increasing localisation related advantages will result in more technology intensive manufacturing. Bigger markets and innovation will give economy of scale effects and rising

wages will encourage more use of technology. This will attract inward direct investment since more value is created locally. Inward investments will focus on efficiency seeking production and move away from import substituting production.

Governmental intervention will play a smaller role for ownership related advantages for domestic firms. They will be more capable of competing with foreign firms when it comes to managing and coordinating geographically dispersed assets because they are more multinational.

Outward direct investments will be directed towards stage 1 and 2 countries as part of a market seeking strategy and also towards stage 3 and 4 countries in order to acquire strategic assets in order to protect or upgrade the ownership advantages of the investing firms.

Stage 4

In stage four the outward direct investments are equal to or even larger than the inward direct investments and it has a higher rate of growth.

Domestic firms are able to compete with the foreign ones in an effective way and succeed at penetrating the foreign market. The cost of capital will be lower than the cost of labour, increasing the capital intensive production. Therefore location related advantages will be based on created assets.

The inward direct investments come from other stage 4 countries, and are directed towards rationalized and asset seeking investment. These firms tend to have ownership related advantages that are “transaction” related rather than “asset” related.

Continued growth in outward direct investment is moving operations with decreasing competitive advantage to offshore locations.

The government will play a strategic role, giving more attention to the structural adjustment of location related assets and technological capabilities. By playing a more active role in upgrading infant industries and out-phasing declining ones, the government helps the market work more efficiently.

Stage 5

At the last stage the Net Outward Investment position starts out by falling and end up by fluctuating around the zero level (as illustrated). At this point inward and outward FDI are equally likely to increase.

At this point multinational enterprises (MNEs) play a much more important role and no single country has an absolute hegemony of created assets. The ownership related advantages of the MNEs will depend more on how well they organize their advantages across borders than on their country's natural resources. As firms become more global, the nationality become of secondary importance. They no longer operate with the interest of the home nation in mind, but behave more like mini markets. The ownership and territorial boundaries become less clear cut, as they operate in a complex environment with a number of trans-national cooperative agreements (Dunning & Narula, 1996).

7 Real Options Approach to investment

The Real Options Approach to investment is a new way of approaching an investment decision. Traditionally an investment decision is made by the “net present value” rule. The Real Options Approach to investment says that the criteria made by this rule are not sufficient to make an investment decision. This is because the traditional rule ignores irreversibility and the ability to delay an investment and it can therefore give very wrong answers (Dixit & Pindyk, 1994).

In most cases an investment can be characterised by three factors; irreversibility, uncertainty and the timing. When an investment is made, the cost of investment cannot be completely recovered. Marketing expenditure and industry-specific costs are examples of costs that cannot be completely recovered. Therefore we can say that an investment is either partially or completely *irreversible*. The future rewards of the investment are *uncertain*. The only way of getting an idea of the possible outcome is by calculating the probability of alternative outcomes. When it comes to *timing*, investments have some leeway, meaning that the action can be postponed in order to wait for more information about the future. Investments are rarely a “now or never” decision. The Real Options Approach to investment focuses on how these three characteristics interact in order to determine the optimal decisions of investors when making irreversible investments under uncertainty (Dixit & Pindyk, 1994).

The Real Options Approach to investment values flexibility in an economy with irreversibility and uncertainty (Sødal, 2005). In this kind of markets we need to consider the real options that are created as a result of different decisions. We often see investors delaying investments that are seemingly profitable in order to wait for more information and thereby reduce uncertainty (Sødal, 2003).

7.1 The traditional theory of investment –The Net Present Value Approach (NPV)

Using traditional theory of investment, the investment decision is based on whether or not the project has a positive net present value. First, the present value of the expected stream of profits is calculated, and then the present value of expenditures required is calculated. If the

difference between the two, *the net present value (NPV)*, is positive it is advisable to make the investment.

I = Initial investment

CF = Cash Flow at the end of period t

k = risk- based discount rate

T = Project life

t = Time left of project time

$$PV_o = -I + \sum_{t=1}^T \frac{CF_t}{(1+k)^t}$$

According to standard NPV theory an investor should invest in any project with a positive net present value to increase his profits. This is only optimal when the projects are independent of each other. When a number of projects are competing, the project with the highest NPV should be the winner. A lot of investments are irreversible and mutually excluding. This is a problem that is one of the main points of the Real Option Approach (Sødal, 2003). Investing in a project at one point can even be seen as competing against investing this very same project at a later time. The two options are irreversible and mutually excluding. We shall take a look at this later when we look at the Real Options Approach.

The problem with the traditional theory of investment is that the question of investing is an either/or decision with *no flexibility*. Flexibility implies the option to interrupt a project after a certain time or delay a project until the level of cost is more desirable. Another problem is that the risk based discount rate (k) used in the cash flow is held constant. These requirements are hard to live up to, since these estimates tend to vary in real life (Susort & Strøm, 2005).

Firms in markets with high uncertainty tend to invest in projects that are expected to yield a return in excess of a required rate. This is typical for the petroleum industry where the return is sometimes three four times the cost of capital. This means that companies tend not to invest

until the prices rise substantially above the long-run average cost. On the other hand the companies can stay in business for a long time while absorbing operating losses, not having to worry about the prices falling below average variable cost (Dixit and Pindyk, 1994).

7.2 The Real Options Approach

An investment can be defined as “a cost someone undertakes now in order to obtain increased consumption (or another benefit) later”. As we have seen earlier, an investment should be made when the NPV is positive; given that no competing project has greater NPV value. However, this definition may be too narrow in an economy with constant changes. In that case it may be more suitable to look at an investment as exercising an option (Sødal, 2005).

In real life irreversibility and the ability to delay a decision are important characteristics of investment projects. Traditional theory is based on the assumption that investments are reversible and that they can be seen as “now or never” propositions. This is almost never the case in real life. Most investments do not meet these assumptions and this is often overlooked when dealing with traditional NPV theory in real life. This undermines the simple net present value rule and the theoretical foundation of standard neoclassical investment models (Dixit & Pindyk, 1994).

In reality, we can say that a company with an opportunity to invest is holding a financial “call option”. A call option is “a right but not an obligation to buy an asset at a future time of its choosing” (Dixit and Pindyk, 1994). The decision of whether or not to invest can be seen as exercising or “killing” this option. When an option is being exercised the opportunity to wait for more information about the future is lost. The lost option of waiting for more information represents an opportunity cost that should be included in the investment costs. This cost can be fairly large cannot be ignored. This leads us to a necessary modification of the traditional NPV rule. We need to include the *value of keeping the investment option alive*.

This opportunity cost is also highly sensitive to the uncertainty of the future value of the project. Economic conditions affect how risky a project seems. Unstable economic conditions affect the expected future cash flows and can have a larger impact on investment spending than say changing interest rates.

As mentioned briefly earlier, an investment project can be seen as its own competitor. We can look at “investing now” and “investing later” as two different projects that mutually exclude each other. We have the option of investing now and the option of investing later, but never both projects. The projects mutually exclude each other and we choose the project with the highest NPV. However, the option of investing later has the value of keeping the investment option alive, adding value to this project.

So far the neoclassical investment theory has not been able to provide good empirical models to explain investment behaviour. An overrated belief in the effectiveness in interest rates and tax policies when simulating investments may explain why. This may help us to explain why actual investment behaviour differs from theory. In real life companies tend to invest in projects that are expected to yield a return three or four times the cost of capital or the “hurdle” rate.

7.2.1 Irreversibility

Let us take a look at what makes an investment a sunk cost and therefore irreversible. An investment is sunk cost when it is firm or industry specific. Marketing and advertising are examples of firm-specific investments that cannot be recovered. Investments in certain industries like the petroleum industry are hard to undo. Even though the investor should change his mind, the investment made would not be of much value. In a reasonably competitive industry the value of all firms would be the same. Therefore the gains from selling would not be high should the investor change his mind.

Even for investments that are not industry specific, for example equipment and goods that can be sold to other industries, the gain from selling will be poor. This is because the buyer knows that the seller will be reluctant to sell an above-average item. Therefore the price will be based on the average quality in the market even though it may be almost new.

Furthermore, government regulations or institutional arrangements can explain why investments are irreversible. Capital controls can make it difficult for investors to sell or reallocate investments and the cost of hiring, training and firing personnel may make investment in new workers expensive (Dixit & Pindyk, 1994).

7.2.2 The possibility of delaying investments

Even though delaying an investment is not always a possibility for strategic reasons like market position and excluding potential competitors, most cases of investments have this opportunity. The cost of delaying an investment, caused by the risk of other firms to enter or foregone cash flows, must be weighed against the benefits of waiting for new information which in most cases is fairly large.

Since the investor cannot retrieve the option or the money he has paid for it, exercising an option is irreversible. “The option to invest is valuable because the future value of the asset obtained by investing is uncertain.”

It can be interesting to look at how the opportunity to invest is obtained in the first place. Sources of investment opportunities can be patents or ownership of land or natural resources. But more generally they tend to come from managerial resources, technological knowledge, reputation, market position, and possible scale. These factors may have been built up over time and makes a firm able to undertake investments in a productive manner where individuals or other firms cannot compete. The option to invest is valuable to a firm and is represented in the firm’s market value. The market value reflects among other things, the firm’s options to invest and grow in the future. (Dixit & Pindyk, 1994).

7.2.3 A “Bad news principle” (Dixit & Pindyk, 1994)

The bad news principle, suggests that only the expected severity of “future bad news” matters when deciding whether to make an investment today. The outfall of an investment can be estimated by looking at the probability for good news to occur (e.g high prices) and the probability for bad news to occur (low prices). According to the “bad news principle the potential good news should not have any affect on the investment decision. The intuitive reasoning behind this is that the option of waiting has no value when investing today is the right decision (Haigh & List, 2005). By waiting for more information, the investor can avoid the option of a bad turnout. Waiting reduces the risk of a downward move to occur.

We shall see that only the size of a downward move and not the upward move will affect the price of the investment. This is because the ability to avoid the consequences of “bad news” leads us to wait. With a positive probability of a downward price movement, the possible loss

from the project investment can be avoided by waiting. The critical price of the investment depends on the size of the downward movement and the probability for this to occur (Pontificia Universidade Católica do Rio de Janeiro, 2006).

An illustrating example of this can be found by looking at why Japanese firms are more aggressive investors than American ones. The answer lays in the fact that Japanese firms are protected from the downside risk through government supports. When the downside movement potential is small, the value of waiting for more information is equally small. Therefore the Japanese are more likely not to wait because there is not much to gain from it (Pontificia Universidade Catolica de Rio de Janerio, 2006).

Let us take a look at the technical part of the theory. Suppose that the initial price is P_0 , but in period 1 the price (P_1) becomes

u = size of an upward move

d = size of a downward move

k = risk-balanced discount rate

I = Initial Investment

V = Value of project

$$P_1 = \begin{cases} (1+u)P_0 \\ (1+d)P_0 \end{cases} \quad \text{With probability } q, \text{ and } (1-q) \text{ respectively}$$

The NPV is now

$$NPV = -I + P_0 + q \sum_{t=1}^{\infty} \frac{(1+u)P_0}{(1+k)^t} + (1-q) \sum_{t=1}^{\infty} \frac{(1-d)P_0}{(1+k)^t}$$

On the other hand, *by waiting*, the NPV is

$$NPV = \frac{1}{(1+k)} \{q \max[0, -I + V_0(1+u)P_0] + (1-q) \max[0, -I + V_0(1-d)P_0]\}$$

In this case the NPV is simplified to

$$NPV = \frac{q}{(1+k)} [-I + V_0(1+u)P_0]$$

because the probability of a negative outcome is ruled out.

By equating the NPV for investing now and the NPV for waiting to invest we get the ***critical price***:

$$P_0^* = \left(\frac{k}{1+k} \right) \left(\frac{k + (1-q)}{k + (1-q)(1-d)} \right)$$

As we see, the critical price only depends on the size of the downward move, d , and the probability $(1 - q)$ of a downward move to occur. The size of an upward move, u , does not affect the critical price as it is not even part of the formula calculating the critical price. The larger d , the larger is the critical price. The importance of the possible “bad news” drives the incentive to wait.

8 The coordination problem and cluster effects

8.1 External economies

We shall now take a look at what determines the location of a firm and why firms in an industry tend to agglomerate. This leads us to look at agglomeration and external economies. Agglomeration is “the clustering of economic activity, created and sustained by some sort of circular logic”. This kind of clustering occurs at many levels, from local to more global concepts. The concept of external economies looks at the advantages of producing in an industrial district. According to Alfred Marshall there are three reasons why producers would prefer to locate near each other producers in the same industry. The first reason is the concentration of specialized local providers of input. The second benefit is the concentration of firms employing the same kind of workers, creating a labour market pool. Finally, geographic proximity would facilitate the spread of information (Fujita, Krugman & Venables, 1999).

A simple example of cluster effects on local level is shoe shops. These tend to locate close to each other in order to benefit from each other by attracting potential customers to a specific area where they expect to find a wide range of shops to choose from. Classic examples of agglomerations in the world economy are the concentration of technology based industry in Silicon Valley in California and financial institutions in the City of London. In Silicon Valley successful computer related companies emerged in the mid 90’s, leading other companies who wished to start up in the same industry to locate there. The surge in the number of Silicon Valley start-ups led to a number of venture capital firms to relocate or starting up offices there. This in turn encouraged even more entrepreneurs to locate their start ups there.

Alfred Marshall argued that industrial districts arise because of knowledge spillovers (“the mysteries of the trade become no mysteries; but are as it were in the air”), the advantages of thick markets of specialized skills and the forward and backward linkages associated with large local markets. New economic geography models have downplayed the role of the first two and tend to focus on the role of linkages. The reason for this is the ability to model this role specifically (Fujita, Krugman & Venables, 1999).

When discussing the investment and localization decisions of multinational petroleum companies it is particularly central to take the extent of trade liberalization in services and the strength of the agglomeration forces in the petroleum sector into account. In order to make it profitable to invest in marginal petroleum field, major technological innovations and development of a variety of specialized intermediate goods are required. In addition, the stages in the value chain, like Research and Development and engineering must be of a certain size, above a critical level in order to make it interesting for the petroleum companies.

When looking at the petroleum sector, it is especially interesting to look at the knowledge externalities. The interaction between agents may be expected to be larger in the petroleum sector than in other industries. There are several reasons for this. First of all the interaction between agents reduce transaction costs. Secondly, geological co-localization makes room for externalities. Thirdly, petroleum companies and suppliers are tightly integrated, so that engineers work closely with the suppliers. Sometimes this type of cooperation is formalized through common project organizations. Additionally, common processes, time-critical supply chains and Research and Development projects of common interest, causes tight cooperation (Kind, Osmundsen & Tveterås, 2000).

This theory will show us how agglomeration forces may influence the choice of localization for multinational petroleum companies, and what consequences trade liberalization can have in the petroleum related services.

8.2 Forward and backward linkages

Producers want location with good access to large markets and supplies of goods that they need in production. A place that for some reason already has established a concentration of producers tends to offer this. The advantage access large markets and supplies of goods needed in production correspond precisely to the backward and forward linkages of development theory (Fujita, Krugmann & Venables, 1999).

Let us take a look at a model with two industries. The first industry is the upstream industry and consists of a number of M firms. They deliver intermediate goods to the second industry, the downstream industry. The downstream industry consists of a number of N firms and delivers final products to an external market. We assume that both industries have imperfect

competition since the kind of case that will be discussed later includes big companies with large fixed costs and market power.

In terms of the petroleum industry downstream includes operations conducted after oil and gas leave the export terminal and up to the point where they reach the consumer. Examples of downstream activities are transport, refining and marketing.

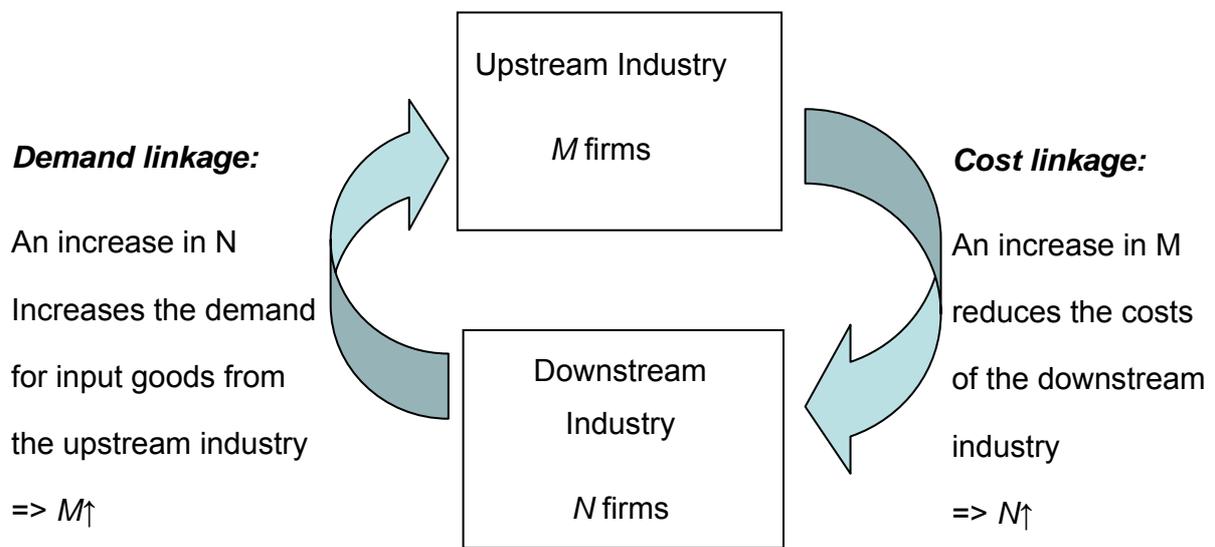
Upstream operations on the other hand include activities up to the point where the petroleum leaves the production facilities, the export terminal for oil and the treatment plant for gas. Examples of upstream activities are exploration, development and production (www.statoil.com).

In this model the downstream industry is the market for firms in the upstream industry. If the competition in the upstream industry increases through an increased number of firms, $\Delta M > 0$, the costs of the downstream industry decreases and thus their profitability increases. Increased profitability in the downstream industry will attract more firms to operate in this industry, and the number of firms increases $\Delta N > 0$. This again leads to an increased demand for input goods from the upstream industry. And the increased demand in the upstream industry causes for more firms to establish there and therefore the number of firms increases utterly $\Delta M' > 0$. This is a self-reinforcing mechanism with forward and backward linkages.

The forward linkage is a linkage in product markets. When the number of firms in the upstream industry, M , goes up, the production in the downstream industry increases as a result of lower costs (cost linkage). The backward linkage is a linkage through intermediaries and factor markets (capital and labour). When the number of firms in the downstream industry increases the demand for intermediate goods increases and therefore the number of firms in the upstream industry increases. This circular causations or self-reinforcing mechanisms explains why related industries tend to locate together.

It is not the number of firms in the two sectors that is relevant per se. The interesting point is the level of activity in the two sectors. Small activity in the upstream sector means poor conditions for firms in the downstream sector, and this again reduces the opportunity for the upstream sector to develop further because of the lack of necessary input from the downstream sector.

Imperfect competition downstream and upstream



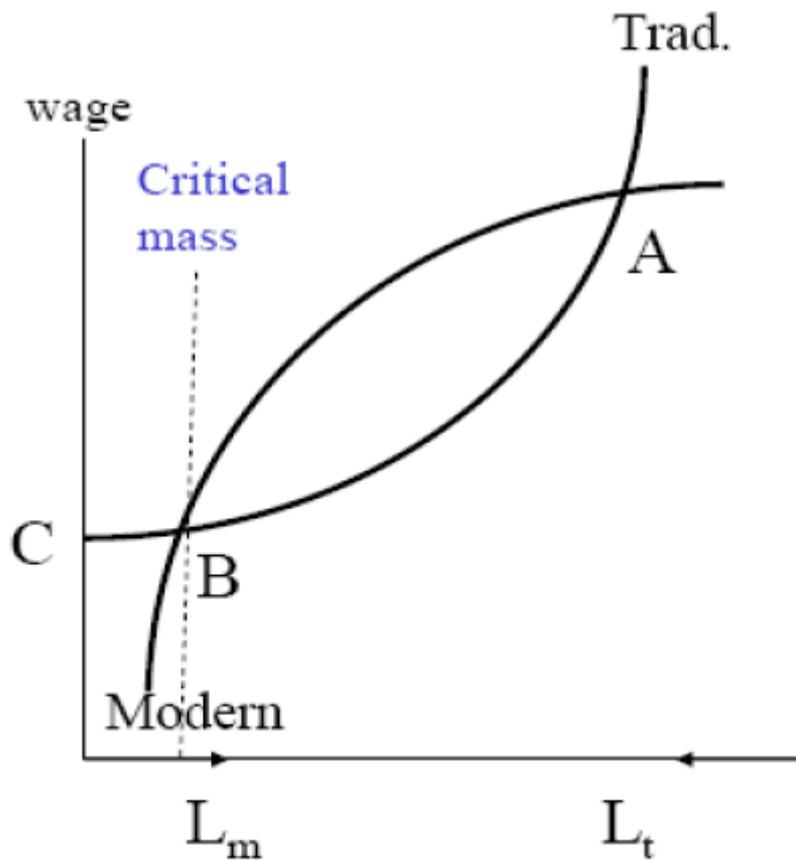
Market linkages only create external economies of scale if the size of the market matters for price or product range, i.e. if there are scale economies or imperfect competition. (Strandenes 2006)

8.3 Equilibrium with external economies and the coordination problem

Traditional economic theory assumes that an industry sector is less profitable when the number of firms increases, if everything else is equal. This may lead us to assume that an industry yielding an under average profit has too many actors and that the number of firms will decrease until the profits equals the profits in other industries. However, if we assume that the industry sector has positive externalities through cluster-effects, the situation is reversed. In this case the low profits may be explained by an insufficient number of participants (Sterri, 2005).

In order to explain the coordination problem, let us take a look at how a struggling industry in a country can improve its situation through cooperation and coordination on investment decisions. We will see that the participants are depending on each other and that one investor alone will not gain from making an adjustment. To illustrate this, let us take a look at a model with two industries, a traditional sector (T) and a modern sector (M) (Barbara- Navetti & Venables et al. 2004) To simplify the model we assume that the only variable input is labour (L). The traditional sector's demand for labour L_T has a decreasing marginal product in accordance with neoclassical growth-theory (Sterri, 2005). The wage ability of the traditional sector is higher the higher the lower the number of employees in the traditional sector. The modern sector's demand for labour is L_M and has an increasing marginal product due to external economies of scale. The modern sector can be represented by the petroleum sector. In this sector the higher the employment, the higher the wage level it is able to pay. Each firm would experience a normal, downward-sloping labour demand schedule due to the fact that scale economies are external to the firms. However when the activity level in the modern sector increases with a higher number of firms, the demand curve for each firm will also increase. Therefore a single firm cannot benefit from scale economies on its own, but is dependent on an increased activity level in the sector as whole. Positive scale effects will only appear through interaction of firms (Barbara- Navetti & Venables et al., 2004).

Before looking further at this model it might be useful to look at a few characteristics of the petroleum sector. The petroleum sector is very Research and Development (R & D) intensive, and has very high expenditures on R & D per worker. Large parts of these costs can be linked to external purchases of highly specialized intermediate goods. In this sector the share of these purchases can be as high as 43% compared to 20% in other industries. These intermediate goods can be seen as complementary, so that the higher the agglomeration of this type of specialized intermediate goods, the higher the productivity of each single good. In other words, the market value for intermediate goods and thus the wage level increases with the number of other intermediates that are already produced. Thus there is a positive relationship between the employment in the petroleum sector and the agglomeration of intermediate goods producers (Kind, Osmundsen & Tveterås, 2000).



The model assumes that the labour will move to the sector offering the highest wage and that the labour force is completely flexible. Further it assumes that the cluster in the modern industry leads to increasing marginal productivity because of the increasing returns of scale. As a result we get the ascending curve as shown in the graphic presentation (Sterri, 2005). Another explanation for the increasing marginal productivity may be that there are more specialized input goods, giving the producers productivity gains.

The model presents three possible labour market equilibrium outcomes in this economy, as shown in the figure. Let us use point C as our point of departure. At this point all the resources (labour) are used in the traditional sector. The wages are relatively low due to the decreasing marginal productivity, but at this point the wage level in the traditional sector is higher than in the petroleum sector. This is a stable equilibrium, meaning that attempts to start activities in the modern sector, the petroleum sector, would fail. At this point the petroleum sector is too small and has too low labour productivity to be able to compete with the traditional sector for the labour force. The wages are too low to attract labour to move from traditional sector to modern sector and thus it has no employees. This is the case as long as we

are at the left side of B. This can be seen as a “development trap” where the modern sector fails to develop due to coordination-problems (Kind, Osmundsen & Tveterås, 2000).

In point B a small petroleum sector has developed and is able to offer the same wage as the traditional sector. The wage offered in this point is higher than in point C and the petroleum sector is able to compete with the traditional sector for labour. This is also an equilibrium, though an unstable one. Any small change in the activity level will lead the economy to move away from point B. The situation in the petroleum sector is very unstable and just a small reduction in activity in this sector could lead it to disappear. On the other hand, a small increase in the petroleum sector beyond point B would imply that there are highly profitable petroleum investment opportunities and move more labour from the traditional sector to the petroleum sector. More labour will keep moving from the traditional sector to the petroleum sector until a new equilibrium is reached in point A where the traditional sector once again is able to pay the same wages as the petroleum sector. This is a stable equilibrium.

To sum up we have a situation with multiple equilibriums. Point A and C are stable equilibriums while B is an unstable equilibrium and will eventually end up either in A or in C.

In point A we have an equilibrium with a large petroleum sector (externality) sector, and in point C there is little or no petroleum sector. Ranking the welfare from a country’s point of view, A is obviously better than C (or B) as the wage in this point is higher. The increase in wage at this point is only partly offset by reduced return to specific factors in the traditional sector.

The key concepts in this model are **coordination failure and critical mass**. It shows that the agglomeration forces can turn out to be a “double-edged sword”. They can lead us to believe that the profitability of investing is very high if the activity level is sufficient, but then again it may be unprofitable to invest unless a sufficiently large number of other firms also invest.

This may lead to a coordination problem between firms that produce intermediate goods. This is particularly of interest for the petroleum industry since such a large part of the intermediate goods are bought externally. The coordination problem can explain why certain countries have difficulties in developing and exploiting potentially rich oil fields. This is often the case when domestic entrepreneurs are short of capital and human capital and they are not

coordinated. As a result these countries are interested in attracting foreign petroleum companies.

Since the petroleum sector is so intensive in knowledge and demands such a variety of specialized intermediate goods and services, it would not be profitable for just a few petroleum companies to operate in a specific location. This calls for the government to introduce a policy that arranges a coordinated entry of foreign firms (Kind, Osmundsen & Tveterås, 2000).

The market outcome of this model depends on where the economy starts out. If it starts out with a small petroleum sector, point C is more likely equilibrium because firms and investors have no incentive to invest in the modern sector. However, when the number of firms in the petroleum sector increases other firms will have incentives to follow. Therefore, in order to move the economy from point C to point A, this requires *coordination* of the decisions of a sufficient number of investors.

The unstable equilibrium in point B constitutes a *critical mass*. This is the minimum amount of investments or activities in the petroleum sector that is required for the economy to be able to reach a stable equilibrium in point A. When the economy reaches this point it is interesting for firms to act together and invest in the petroleum sector (Barbara- Navetti & Venables et al., 2004).

The actual equilibrium may depend on

-Historical development

-Market conditions

-Policies

(Strandenes 2006)

9 Concluding remarks and thoughts about the future investments in the Mexican Petroleum sector

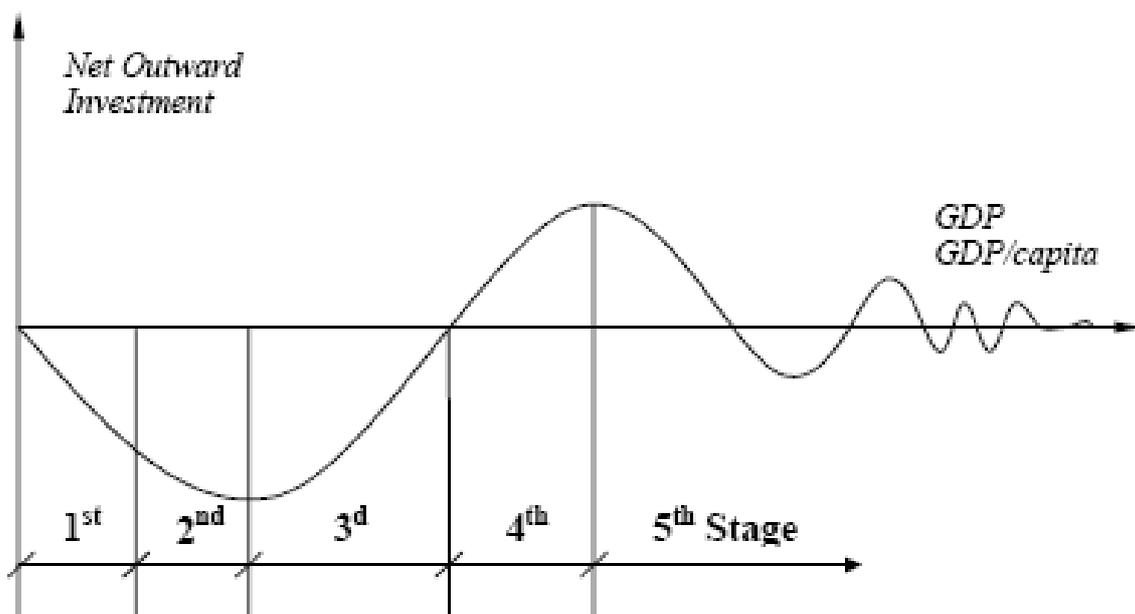
As a final part, the situation in the Mexican petroleum sector will be evaluated in light of the presented theory. I will take a look at how private participation in this sector is affected by uncertainty about the future and what other factors may influence the situation.

The investment Development Path in Mexico (Dunning and Narula 1996)

In spite of a closely regulated petroleum sector in terms of private and foreign investments, FDI has played an important role in Mexico since the 19th century. The first steps of developing the mining and oil industry in the early 20th century was mainly financed by foreign investments. The FDI flows were interrupted by the Mexican revolution that started in 1910, but gained new importance during the import substituting internationalization process (ISI) and the development of the manufacturing industry.

Multinational enterprises are playing an important role in many of the key industries serving the domestic market and industrial exports. The investment development path (IDP) is a useful tool in order to understand the dynamics of Mexico's FDI flows.

IDP Stages According to Dunning & Narula



A new look at the illustration of the investment development path that was introduced earlier reveals how Mexico fits into this path.

Mexico was at stage 1 of the investment development path until the mid 1940s. Insufficient location specific advantages with the exception of natural resources made it hard to attract foreign investors.

The country entered stage 2 when the metal-mechanical and chemical industry was developed at the time of the import substitution policy. Local production with a local content of parts and components had become profitable thanks to improved infrastructure and human resources via education. The import substituting industrialisation process resulted in a fast growing domestic market, attracting investors.

The fast growing economic conditions and protecting policies in the 1950s and 1970s made the FDI inflow increase drastically. Capital investments were subsidised, protecting the purchasing power of the urban population.

In the 1980s the economic crisis stopped the economic growth. Nevertheless some industrial sectors were strengthened by the drastic economic restructuring of the country. Large Mexican firms located in these sectors became significant direct investors abroad just as expected for a country that is well developed in the second stage of development (IDP).

Ownership advantages in the production of some industrial commodities and important internationalisation advantages for firms in this industry may represent forces that are pushing Mexico's upgrade to a stage 3 country. In order to become a stage 3 country the net outward investment needs to increase. That is, the growth of inward investments decreases while outward direct investments increase. An obstacle for this development has been the financial crisis in 1994 that caused foreign capital flight and a serious recession of the Mexican economy. Even though the economy has managed to recover since then it has been more dependent on foreign investment inflows in order to modernize the economic structure. The net outward investment (NOI) is expected to be negative for a long period in the future. Thanks to its membership in NAFTA Mexico has managed to attract major foreign investment, making Mexico second to Brazil in receiving FDI in Latin America. The MNEs have been, and still are, playing a very important role in the development and modernization of the country's economy and its competitiveness.

Dunning's OLI framework

Dunnings OLI framework studies the underlying forces of international production, that is, the factors that will make multinational petroleum companies take interest in the Mexican market.

The multinational petroleum companies have the financial and human capital and the technology needed by Pemex to exploit the deeper water regions in the Gulf of Mexico. These are ownership specific advantages that Mexico needs in order to develop the petroleum sector further. Through service contracts Pemex can profit from these advantages.

The localisation advantage that Mexico can offer as a host country for foreign investors in the petroleum industry is both the access to what are probably huge undiscovered resources on deeper water and access to one of the largest energy markets in the world. Other location specific advantages could be low costs of labour and production. However, the problem for foreign oil companies is that investments through Multiple Service contracts will not be affected by the size of these reserves. They will only be paid for goods and services rendered.

The Internalisation advantage relates to how organizing the production within own affiliates, rather than outsourcing services, can be an advantage for the petroleum companies. When we look at the Mexican market, the situation is rather special because of the Multiple Service Contracts being the only way of doing business. Therefore outsourcing the production is not an option since it is actually the petroleum companies that are rendering services outsourced by Pemex. However, a liberalization of the Mexican market would make producers want to internalize production rather than outsourcing it. Know-how, patents and technology are examples of ownership advantages that petroleum companies would try to keep within the company although the companies in the petroleum sector tend to work closely.

Real Options Approach to investments in Mexico

So far the large international petroleum companies have been reluctant to sign the Multiple Service Contracts. Statoil is an example of a Norwegian based oil and gas company that is present in Mexico but has so far not made any investments in the Mexican market due to

unsatisfactory investment conditions. Like Statoil, many major petroleum companies are present in Mexico, cooperating with Pemex through cooperation agreements that give data access and an insight in the geology and the operational environment without making direct investments. They are monitoring the bidding rounds and are preparing to invest when or if changes are made by the government or Pemex. The governmental election process has led to an expectation or a hope of a more liberal petroleum sector.

The investment opportunity in Mexico can be seen as a financial call option. The options are to invest now or to invest later in order to wait for more information. First of all, for a project to be interesting for the large international petroleum companies, they have to be of a certain size. Due to limited resources in form of management and employees with specialised competence the companies will require a certain size of the project in order for it to be interesting. This concept is known as materiality (Kind, Osmundsen & Tveterås). The materiality requirements made by petroleum companies are closely related to the areas where they have comparative advantages. They focus on fewer activities and in return they demand larger contributions after tax from each of these activities. If a petroleum company is to make an investment it needs to be of a certain size because it will occupy limited resources of human capital which rules out the option of investing later. When postponing the investment, the value of keeping the investment option alive is adding value to the project.

Further, the presidential election and the change of government lead to expectations about the future. It could result in good news in form of a liberal government that *might* open the petroleum sector for private investments, or in bad news, a government that wishes to modernize the petroleum sector without privatizing. The Real Options theory says that only the severity of future bad news matters when making an investment decision. Thus, the increasing probability for the good news to occur through the election of a liberal president does not affect the investment decision because the option of waiting has no value when investing today is the right decision. Therefore the probability for the bad news to occur will lead the investors to wait in order to avoid this option. This may explain the investment behaviour in the market today and the future.

The coordination problem and cluster effects in Mexico

The suppliers play an important role in the petroleum industry's value creating activities. Cooperation between the different actors in the sector is very important in order to secure the safety of the service rendered and the competitiveness of the oil companies.

A great number of foreign companies related to the oil and gas industry are present in Mexico. Drilling companies, companies offering spare parts, services and equipment and of course a number of large international petroleum companies. Some of the oil companies are involved in projects with Pemex while others are present in order to monitor the bid round process of the Multiple Service Contracts (Nesteng, 2004). However, due to difficulties in getting good information about the specific activity in the supplier industry in Mexico this thesis does not go into detail on this subject.

The activity in Mexico's petroleum sector will lead companies to locate together, surrounding this industry. These firms will experience positive externalities from the proximity in terms of geography and type of activities. Access to specialised labour and supplies, knowledge transfer, pressure of maximal performance in a competitive environment are examples of these positive externalities. These clusters may even include authorities and institutions, like universities, research institutions and information centres.

Forward and backward linkages

When looking at the model of forward and backward linkages in relation to the Mexican market it is important to note, as mentioned earlier, that it is not the number of firms in the upstream sector that is important but the level of activity. In Mexico, the only legal actor in the upstream sector is Pemex. Declining reserves and a difficult financial situation for Pemex, is creating a difficult situation for boosting activity. Pemex is depending on private capital and competence in order to change the situation, and is trying to solve this through offering Multiple Service Contracts. However, since the size and the conditions of these projects are unsatisfying for international petroleum companies, and since the level of activity in the upstream sector is too small, companies in the supporting industry will not establish in the downstream sector. A small level of activity in the downstream sector will reduce the

possibility for Pemex to develop further and improve the difficult situation they are in because of the lack of technical competence, finances and equipment.

Therefore, in order to boost the activity in both sectors and attract private investments in the future, major changes will have to be made in the upstream sector. In order for Pemex to attract private investors, the activity level in the upstream sector will have to increase. A change in the constitution, allowing private investments upstream as well as downstream is one solution to the problem, or the conditions of the contracts must be changed.

Equilibrium with external economies and the coordination problem in Mexico

The coordination problem theory tells us why the companies in the petroleum sector need to coordinate their investment decision. Even though the activity level in the Mexican petroleum sector would be high, this does not necessarily mean that it is profitable to invest unless other firms also invest. The international firms are depending on a number of factors to be present in the Mexican market in order to perform their activities. Skilled workers on technical, legal and managerial matters, service and equipment need to be present at the same time. The lack of important factors would lead the companies to bring these factors from other countries, which would result in very high costs and less profitable projects.

The development path towards a stable equilibrium with high employment and wages in the modern sector can not be expected to be sleek. Again, the conclusion is that big changes will have to be made in order for the big oil and gas companies to take up significant investments in the Mexican petroleum market. The Constitution is blocking for private investments in the petroleum sector's upstream activities and is therefore also blocking for the development to reach beyond the critical mass. The critical mass is the minimum of investor activities required in order for the modern sector to develop and for the country to reach a stable equilibrium with a big interesting modern sector.

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