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BRAZIL, OIL AND STATOIL

CHALLENGES AND OPPORTUNITIES

NORGES HANDELSHØYSKOLE
Master of Science in Economics and Business Administration

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Abstract

This thesis aims to shed some light on what challenges Brazil faces concerning its oil reserves. It also considers Statoil's situation and attempts to analyse the challenges both face. Hotelling's rule and Dunning's OLI framework are presented and used in order to complete this analysis.

The thesis starts by looking at the history of petroleum in Brazil and Norway. Next, the theoretical framework is outlined.

The challenges for both Brazil and Statoil are presented and analysed through the use of the theories presented. Finally, some future prospects are outlined.

Preface

This thesis begun as the culmination of my years at NHH. It has been an exciting couple of years, and especially the thesis has been challenging and rewarding to work with. It is not without dread I turn it in however — once printed, it is committed for posterity. As with other things, time has not been sufficient. The topics are vast, and six months is far too little time to devote to these topics. It is

I think the oil industry is interesting, and especially so the economic issues surrounding it. I have lived in Brazil, twice, and I think the economic issues in the country are fascinating. Since the recent findings of large petroleum deposits in Brazil, it was therefore natural for me to write my thesis about petroleum, Brazil and Statoil.

I have translated some of the quotes from either Norwegian or Portuguese to English. I have tried to keep translations as close to the original meaning and sentiment as possible. Any errors in translation are my own.

The thesis itself is builds on various sources — much of it is things that have surfaced in Brazilian or Norwegian newspapers. The historical accounts come from a couple of great books, especially on the History of Petroleum in Brazil. ANP and Petrobrás have provided most of the statistics needed.

I would like to thank my wife Juliana for making sure I finish; without her and her support this would not be possible. My son Christoffer for his love and much needed distractions. Thanks to my parents who, by virtue of being NHH-graduates, made me want to study economics.

I would also like to thank the library at NHH, and especially Morten for obtaining some hard-to-find, and sometimes quite obscure, books.

Finally, thanks to Stig Tenold for understanding what I wanted to write, giving me advice on how to write it, keeping me on track and keeping digressions to a minimum.

Bergen, June 2010

Harald Christoffer Linchausen

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Chapter 1

Introduction

This thesis is an attempt to look at the opportunities and challenges surrounding the newfound petroleum resources in Brazil, and the opportunities this presents for the country and Statoil. My research has been focused on the historical development of the petroleum sector in Brazil, and the future challenges. I also introduce Statoil, and attempt to discover whether Statoil has a future in Brazil, and whether Statoil's involvement will be good for the country. By looking at the challenges faced by both Brazil and Statoil, I try to discover if the two are a good match. My research questions can tentatively be summed up as:

1. What challenges does Brazil face in its newfound petroleum wealth, how can those be resolved?

2. Is Statoil a good match for Brazil and vice versa, and what advantages does the company have in the country?

Chapter 2 provides some background information. It starts with Section 2.1, gives an overview over the history of petrolum in Brazil, from 1930 and onwards. It also gives an overview of the regulatory framework in existence today. This is

important, because it gives an introduction to how petroleum has been viewed in Brazil, and how the changes have been made.

In Section 2.2 I give a short overview of the beginnings of the Norwegian petroluem history and the foundation and evolution of Statoil. This is important to be able to review Statoil's role today.

In chapter 3 I present the theoretical foundations. Section 3.1 is about FDI, and Dunning's *OLI*-framework especially. In order to analyse Statoil's FDI, this is important. I also present some of the host country effects of FDI. Section 3.2 is about resource extraction and its taxation. First I present *Hotelling's rule*, its implications for price formation and extraction, and some criticism of it. Second, argue why natural resources should be taxed specifically and I present different alternatives for taxation, and the resource rent tax.

In chapter 4 I outline Brazil's and Statoil's future challenges. In section 4.1 I show what challenges further petroleum extraction may present for Brazil, with special emphasis on the effects petroleum extraction has on corruption and growth. Section 4.2 is about Statoil's challenge; that the Norwegian continental shelf is running out of oil, and that it's continued existence depends on increasing activities outside Norway.

In section 4.3 I tentatively conclude that:

1. The resolution to the challenges imposed by the resource wealth is probably best met by continuing the positive development in government. This however depends on the institutions being able to counteract the negative impact of the oil industry.

2. Brazil, with its vast fields is a good place for Statoil to continue its operations.

Chapter 2

Background

2.1 History of Petroleum in Brazil

Brazil was discovered by Portuguese explorers in 1500, although some speculate that Portuguese fisherman had landed there earlier. The new colony was named after the first valuable resource the colonisers found there, Brasil-wood, used in red colouring dye. The country was a colony until 1822, although the last years nominally as an equal partner with Portugal after the Portuguese court fled due to the Napoleonic wars. It was a monarchy until 1889, when a military coup ended the empire and instituted the Old Republic. The constitution of 1891 did little to change the social structures in the country, and especially in the old colonised regions in the Northeast, a handful of families in each state controlled most of the land. The First Republic, also dubbed the *Velha República*, the Old Republic, was dominated by oligarchies in the biggest and richest states, São Paulo and Minas Gerais. The constitution, although nominally democratic, only extended suffrage to men over the age of 21 who were literate. 85 % of the population was illiterate

at the time.[1]

2.1.1 The Vargas regime (1930-45)

The Brazilian petroleum history has its first beginnings in the Constitution of 1934. Following the coup in 1930 which ended the Old Republic, Getúlio Vargas was made president of the republic. After the *café-com-leite* system broke down, in which the landed oligarchies in Minas Gerais and São Paulo shared power, Vargas envisioned more modern Brazil.[2] A Constituent Assembly was formed, and in 1934 they declared a new constitution. Ownership of subsoil resources, such as oil and minerals, was to be national, under the ownership of the Federal Union.[3]

The coalition that brought Vargas to power, although not a homogeneous faction by any metric, wanted to bring an end to the old system, and economic and industrial development was important for the construction of the modern Brazilian state. The state was to be an important instrument in this modernisation of the economy.[4] However, oil was at the time of Vargas' ascent to power in 1930, not a big issue. Oil consumption was low, less than a third of Argentina's, and it made up less than 10 % of the import bill.[5]

The military, however, had long held the view that oil was a strategically vital resource. Already in the 1920s most officers saw "state intervention in the sector and nationalisation of reserves" as necessary.[6] Following São Paulo's defeat in the short-lived 1932 civil war and the establishment of the authoritarian Estado Novo

[1] Bethell (2008b, p.5)

[2] Café-com-leite literally means coffee with milk, a reference to the landed oligarchies in São Paulo and Minas Gerais, who produced coffee and were cattle ranchers, respectively.

[3] Bethell (2008b, p.32). The term Federal union is used interchangeably with the federal government.

[4] Bethell (2008b, p.10)

[5] Philip (1982, p.227)

[6] Philip (1982, p.229) and Cohn (1968, p.46)

in 1937, Vargas was ever more dependant on the military to hold on to power. Vargas himself lamented the 1934 Constitution, which ended the dictatorship, which he saw as instrumental to building a modern nation. It also imposed term limits on the presidency and Vargas would have to resign in 1938 had the coup not taken place.

Throughout the 1930s, oil consumption in Brazil increased at an annual rate of 19.55 %, and oil's importance in the national economy increased.

A secret committee set up after the establishment of the Estado Novo, led by the previous director of the Serviço Geológico Fleury da Rocha, recommended that a national oil agency, *Conselho Nacional de Petróleo* (CNP), be set up with extensive powers over the sector. The committee was held a secret, according to Wirth (1970), so that the government could push through its legislation before any opposition to the proposition could be mounted. Existing private assets remained in private hands, however, and the state was not given a monopoly over exploration. Explorers should however be Brazilian companies with Brazilian owners.[7] Foreign capital was excluded from refining.

Opposition to state control over the sector was led by the so-called entrepreneurs, although Philip (1982) maintains that their skills were more in publicity rather than oil exploration. Even so, the charges levelled against the bureaucracy and the international oil companies were quite serious, as evidenced by Monteiro Lobato's *O escândalo do Petróleo* (1936), and his letters to president Vargas.[8] He maintains that the Serviço Geológico, precursor to the CNP, under the leadership of the "foolish and innocent eye" of Fleury da Rocha, was being infiltrated by the "tentacles of the octopus that infiltrates Brazil" that is Standard Oil.[9] He main-

[7] de Paiva Abreu (2008, p.314)
[8] Monteiro Lobato (1936)
[9] Monteiro Lobato (1935)

tains that the state bureaucracy colludes with international oil companies to leave proven reserves in the ground, in order to enrich the aforementioned companies. Hence, oil exploration must be taken out of the government bureaucracy's hands. Although a government investigation found that the accusations had no basis in reality, Standard Oil's involvement in the Chaco war showed their capability in manipulating governments for their own ends.[10]

General Horta Barbosa was charged with leading the CNP from its inception. A military man, apolitical, he too saw oil as a vital resource. With prospects for war in Europe, and even conflict with Argentina, the CNP was more an "answer to a security problem rather than [...] an approach to a longer term strategy".[11] Although not prohibited by the legislation creating the CNP, Horta blocked any further expansion and new-building of private refineries, many of which had reached preliminary stages. After trips to Uruguay and Argentina in 1939, and meetings with Mosconi of Argentina's YPF, Horta Barbosa believed they would limit the federal government's ability to regulate the industry.[12] Vargas did not however, declare refining a national monopoly, as not to interfere with his other development plans, which depended on US support.[13] Specifically, there were plans to set up a steel mill in Volta Redonda, midway between the cities of São Paulo and Rio de Janeiro.

As early as in 1939 was oil discovered in the state of Bahía, and further exploration in the state was reserved for the CNP. However, by 1945 oil production was

[10]Wirth (1970) goes further, and explicitly states that Monteiro Lobato's intentions were to enrich himself by making his own stocks more valuable. The Chaco war (1932–35) was fought between Bolivia and Paraguay, and the belligerents disputed control over Gran Chaco. The region was thought to be rich in oil, and Standard oil backed Bolivia in the war. The conflict itself was the bloodiest in South America in the 20th century, with 100,000 casualties.

[11]Philip (1982, p.230)

[12]*Yacimientos Petrolíferos Fiscales*, Fiscal Petroleum Fields, the Argentinean state oil company.Bjørnstad (2000, p.38)

[13]Philip (1982, p.233)

negligible, and there were no major refineries in the country.

2.1.2 The Petrobrás era

The creation of Petrobrás

During the end of World War II, the United States ended its support for the Vargas regime and the Estado Novo. With a military coup in October 1945, and a new liberal constitution in 1946, coupled with Horta Barbosa's resignation from CNP in 1943, the stage seemed set for a more liberal oil regime. Colonel Barreto, Horta Barbosa's successor in CNP, allowed private capital in the refineries, and wanted involvement from at least US companies in the petroleum sector, if not other foreign companies as well.

General Dutra, elected president after the overthrow of Vargas, supported this path, and allowed two private Brazilian firms to establish refineries in 1946. The question of foreign capital in the exploration and refining had to be addressed by the legislature, however.

In 1947 Dutra established a new committee to decide, again, what Brazilian oil policy should be. The project was then handed over to CNP to propose a new petroleum statute. CNP favoured a concession model like the one in Venezuela, in which private companies would obtain concessions for subsoil resources, but the Federal Union remain the sole owner.[14] Foreign companies would be allowed entry as well, and the concession model was at least in part suggested in order to attract foreign investment.

General Horta Barbosa continued his campaign for a national oil monopoly, even

[14] Bjørnstad (2000, p.40)

Figure 2.1: Communist leaflet from the "O Petróleo é nosso" campaign. The term *entreguismo* loosely means to give away or allow foreign capital to exploit a country's natural resources. The names on the leaflet are amongst others central figures supporting Vargas. (dos Santos, 2006)

though he did not believe the state to be a good industrialist. However, since he regarded oil as such an important resource, having a state monopoly would be the only way to secure it. This position was also the solution of choice amongst officers in the army.[15] An unlikely alliance of communists, army officers and the urban middle class effectively killed the bill proposed by CNP, and when it was presented to the Congress, it was without the President's support. The communists started a campaign, known as *O Petróleo é Nosso*, literally "The Petroleum is ours", which gained support amongst the aforementioned groups.[16]

Another department, DASP, rival to CNP and headed by an ally of Horta Barbosa, proposed to build a new refinery, expand an existing one and acquire a number of tankers in order to solve more pressing supply issues.[17] Even though DASP started out strictly as a budgetary organ, the plan won Congress' approval in 1948, and laid the oil issue dead for a few years. No new legislation had passed concerning how the industry as a whole should be organised and regulated.

Vargas returned to power in the 1950 elections. The oil question had been a contentious one, and Vargas wanted to settle it once and for all. Congress was controlled by conservative forces, which were normally pro free-enterprise. Communists, who had received great support because of the oil matter, were unlikely to agree to any other settlement than complete state control over the oil industry.

PTB, the Brazilian Workers' Party, proposed before congress a complete state monopoly over the petroleum sector. In order to get support from the conservative deputies, Vargas suggested the government set up a holding company, 51 % owned

[15] Philip (1982, p.234)

[16] Bjørnstad (2000) argues that it was a popular movement, however, when the movement took place, only about 25-30 % of the adult population were registered to vote, and a slightly smaller percentage did vote.

[17] *Departamento Administrativo do Serviço Público*, DASP, was principally responsible for the federal budget, and finding ways to improve public services.

by the federal government. It would raise capital by transferring existing CNP assets, selling 49 % to private investors and the government would raise funds through new excise taxes on certain luxury products. There were a few misgivings to such a plan. Some believed that Brazilian capitalists lacked the capital and competence to set up a domestic petroleum industry. To others, such as Horta Barbosa, private capital would act as Trojan horse for foreign interests.

To Vargas' surprise, conservative deputies declared support for the PTB plan. Eventually, it would pass, giving the state through Petrobrás complete monopoly over exploration, extraction and refining, bar the two pre-existing private refineries. They would be allowed to continue, but not expand operations. Later, under President Goulart, it was suggested that the government should nationalise these as well, but this was not done.

The bill itself passed as law no. 2.004 October 3rd 1953, and Vargas said after having signed it

> Congress has turned into law the government plan for exploitation of our petroleum. Petrobrás will secure not only the development of the national oil industry, it will also limit the evasion of our borders. Incorporated with exclusively Brazilian capital, technology and labour, Petrobrás is the result of a firm nationalist economic policy [...].
>
> It is then with satisfaction and patriotic pride I today sanctioned the letter of the law, passed by the legislative body, that constitutes a new mark in our economic independence.[18]
>
> *–Getúlio Vargas*

Petróleo Brasileiro S.A, Petrobrás, formally began operations in 1954, on May

[18] Petrobrás (2009)

10th, taking over existing CNP assets, including the refineries set up by DASP. The refineries, located in Mataripe, Bahía and Cubatão outside Santos in São Paulo, refined 2,663 barrels of oil, or 1.7 % of domestic consumption.[19]

President Vargas' words clearly state what the company's mission was – acquire economic independence for Brazil through self-sufficiency in petroleum products, even though he was not initially supportive of a wholly owned state-monopoly.[20]

In a more global context, Petrobrás was created at a time when belief in governments' ability to run industry efficiently was high, and sometimes necessary to build industry when private capital was lacking. It was also widely held that state ownership could provide protection against unfortunate external shocks.[21]

In other developing countries, other state-owned enterprises were funded in sectors deemed to be of strategic importance. Hindustan Machine Tools in India was given effective monopoly of 17 sectors in the economy following its establishment in 1956. HMT has since experienced a massive overstaffing, due to the government's use of the enterprise as a tool for job-creation. Semen Gresik of Indonesia was established after the discovery of large limestone deposits in the country. In Turkey, Sumerbank, later Sumer Holding, was established in 1933 to facilitate and promote industrialisation in the country.

In Italy, the organisation established to preserve the banking sector after the 1929 depression was seen as an important player in rebuilding the country after the Second World War. Istituto per la recostruzione industriale (IRI) was not as locked in its operations as other SOEs; it was governed largely as a private enterprise

[19]Petrobrás (2009)

[20]Vargas would later in 1954 commit suicide, and in his suicide letter (Vargas, 1954), he accuses the "forces against Brazilian independence" of working against him and effectively forcing him to kill himself.

[21]Muir and Saba (1995, p.11). The following paragraphs are also based on Muir and Saba (1995)

	Average annual change	
Period	Consumption	Production
1955–1959	18.49 %	63.36 %
1960–1964	11.07 %	2.38 %
1965–1969	9.57 %	13.25 %
1970–1974	11.15 %	1.55 %
1975–1979	5.04 %	-0.75 %
1980–1984	1.38 %	21.36 %

Table 2.1: Growth in production and consumption, 1955-84. Source: Brazilian oil production, consumption, imports 1942-1999 on page IV

until 1960, and did not receive any government support before that. The state was also playing an increasing role in the British economy, although this began in the aftermath of the First World War.

Against this backdrop of political fighting over the future of oil production in Brazil, CNP did have some success in locating petroleum deposits. From 1945–55 proven reserves increased from 1 million to 35 million barrels. Furthermore, the founding of Petrobrás lessened the Brazilian dependency on importats of refined petroleum products. The dependance on straight crude increase however — in 1953, crude imports were at 30,000 metric tons, whereas in 1955, the year after the company was founded, crude imports were 3,513,000 metric tons.

Continued operations

The goal of achieving a self-sufficient Brazil in petroleum remained elusive. Throughout the Kubitschek's and Goulart's presidencies, as well as the military regime ending in 1985, domestic crude oil production never exceeded 43% of domestic consumption. Domestic production did increase in the period, quite dramatically. Crude consumption increased more however. Table 2.1 illustrates.

In 1961, Petrobrás opened the first refinery built by the company, in Duque de

Caxias outside Rio de Janeiro. The same year, offshore exploration began, on the continental shelf. In this context, the continental shelf was defined as waters up to two hundred metres deep. The exploration zone itself stretched from the state of Espírito Santo to Maranhão.

The first offshore field was found in 1968, off the coast of Sergipe, in the North-east.[22] The development of the field was not decided on economic merit. Rather, Petrobrás decided to start production in order to gain offshore experience. As such, the decision was a strategic one.

The oil crises of the seventies highlighted the need for domestic production, in the eyes of the policymakers and Petrobrás leaders at the time. The focus on offshore explorations was increased. In 1974, discoveries were made in the Campos Basin, outside the coast of northern Rio de Janeiro. A number of oilfields were discovered in the following years in the basin, and made the Campos Basin the primary petroleum producing region in Brazil.

This was not enough to cover domestic demand however, and in 1979, domestic production covered less than 15 % of consumption, down from 31.5 % in 1970. The regime was conscious of the import bill imposed by increased petroleum imports and the price hikes caused by the oil crisis in 1973. It was these factors that made the Brazilian government start the Pro-Alcoól programme.

The use of combustible ethanol as a light vehicle fuel made sense in Brazil, the world's biggest sugar producer. The early success of the programme vanished once the oil price decreased in 1985 however, and ethanol only became a commercially viable fuel source again after 2003 with the invention of flex-fuel engines. This substitution of ethanol for petrol has made the goal of self-sufficiency in petroleum more easily attainable, however and today around 50 % of Brazil's

[22] See Map of Brazil

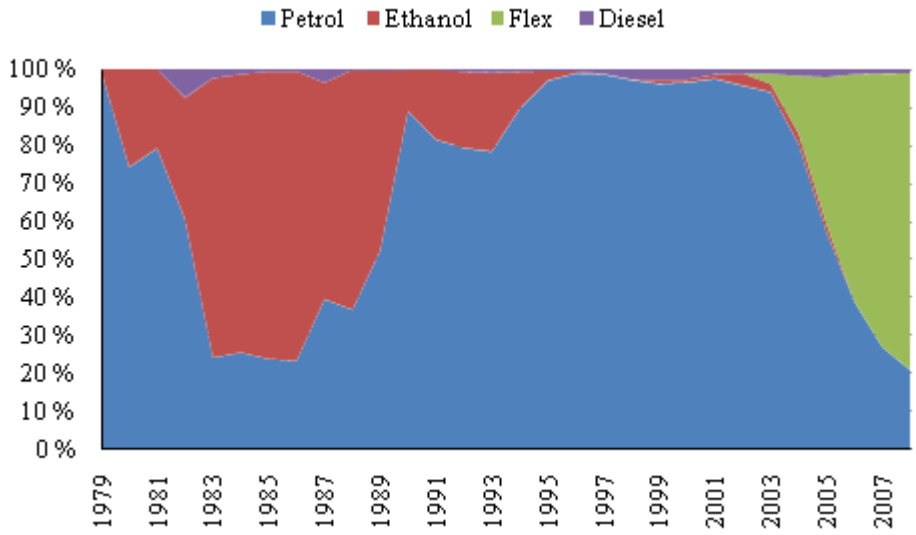

Figure 2.2: Brazilian car production, by fuel. (Anfavea, 2009)

light vehicle fuel needs are covered through sugar-based automotive ethanol.

The same factors made the government open up for risk contracts — international and domestic oil companies could search for oil within Brazil, but any finds had to be handed over to Petrobrás, agent for the federal government. Compensation would be given in cash, not a share of production in any fields found.

In the 1980s, the authorities wanted more of the platform construction and so forth be done domestically, and initiated a programme to achieve that. Previously, Brazilian industry had been more of a bystander in this process. In 1984, the first giant field was found in the Campos basin, the Albacora field. The second giant, the Marlim field was found the next year. The same year, natural gas was found in the Santos basin, and oil was found on land in the Potiguar basin. Those two were the only discoveries yielded by the risk contract programme.[23] The Campos basin further yielded the Roncador and Marlim Sul giant fields.

[23]There is some conflicting information on this matter however. Nordås et al. (2003) state that there were five commercially viable discoveries, but Petrobrás (2003) cites only these two.

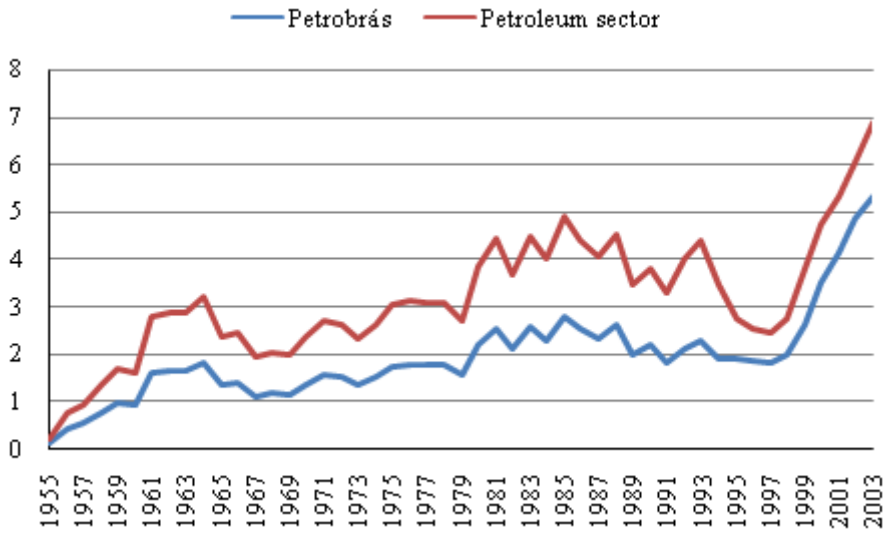

Figure 2.3: Contribution to GDP, percentage points. (ANP, 2005)

2.1.3 Deregulation

After the somewhat peculiar return to civilian rule on March 15th, 1985, a new, democratic constitution was approved in 1988.[24] The new constitution maintained the Federal Union's ownership over subsoil resources, thus the transition to civilian rule meant little for Petrobrás.

Fernando Henrique Cardoso, riding on a wave of popularity following the success of his stabilisation programme, was elected president in 1994 and took office in 1995. He would be an unlikely candidate for implementing orthodox economic measures, at least given his contributions to the *dependista* school of thought. He did just that, as the Real programme was an example of. A "crack team" of

[24]I use the term peculiar because the president-elect, Tancredo Neves, fell ill the day before inauguration, and his vice president, José Sarney was sworn in as interim president. Sarney had until May 1984 been president of the pro military regime party. The first civilian president in 21 years was therefore a man with strong ties to the former regime.

In a recent ruling on whether the amnesty law granting amnesty for crimes committed under the military regime, Supreme Court justice Lewandowski places part of the blame for the fall of the military regime on the oil crises, which destabilised the national economy.

economists determined a set of measures that would end inflation. Brazil had by then however, a rather long list of attempts to solve the inflation problem through more heterodox measures, all of which failed to highlight the need for fiscal adjustments.[25] In the period from 1985 to 1994, Brazil had gone through no less than six attempts at economic stabilisation. After the implementation of the Real programme, the government divested itself from many enterprises in "non-sensitive sectors".[26]

In 1997, Petrobrás' monopoly on petroleum exploration and extraction ended. Law no. 9478, signed on 6 August 1997 formally ended Petrobrás' monopoly. In order to fulfil the constitutional requirements, a new agency, ANP, was set up.[27] It hands out concessions to explore for and extract petroleum on Brazilian territory. In hindsight, the move looks to be successful, and the petroleum sector's share of GDP has risen rapidly after the liberalisation of the sector. The non-Petrobras share is stable though — even though the sector has been liberalised, most of the gains have been made by Petrobras. (See Figure 2.3) At the time, Petrobrás workers staged a strike against what they perceived as privatisation. The government was succesful in winning the population's support. By accusing the Petrobrás workers of being effectively part of a privileged labour aristocracy, the strikers lost support quickly.[28]

Petrobrás was also part privatised, and today the Federal Government owns 55.7 % of the voting shares in the company. The company has two classes of shareholders, and all state holdings in the company are in voting shares.

[25] For a simple outline on the various attempts at stabilisation, see Grung (2008).

[26] Grung (2008, p.23)

[27] *Agência Nactional do Pétroleo* (ANP), National Petroleum Agency. The full name has since been changed to *Agência Nactional do Pétroleo, Gás Natural e Biocombustiveis*, and its responsibilities also include natural gas and biofuels (ethanol).

[28] Bjørnstad (2000)

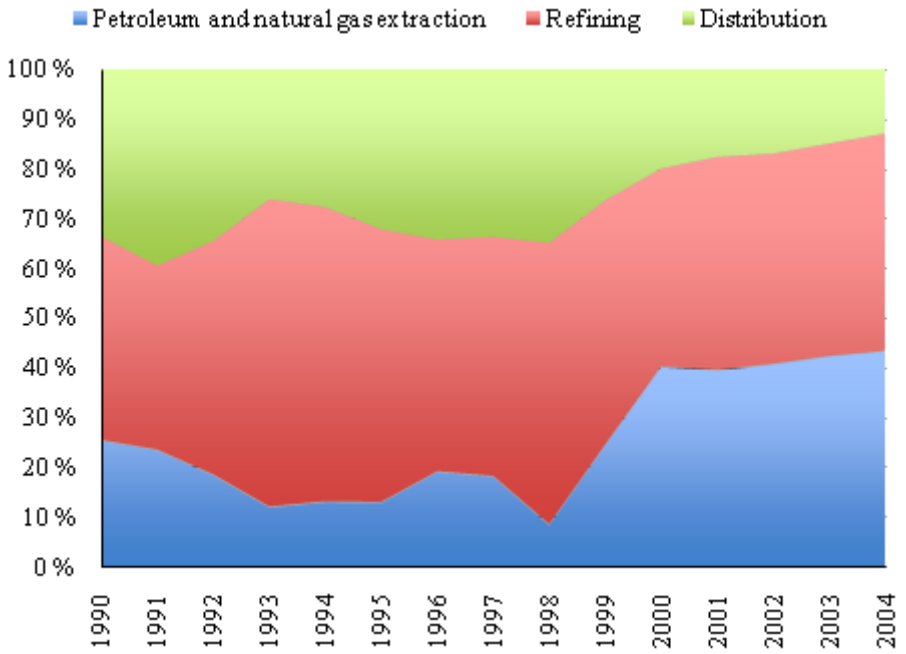

Figure 2.4: Composition of petroleum sector GDP. (ANP, 2005)

Figure 2.4 provides more evidence that the deregulation of the petroleum sector has been successful in developing the sector, and making sure that more fields come online. Upstream petroleum activity has gone from a low of around 8.5 % in 1998 to close to 40 % of value added in the oil industry, at the same time as the petroleum sector's share of GDP has increased. Success in this regard is defined as higher domestic crude and natural gas production, which was part of the original reasoning for founding Petrobrás.

The same trends are visible if one looks at the production of crude. Production shows a steep increase after the deregulation. Petrobrás' share of the petroleum sector value added also increased after the deregulation. The reasons for this may be numerous, but outsiders, such as the US government, have made harsh criticisms against the way concessions are given — ANP has been accused of giving the fields with best prospects to Petrobrás.

Nevertheless, big and important fields have been given to foreign companies. Statoil is operator and developer of the Peregrino field, in the Campos basin. When production starts in 2011, it is expected to produce 100,000 barrels a day.

In 2007, the pre-salt fields were discovered, and this puts Brazil in a completely new situation. These fields are located in the Campos and Santos basins outside Rio de Janeiro and São Paulo respectively, and contain large amounts of oil. Although oil production has increased markedly, and production now surpasses domestic needs, the scale of these fields is enormous.

Upon announcing the discovery of the Tupi field in 2007, Petrobrás estimated that recoverable resources were around 5-8 billion barrels of oil equivalents. The director of ANP also announced in 2008 that the nearby Carioca field contained around 33 billion barrels, which would make it the third largest field ever discovered, and that largest field discovered in the last thirty years. This has not been confirmed from either Petrobrás or BG Group, which both hold licences in the block that contains the field. Another field on the same block however, has confirmed reserves of 1.5 to 2 billion barrels.

The giant pre-salt fields have necessitated new influx of capital into Petrobrás. Contrary to what would be done in the era of state ownership, the company has announced a share issue worth USD 25 billion in 2010. This is the biggest share issue in ten years in the West. The development costs for the ultra-deep fields are estimated to be around 240 billion USD.

Taxation and regulatory framework

All the fields that are under concession today are subject to a signatory bonus, royalties, special participation tax, land use fees and normal company taxes. The

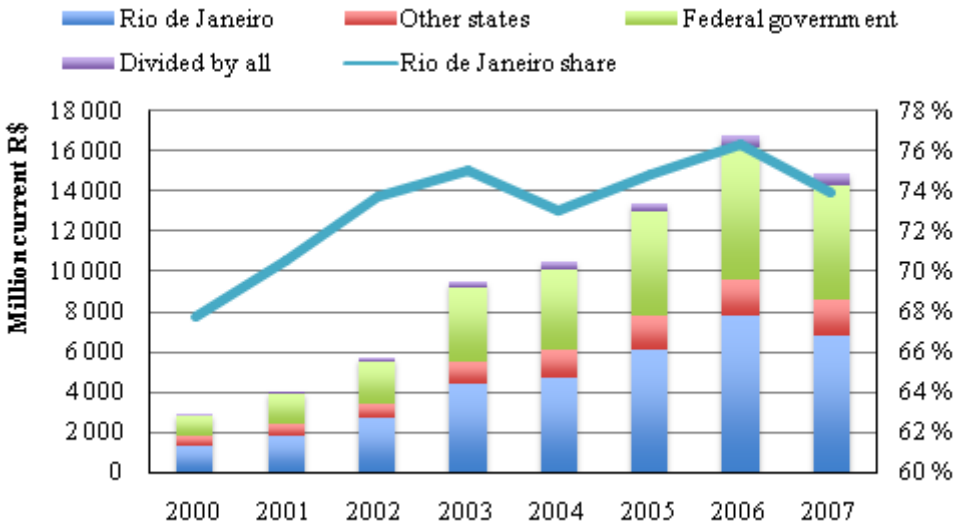

Figure 2.5: Distribution of special petroleum taxes 2000-07. (ANP, 2008)

signatory bonus is the amount the oil company agrees to pay for the concession, which is decided through an auction.[29] Royalties amount to 5-10 % of gross production, depending on the field. Most of the royalties go to state and municipal coffers, not the national government. The special participation tax depends on field size, field age and whether the field is onshore, offshore shallow waters or offshore deep waters.[30] Deductions for costs are allowed. The revenue net of deduction is subject to the tax, which varies between 0 and 35 %. Tax revenues are divided between the Federal government (50 %), adjacent states (40 %) and adjacent municipalities (10 %). Rio de Janeiro receives the biggest share of the royalties and the special participation tax; a hefty 75 % of total decentralised taxes are paid to Rio de Janeiro.[31]

That means that oil companies are subject to special taxes corresponding to those

[29] Ferriche (2009) provides a good overview over the application of auctions in the Brazilian oil sector, albeit in Portuguese.

[30] Deep waters in this context means waters of more than 400 metres depth.

[31] Último Segundo (2010)

Figure 2.6: Banner hanged on *Christ the Redeemer*, landmark of Rio de Janeiro. The banner reads "In Rio [de Janeiro]'s defense against cowardice". (Santiago, 2010)

detailed in section 3.2.2. The profit tax and royalties serve two purposes; royalties means that some of the risk in a field is borne by the government, and the special participation tax will capture a larger part of the resource rent.[32] In this context, risk can mean both financial risk, and political risk; specifically, that a country may chose to expropriate an oil installation after the whole investment is made, and a signatory bonus is paid. By placing some of the taxation in the production phase, part of the political risk is reduced.

Law no. 5938/09, which is still under deliberation, stipulates that the royalties should be transferred to all the states and municipalities in Brazil.[33] The special participation tax' distribution is also subject to change if the Senate approves law

[32]Ferriche (2009, p.38 and p.41)

[33]The law has been approved in the Chamber of Deputies, and has been sent to the Senate for approval. As of 22 Apr. 10, it has not been voted on by the Senate.

no. 5938/09. The share given to each state or municipality should conform to the share of taxes transferred from Federal government.[34] The law has received broad support, with the majority of opposition coming from Rio de Janeiro. Sérgio Cabral, governor of Rio de Janeiro state, has launched a massive PR-campaign against the law. The state and municipal governments stand to lose some USD 4 billion in yearly revenue. Figure 2.5 illustrates how inequitably the tax revenues are shared.

[34]The Federal government collects income taxes and taxes on industrialised products, and 22.5 % of that is handed back to the states and municipalities.

2.2 Petroleum in Norway

Petroleum was first discovered off the coast of Norway in 1969. There was much scepticism about the prospects for finding petroleum in the North Sea. On request from the Norwegian Foreign ministry, the Norwegian Geological Society authored in 1958 a now infamous letter. It stated that "the possibility of there being coal, oil or sulphur on the continental shelf along the coast of Norway can be discarded".[35] The prospects for oil in the North Sea were first made apparent after the discovery of the Groningen field in the Netherlands in 1959.

Unlike Brazil, Norway had to resolve border issues with its neighbours Denmark and UK. The Norwegian government was unwilling to accept a limitation of the continental shelf to waters under a set depth, and within a specific distance of the coast. Rather, an accord building on the principle of a mid-line was wanted, that is, a line equidistant from each country was to designate which country had the rights to the resources underground. This was achieved rapidly, and no drilling or extraction was allowed before the agreements with both Denmark and the UK were in place.[36]

The sharing itself was most fortunate for Norway; the mid-line principle meant that several large oil fields came within the Norwegian part of the North Sea.[37] The Ekofisk field would have been Danish rather than Norwegian had the sector

[35] The letter does state that there have been no comprehensive surveys of the North Sea however, and the authors apparently believed the Foreign Ministry's request was only about near-coast areas. There is also some belief that Erik Pontoppidan, 18th century professor and theologian, "knew" about the oil underneath the sea. In his work about the nature of Norway, he writes about the "fat of the North Sea", which has later been interpreted to mean hydrocarbons. Even Kindingstad and Hagemann (2002) refer to this. Jahren and Bjørlykke (2005) refute this misconception thoroughly.

[36] There were also attempts to reach an agreement with the Soviet Union from 1970 onwards, but the question was only resolved in April 2010.

[37] According to Kindingstad and Hagemann (2002, p.30), Norwegian authorities succesfully established that the outermost rocks in the sea formed the limits from which the mid-line should be calculated.

principle rather than the mid-line principle been followed. The oil question was not a political one at first. At the onset, it was the civil service that was most preoccupied with it. Jens Evensen was responsible for the deals outlining the sharing of the North Sea, and with two fellow civil servants he captured national interest for oil.

Philips Petroleum of Oklahoma was the company to first show interest for exploration of Norwegian waters. In a letter dated 29 October 1962 they attempted to obtain exclusive rights for exploration and exploitation of petroleum resources in the Norwegian parts of the North Sea. Their offer to the government in exchange for this exclusivity was doing a survey of Norwegian territorial waters, costing $ 160,000 per month and totalling to around $ 1,000,000. Their application, although not answered for another few decades, was politely declined. Phillips' interest for Norway was primarily a practical one. The Seven Sisters were given preference in Great Britain and the Netherlands, and in Denmark the industrialist A.P. Møller was given exclusive extraction rights, on both territorial waters and under land.

The Norwegian civil service was decisive in the shaping of the regulatory regime. In 1965 the first concessions round was held. A novel concept was established — rather than requiring cash payments in exchange for concessions, the government demanded that the blocks conceded be properly explored. That meant that all the companies applying for concessions had to elaborate drilling and exploration plans for any blocks conceded to them. Furthermore, if no drilling took place, 25 % of the block would return to the government. After another three years, the oil company would lose another 25 %. The primary concern for the authorities was to establish the scope and scale of any oil resources.

As a curious detail, there was apparently a meeting between oil executives in New

York prior to the first concessions round, where they agreed that "any attempt to unduly influence or bribe Norwegian authorities or their representatives would be unwise".[38] Implicitly this is an admission that the big oil companies were party to corruption elsewhere. Section 4.1.2 supports this.

When the first oil rig reached Norway in 1966, the Ministry for Industry took control over offshore safety, in order to ensure that inspection and regulatory responsibility was not dealt with by the individual agencies responsible for explosives, airspace, health and safety and so on. In total at least six different government agencies would instead be consulted, with the Ministry for Industry as supervisor.

Phillips Petroleum would be the first company to discover a commercially viable field on the Norwegian continental shelf. The Ministry for Industry was informed of the discoveries on the day before Christmas in 1969. The Ekofisk field would be a giant field, and today it is a National Industrial Heritage. The field entered production two years later, in 1971.

Had it not been for the obligations that Phillips had taken on under the concessions regime, Phillips might not have found the field however. The hole that showed evidence of viable oil resources was the last that the company was obliged to drill, and was only drilled because if had it not been, Phillips would be fined $ 1,000,000. After the first finding, the rig manager sent a message Phillips' Norwegian headquarters where he declared "the North Sea, from here to the North Pole, is one big pool of oil".[39] Ekofisk is still in production today, almost 40 years since it was first opened.

The parts civil service in charge of handling the oil question, headed by Jens Evensen, regarded the oil business to be too risky for Norwegian companies to

[38] Kindingstad and Hagemann (2002, p.47)
[39] Kindingstad and Hagemann (2002, p.75)

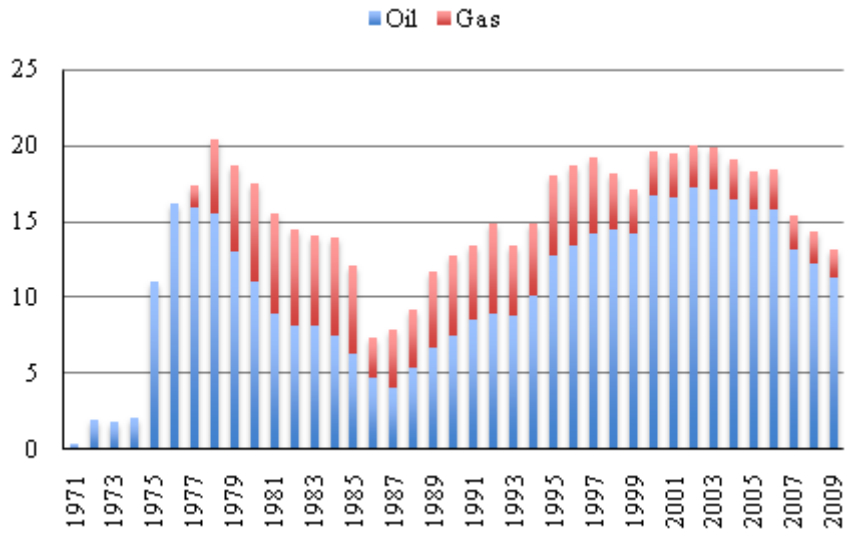

Figure 2.7: Oil and gas production from Ekofisk in million m^3 oil equivalents, 1971-2009. (Oljedirektoratet, 2009)

take party to. Because of the great risk, and uncertainty of ever recouping the costs, "oil was seen as something the Americans dealt with".[40] The contrast to the views of the Brazilian army and civil service is sharp.

Opinions since changed, and the government of the time, a centre-right coalition headed by Borten, wanted Norsk Hydro to be the Norwegian financial and industrial instrument. The company was at the time the biggest in Norway, and it had international experience and some international owners. Additionally, the company consumed around 12 % of all oil in Norway. The government started a secret buying spree in the company, and wound up with a majority of the voting shares. Only after the transaction was made public did the government seek funds in Stortinget to finance the deal. Stortinget approved the purchases, but alsodecided that the state's ownership in Norsk Hydro did not bind it in any way, meaning that the possibility for establishing a wholly owned national company

[40]Kindingstad and Hagemann (2002, pp.82–83)

was still present. Borten's attempt to pre-empt a successive Labour government from establishing a national oil company was thus unsuccessful.

During the winter of 1971 Borten resigned and a new Labour government was formed. It decided that a new state-owned company should be formed for managing the state's business interests, called *Den Norske Stats Oljeselskap AS*, Statoil. Also in other oil producing countries, there was a tendency to establish new, state companies in charge of oil exploration and extraction.

Furthermore, it was decided that all oil should be landed in Norway, which was not obvious due to the proximity to other nations with oil handling facilities. Exceptions could be made in case economic considerations demanded it. The state-owned oil company was largely a Labour project, and the first CEO of the company was a Labour member. After the first oil findings, the Norwegian government realised that the blocks were worth more than initially thought, and for the next round of concessions it obtained higher tax rates from some of the oil companies, and Phillips even agreed to *carried interest*, which would allow the government to participate in exploration and extraction, without taking any risk.

The border with Britain also presented some challenges. In 1972 the Brent field was discovered, and showed indications that it would stretch from British sector into Norwegian waters. The concessionaries on British side, Shell and Esso, wanted concessions into Norway as well. Dividing the Norwegian blocks between these two companies was denied for two reasons: first of all, this would give incentives to inflate the share of the petroleum reported to be in Britain, since regulations there were laxer and taxes lower.[41] The second consideration was to await the establishment of Statoil, the aforementioned state company. Statoil was awarded a 50 % share of the blocks on Norwegian side.

[41] See section 3.1.2 about profit shifting.

Later on, it was discovered that the Brent field had little extension into Norway. Instead, the Statfjord field was found on the same blocks. Chevron was the first choice for operator of the blocks, but the company's management did not approve of the conditions placed on it: 50 % Statoil share, and a later relinquishing of the operator status to Statoil. Chevron believed it could negotiate a better agreement, and did not respond the authorities within the deadline.[42] The Norwegian government subsequently chose Mobil as operator, which Chevron discovered only through the media. Mobil on its hand did not believe Statoil would be ready to become operator of such a large field within 1984, the agreed upon year for Statoil's takeover.[43]

Statoil's role has since changed. Initially, it was the government's prime instrument for dealing with the oil industry. The right wing of Norwegian politics was worried about Statoil; that Statoil was becoming a too big player in the Norwegian economy and the company was too young to administer a great portion of the State's revenues. In 1985 after a compromise between the Labour party and the ruling coalition led by the Conservatives, Statoil's operations were split in two — one part continued to be the company's financial interest in production, and one part became the State's Direct Financial Interest (SDFI). The SDFI is a purely financial interest, so Statoil would still cover the State's industrial involvement. Furthermore, Statoil administered the SDFI for the government, since the civil service had no prior experience in and lacked the competency to manage financial assets.

The government had wanted to use the petroleum industry to maintain employment in declining regions, and the on-shore operations of Statoil were spread

[42] Kindingstad and Hagemann (2002, p.96)

[43] Kindingstad and Hagemann (2002, p.96). Mobil stated that it would take 25 years for Statoil to be ready, to which Arve Johnsen, first CEO of Statoil, reportedly responded "you've come to an industrialised country now, not a third world country".

throughout the coast. Following the oil price crash in 1986, when Saudi-Arabia ended its role as a swing producer in OPEC and price guarantor in international markets, the commercial objectives were given larger weight. The government's involvement was diminished and commercial objectives became the main focus.

Until the end of the 1990s, it was the government's policy to allow and rely on three Norwegian oil companies:

1. Statoil: wholly owned state enterprise, with focus on the petroleum industry.
2. Norsk Hydro: partly state owned and listed enterprise, whose main businesses were aluminium, oil and fertilizers.
3. Saga Petroleum: publicly listed and privately owned company. The Norwegian government had no financial interests in the company.

This policy has since changed. Firstly when Saga Petroleum came into financial distress and was taken over by Norsk Hydro and Statoil. Norsk Hydro and Statoil bought half of the shares each. The then director of Saga protested this development by selling his shares to French ELF at a lower price than Norsk Hydro's and Statoil's offer. Subsequently Norsk Hydro was restructured. The company's petroleum division was sold off to then partly privatised Statoil ASA. The fertilizer division has become Yara, and Norsk Hydro now only deals in aluminium.[44]

In 2001, Statoil was partly privatised. Since Statoil was still in charge of managing the SDFI, a new state owned company was established, whose sole function is to manage the SDFI.

Still, even when it was a purely state owned enterprise, Statoil was well run, and Muir and Saba (1995) argue that Statoil was the best run state owned company at

[44]Norsk Hydro is involved in Brazil as well, and increasingly so following its takeover of Vale's aluminium assets.

the time.

Chapter 3

Theoretical framework

3.1 Foreign direct investment

Foreign direct investment (FDI) is defined as a long-term investment in a company in another country with the objective to influence management. This puts it at odds with portfolio investments, which are short term in nature, and take place to earn a return on the investment without trying to change how the firm is run. According to the OECD, "the direct or indirect ownership of 10 % or more of the voting power of an enterprise resident in one economy by an investor resident in another economy is evidence of such a relationship".[1] However, ownership shares of that magnitude are not controlling, and influence over management may be limited. The corporate ownership structure in the recipient country is decisive for whether this is controlling or not. For instance, a 10 % share in a country with little or no protection for minority shareholders is next to useless in terms of controlling or influencing a company, whereas owning 10 % of a listed US company

[1] OECD (2007, p.7)

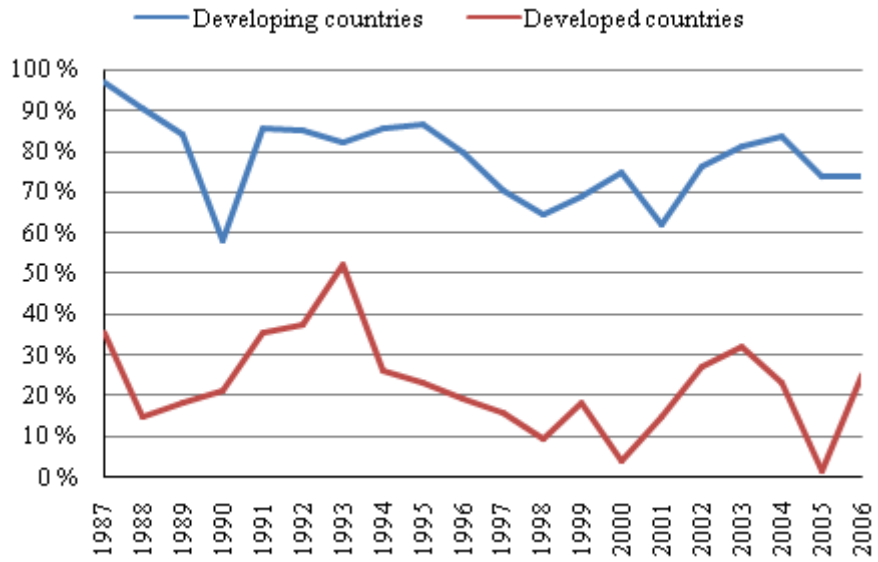

Figure 3.1: Greenfield as % of total FDI. (UNCTAD)

is practically a controlling stake, due to the fragmented ownership in the country.[2] The OECD does not allow divergence from this threshold though, for statistical purposes — if different agencies use different metrics for what constitutes FDI, the figures will no longer be comparable. It should be noted though that the 10 % is for statistical purposes, and is not necessarily indicative of control.

FDI can take two forms, mergers and acquisitions (M&A) and Greenfield investments. M&A means that an investor acquires a stake in an already existing productive asset. Greenfield investment refers to an investment where a new productive asset is set up. M&A is by far the most important form of FDI for advanced economies, whereas Greenfield investments dominate for developing economies. (See Figure 3.1 and Barba Navaretti and Venables (2004a, p.9)).

In addition, FDI can be split into two main types, vertical and horizontal FDI. Ver-

[2]The definition does not take share types into account either. If a company is divided between voting and preferential shares, an investor could hypothetically control the company holding one percent of the total equity, but more than 50 % of the voting shares.

tical FDI exploits differences in factor costs across countries, where the company splits production into various parts. The classic illustration of vertical FDI is the maquiladora industry in Mexico, which assembles American cars. The stylized example splits the production in to two parts, design and assembly of the car. Design, which is intensive in its use of human capital, is located in the US, which is abundant in human capital. The assembly, intensive in its use of unskilled labour, takes place in Mexico, where it is abundant.[3] This kind of vertical FDI depends on low trade-costs between the locations where production occurs. This means that tariffs and other barriers to trade restrict vertical FDI. Additionally, by splitting production into several stages in discrete locations, the firm incurs splitting costs. Depending on the nature of the firm these may be significant.

Horizontal FDI, also referred to as tariff-jumping FDI, gains access to markets that are otherwise off-limits due to trade-restrictions, manmade or natural. In essence, the firm duplicates its home-country production in the host economy. The firm therefore foregoes some economies of scale to pursuit market access in the country it invests in. However, some firm-specific activities are not duplicated, e.g. R&D, which leads to firm level economies of scale. Contrary to vertical FDI, higher barriers to trade encourage horizontal FDI. The size of the host economy is also important, which is evidenced by the increase of inwards FDI in the EU after the common market was created in 1992, in which there are no barriers to trade. For example, Japanese companies established plants in the UK to serve the whole EU, rather than producing at home.

Estimating how much FDI is vertical and how much is horizontal presents some measurement issues, as there are few reporting requirements.

As this paper will focus on a multinational enterprise (MNE), it is useful to define

[3] Feenstra and Hanson (1997)

what an MNE is. "MNEs are firms that own a significant equity share [...] of another company [...] operating in a foreign country".[4] More precisely, a significant equity share would mean owning more than 50 % of the outstanding voting stocks in said company.

3.1.1 OLI

The OLI model is a conceptual framework that identifies three factors that determine whether a company will engage in FDI or not. The model itself is based on the assumption that FDI occurs due to market failures. "The basic proposition is that market failure in intermediate product markets and the need for firms to exploit the economies of interdependent activities, lead them to replace the market mechanism of cross-border transactions by internal hierarchies".[5]

There must be some kind advantage to the firm contemplating FDI to actually do it rather than producing at home and exporting, or buying imported components off the shelf in the market. These three factors are:

1. Ownership advantage (O)

2. Localisation advantage (L)

3. Internalisation advantage (I)

Table 3.1 gives examples of what these advantages may be.

[4] Barba Navaretti and Venables (2004a, p.2)
[5] Dunning (1993, p.187)

Ownership advantage

The multinational enterprise needs to have some advantage in owning the production process. Examples of such advantages may be patents, human capital or access to unique production processes. These assets can "take on the quality of public goods, that is, their marginal usage cost is zero or minimal".[6] Another ownership advantage may be due to corporate culture or the specific incentive structures to the firm. As an example of this, Dunning and Lundan (2008, p.132) reference the capitalists of the 19th century, who "created industrial empires and communities [...] which strongly reflected the values and beliefs of their founders".

For horizontal FDI, the enterprise must be competitive with local firms. These advantages become especially important if the MNE has to overcome cultural or linguistic barriers when locating abroad.

Localisation advantage

Localisation advantages mean that the MNE has advantages in conducting some of its activities abroad rather than at home. The host economy has to present some characteristics that make it profitable to locate there. One can look at three kinds of localisation advantages, related to:

1. Market access
2. Efficiency gains
3. Natural resources

[6] Dunning (1993, p.191)

Market access means that the MNE invests in the host economy to overcome trade costs, tariffs or other barriers to trade. In essence, this is horizontal FDI. For instance, Chinese owned textile industry in Lesotho can be seen as market seeking FDI, not because Lesotho is or was a very attractive market, but because industry located there had barrier-free access to markets in Europe and North America. The disadvantage with this kind of inwards FDI, for the host country, is that it depends on the proliferation on tariffs or other, non-tariff barriers to trade.

Advantages related to efficiency means that the MNE enters into production in the host economy to take advantage of some kind of factor cost differential. Above-mentioned is the maquiladora industry in Mexico. This kind of FDI is often demonised as outsourcing of domestic jobs, to places where labour conditions are worse, and labour consequently cheaper. It is also blamed for the downfall of good, secure and well-paying manufacturing jobs, especially in the US.[7]

Lastly, the advantage to natural resources is that the MNE has to locate the production where the resource is, if not, there can be no production. Also, it may be that the marginal production of said resource is cheapest in the host economy. This needs not be the case though — most sources of natural resources cannot be extracted immediately.[8] That means that more than one source must be online at all times to satisfy demand. The resource endowment of an economy is not a static concept; it changes with two variables:

1. The technology available for extracting the resource.

2. Demand for said resource in the economy, or the technology available for

[7]Ross Perot's "giant sucking sound south" is perhaps the most colourful incarnation of such accusations. The phrase was used to describe what he thought the effects of NAFTA would be, namely the offshoring of jobs to Mexico. (The New York Times, 1992)

[8]For petroleum, there is also an optimal rate of extraction due to the fact that it's the underground pressure that drives the petroleum up. If the petroleum is extracted too quickly, pressure may be lost and total recoverable resources will be lower than necessary.

making good use of the resource.

To use oil as an example, the modern era of petroleum is usually dated to 1859, when oil was found in Pennsylvania in the US. Given the relatively shallow oil wells, the oil seeped out of the ground after the well was struck. There was therefore no need to develop specific technologies to extract it. The other hand of the equation, the demand for the oil, came for example through the use of paraffin in street lights and oil lamps. Previously having been fuelled by whale oil, petroleum came to substitute it and eventually led to the downfall of the once great US whaling industry. 40 years ago, when the North Sea oil fields were being developed, the ultra-deep fields in Brazil would not be feasible to develop, due to costs and the lacking ability to extract petroleum so far under water.

Internalisation advantage

There must be some benefit to the MNE in entering into production itself, rather than contracting in the market at arm's length. The cost of internalisation has to be measured against the cost of outsourcing production. Internalisation costs may be investment cost in new facilities, inefficient scale in production and lack of market knowledge. Outsourcing presents its own set of problems. No contract can cover all possible contingencies. This can lead to hold-up problems, principal-agent problems and dissipation of intangible assets.

Hold-up problems arise when the contracted firm under-invests in productive assets. This happens because the firm fears that it might not be properly compensated for its investment in these assets, e.g. the MNE might renege on its contract and the firm, stuck with expensive assets that have little or no alternative use must accept worse terms. In order to protect itself from this, the contracted firm performs a sub-optimal investment.

1. Ownership-specific advantages
   (a) Property right and/or intangible asset advantages
   (b) Advantages of common governance
      i. which those branch plants of established enterprises may enjoy over potential new firms
      ii. which specifically arise because of multinationality
2. Internalisation-incentive advantages
   (a) avoidance of search and negotiating costs
   (b) to avoid costs of enforcing property rights
   (c) buyer uncertainty about nature and value of inputs being sold
   (d) to capture economies of interdependent activities
   (e) to avoid or exploit government intervention
   (f) to control supplies and conditions of sale of inputs
   (g) to be able to engage in practices such as transfer pricing, cross-subsidisation as a competitive strategy
3. Location-specific variables
   (a) spacial distribution of natural and created resource endowments and markets
   (b) factor prices, quality and productivity
   (c) transport and communications cost
   (d) artificial barriers (tolls, quotas, etc.)
   (e) economies of centralisation of R&D production and marketing

Table 3.1: Examples of OLI advantages. Adapted from Dunning (1993, p.198)

When the MNE contracts an outside firm to undertake some part of production for them, this invariably involves sharing some kind of firm specific asset, say, some special manufacturing process. The contracted firm may then take this asset and use it for its own, creating for the MNE not only a new competitor, but at the same time eroding away at its competitive advantage by dissipating of intangible or firm specific assets. The advantage related to internalisation is thus the elimination of market failures.

3.1.2 Host country effects of foreign direct investment

It must be advantageous for the recipient country to allow for FDI, if not, it would not. FDI can increase the total investments in the recipient country, and also increase employment. This is, however, not the only ways FDI may impact a recipient country. An investing company may use local subcontractors, and thus create backward linkages in the economy. By making local companies facing tougher demands, they may become more efficient, and all the local contractors' customers benefit. That again implies that the total effects of FDI rather than local investment may be better for the host economy. MNEs tend to pay higher wages than local firms, and although they lay off workers faster than local firms, their reactions are emphless severe in the sense of number of workers laid of for instance.[9] That is, "people who work in an MNE are less likely to be laid off, but if it happens it happens fast".[10]

UK data shows that multinationals are more productive than purely domestic firms. This finding still holds, even when taking into account factors such as capital employed, size of the company and other factors that may affect labour

[9] Barba Navaretti (2004, p.163 and p.170)
[10] Barba Navaretti (2004, p.170)

productivity.[11] The need for this distinction arises because MNEs tend to be bigger, employ more capital per employee and have more skilled employees than other firms. Other studies investigating total factor productivity have similar findings.[12] Since these studies are based on data from developed countries, they capture mostly M&A FDI. There seems to be a slightly positive effect from being taken over by a foreign enterprise, however this is still controversial and opposite results have also been found. Whether acquisition by a foreign company affects productivity, or if they acquire the most productive companies has thus not been settled yet.[13]

Profit Shifting

MNEs have the opportunity to affect where they pay their taxes. Tax rates differ across countries, and sometimes even within countries. Companies that have subsidiaries in different jurisdictions may try to shift profits to the location with lowest taxes. This leads to higher after tax profits than what a purely domestic company can achieve. That is, for a project with the same expected return before taxes, the multinational may be able to extract a higher after tax return. A multinational enterprise will therefore also be less sensitive to tax increases in the host country; a tax increase in the host economy will lead to higher profitability in the home country.[14]

Profit shifting may take place through two mechanisms — abusive transfer pricing and the use of internal debt. Abusive transfer pricing takes place in a transaction between two subsidiaries of the same MNE, by selling intermediaries at a too

[11] Barba Navaretti (2004, p.158)
[12] Barba Navaretti (2004, p.160)
[13] Barba Navaretti (2004, p.161)
[14] Weichenrieder (2009)

high or too low price. That is, the price is different from the "fair market price". Another manner of doing this is through license of franchise fees. Both of these mechanisms allow the MNE can channel more of its profits into subsidiaries in low tax locations.

Internal debt is used to shift profits by lending from a location where interest income is taxed lightly, to a location where interest cost has a high tax deduction. Internal debt in this scenario becomes a substitute for equity, because the debt is owned by another entity in the same company. The equity however earns a higher after-tax return due to the fact that interests are tax-deductible in the high-tax jurisdiction, and the tax liability for interest income is transferred to a low-tax location.

Profit shifting through transfer pricing is positively correlated with minority ownership, as the benefits for the MNE are even bigger when there are other owners involved. On the other hand, the use of internal debt is negatively correlated with minority ownership. The higher the share of minority ownership, the less benefit for the multinational, and hence lower incidence of the use of internal debt.[15]

3.1.3 Foreign direct investment in Brazil

Several large, well-known MNEs are present in Brazil, and have been so for quite some time. GM, for instance, recently celebrated its 85 year anniversary in the country, and it possesses three manufacturing plants in the country.[16] Others include Volkswagen, and other a multitude of other German companies. According to the German Foreign Office, there are over 1,200 subsidiaries of German companies in Brazil. 800 of them are located in Sao Paulo, and the city has "the largest

[15] Schindler and Schjelderup (2008)
[16] General Motors do Brasil (2009)

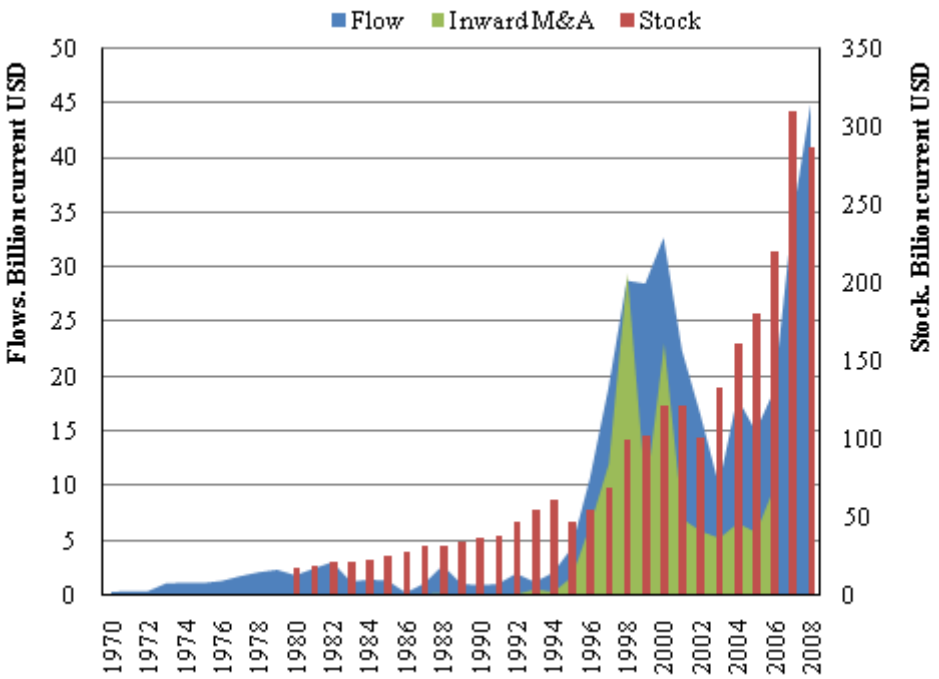

Figure 3.2: FDI flows and stock for Brazil. (UNCTAD)

concentration of German businesses worldwide", outside Germany.[17] This concentration has earned the city one of its nicknames, the "most important German industrial centre".

Figure 3.2 places Brazil somewhere inbetween developed countries and developing countries in terms of how much FDI is Greenfield and M&A. Although the shares are not stable, M&A accounts for between 50 % and 100 % in the period the time series covers, and lies somewhere inbetween on average. This is in line with expectations, given that Brazil is an economy in transition. As mentioned, foreign enterprises have a large presence in the Brazilian market. A priori, one would expect most FDI in Brazil to be tariff-jumping, because of two factors:

1. Long history of import substitution.

[17] Auswärtiges Amt (2010)

2. High import tariffs on manufactured goods.

The two are intertwined however, and not independent from eachother. In addition, Brazilian workers are not especially cheap due to the regulatory regime and hefty payroll taxes.Some put the difference between what is paid out and what the workers receive at 26.8 %, and that number takes into consideration that some of the payroll taxes may be paid back in case of dismissal.[18] Nominally, this fee alone is at 50 % of the salary. That makes vertical FDI to exploit factor price differentials less likely.

FDI inflows are steadily increasing until the Argentinean crisis, and Lula's election, which both upset the markets. FDI in the 90s is more dominated by M&A than laters years, perhaps due to the large wave of privatisations in that decade following the stabilisation programme implemented by Fernando Henrique Cardoso.

The state's involvement in large sectors of the economy prior to the 1990s has also served to decrease FDI in natural resource sectors. However, due to the deregulation of the petroleum sector, amongst others, has led to an increase of foreign holdings in that sector.

[18] Castro (2006)

3.2 Resource extraction

3.2.1 Hotelling's rule

The subject of extraction of finite resources appeared in Jevons (1866). He was concerned with the availability of coal, whether it would be depleted and the subsequent effects on the British economy. Since coal is finite, it cannot be used indefinately for infinite growth, and he concludes that "We have to make the momentous choice between brief greatness and longer continued mediocrity".[19]

Hotelling (1931) is seen by many as the starting point for the economic discussion of finite natural resources.[20] Hotelling's rule shows that even if extraction or production costs are zero, the price of a finite resource should be positive, and increasing with the discount rate.[21]

Formally it is written:

$$p\left(t\right) = p_0 e^{rt} \tag{3.1}$$

where p_0 is the initial price, and $p\left(t\right)$ is the price at t and r is the discount rate for the period.[22] Equation 3.1 is a continuously compounding version. One could also write a discrete time equation:

$$p\left(t\right) = p_0(1+r)^t \tag{3.2}$$

This equation only holds for a scenario of full certainty about the quantity of petroleum in the ground, and perfectly competitive markets. It should also be

[19] Jevons (1866, p.376)
[20] Devarajan and Fisher (1981)
[21] Hotelling (1931)
[22] Hotelling (1931) uses γ, not r, in his paper, but normal notation today in finance would be either r or k. I choose to use r.

noted that this specification depends on the marginal cost of extraction being zero, and in the presence of positive marginal costs, it implies that it is the rent that should increase with the discount rate.[23]

The assumptions behind Hotelling's rule do not hold in the case of petroleum markets. There is much uncertainty about the resources left underground, and new fields are discovered routinely.[24] Additionally, it is not a perfectly competitive market. It is a capital and skill intensive industry, and few companies have the necessary capabilities to be players in it. OPEC attempts to restrict petroleum output on a world basis. Although the amount of the world's supply coming from OPEC countries is shrinking, it is still a large share. There is some argument surround their true power over the world's energy markets, but the oil crises of the seventies and the subsequent price crash in 1985 illustrated the low short term price elasticity of demand and the short term impact the organisation can have.

Halvorsen and Smith (1991) attempt to test the validity of the rule using data from the Canadian mining industry, and their results indicate that it is not valid. However, they test on aggregate data, and do not take into consideration that the knowledge on deposits may have changed during the period for which they test. The authors note that the "the empirical results obtained here should be considered as only tentative".[25] Chermak and Patrick (2001) however find that using data on a single resource, Hotelling's rule can "be useful in describing the behavior of an individual producer". By incorporating risk and uncertainty through the CAPM model, Slade and Thille (1997) find some support for the theory.

[23] By rent is meant: Rent $= p - MC$

[24] Saudi Arabia, the world's biggest producer and most important exporter of oil, regards the amount of reserves to be a state secret even.

In the North Sea, two companies assessed the area containing the Ula-field, finding nothing. BP then started drilling, and BP geologists remarked that it was a "textbook example" of what the conditions should be for finding oil. (Kindingstad and Hagemann, 2002, p.131)

[25] Halvorsen and Smith (1991)

Nevertheless, Hotelling's rule reveals one fact about petroleum production — the continued presence of resource rents. Hotelling's rule implies that the price of oil is independent of the cost to extract it, and depends on the relative scarcity of oil instead. Under these assumptions, Hotelling (1931) also finds that, assuming that society and the producer has the same discount rate, the competitive producer will extract the resource at society's optimum rate. That also means that in a competitive market, there should not be any attempts to conserve the resource by the authorities. This is however an important issue, since modern economic growth depends on the ability to substitute capital for labour, which again depends on inanimate sources of energy.

Hotelling does identify one problem that deals with resources that go beyond the boundaries of one property, which requires government intervention in order to prevent wasteful extraction. For the modern petroleum business, this is only an issue in the US to the author's knowledge.[26]

The oil price itself is constrained by the cost of the use of alternative fuels — at some price point, the use of other fuels than oil will be not only feasible but commercially necessary. Figure 3.3 shows the implied price path, whereas Figure 3.4 shows the actual price development since 1997, with a Hotelling consistent trend line added. The constraint also implies that when the price hits the ceiling imposed by alternatives, all recoverable resources should be exhausted. This price ceiling is called the backstop price. The reason for this is that once the backstop price is reached, it does not continue to increase. The price does not continue to increase due to it being more profitable to exploit the alternatives once the backstop price is reached, which also implies that the alternative is a perfect substitute for all uses of the resource.

[26]Outside the US, most jurisdictions, if not all, define subsoil resources as belonging to the state acting as agent for the nation.

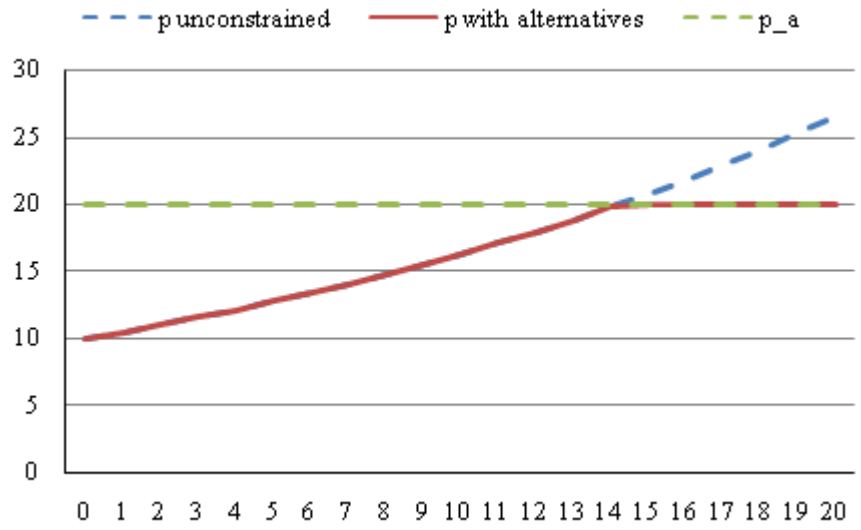

Figure 3.3: Price path implied by Hotelling's rule. Initial price 10, r=5% and backstop price 20, calculated using Equation 3.2

It would therefore be more profitable to have sold the resource in the previous period for the same price, and then investing it at the discount rate. If oil reaches its terminal price, p_T at time=T, then the present value at T of selling oil at T is:

$$PV = \frac{p_T \times Q_T}{(1+r)^T} = \frac{p_0 \times (1+r)^T \times Q_T}{(1+r)^T} = p_0 \times Q_T \tag{3.3}$$

and the present value of selling oil at T+1 is:

$$PV = \frac{p_T \times Q_{T+1}}{(1+r)^{T+1}} = \frac{p_0 \times (1+r)^T \times Q_{T+1}}{(1+r)^{T+1}} = \frac{p_0 \times Q_{T+1}}{(1+r)} \tag{3.4}$$

This shows clearly that the optimal quantum at $T+1$ is 0, and that the production rate should be adapted so that this can be achieved.

Nuclear, coal and hydro are the only viable options for substituting oil in electricity generation presently. Other alternative fuels are too expensive or not available

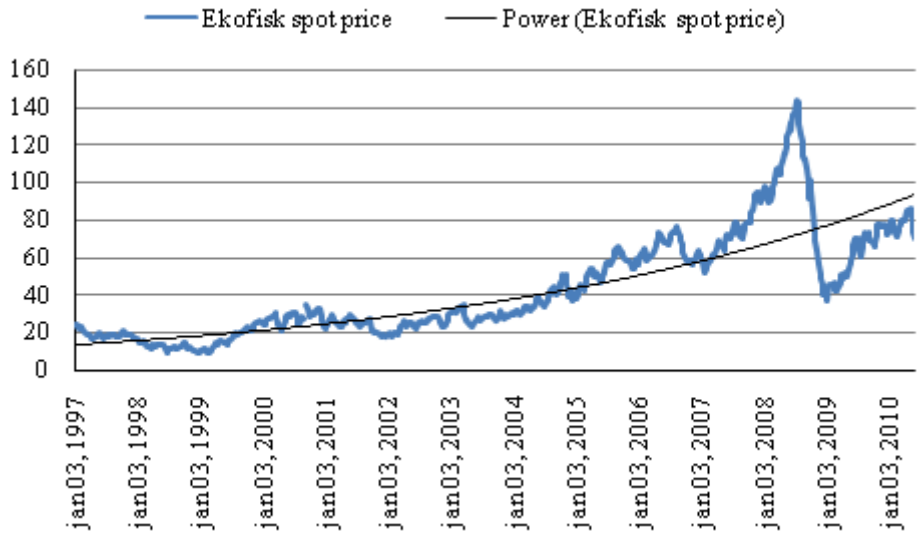

Figure 3.4: Actual spot price path for Ekofisk, 1997–2010.

in big enough quantities to be used. The most obvious alternatives to oil in vehicle use are ethanol, biodiesel and petrol made from coal. These are all alternatives that have been suggested in various countries. In Brazil, ethanol is the alternative fuel of choice due to large sugar cane production and hitherto low costs.[27] Ethanol made from maize and petrol made from coal have been suggested in the US, and the US is currently the world's largest producer of automotive ethanol. US ethanol depends on subsidies to remain competitive, and in terms of emissions of greenhouse gases it is on par with using regular petrol. The US coal lobby has pressed for the use of coal in petrol in order to make the country "energy independent". Due to its high cost, it has only ever been used in times of crisis, such as in Germany during the Second World War. It is also significantly worse than petroleum in terms of pollution.

[27]It would perhaps be disingenious to call a fuel alternative when it covers around 50 % of demand in its market. It is however, the conventional notation.

3.2.2 Taxation

One of the challenges for a country extracting this scarce resource is therefore to manage the windfall profits that come as a result of this activity. Most countries' legislation affirms that subsoil resources are part of the public patrimony. From this it follows that the government should attempt to "capture" the resource rents associated with petroleum extraction, as anything else would be a transfer of wealth from the public to private interests. Furthermore, economic theory implies that rents can be taxed at will, without affecting economic activity. This means that from a practical perspective, government's should raise as much as possible of their tax revenue as taxes on rents, as this will minimise the dead weight loss imposed on society through tax wedges. A third reason that scarce natural resources should be taxed is that extraction is not the same as production in principle. A scarce natural resource can be considered part of a country's capital stock, so any sale of it would be a transformation of it from a natural resource into financial capital.

Auctions

A common way of attempting to tax resource rents is through auctions. An auction has a couple of attractive properties for the governments in oil producing countries. Firstly, it produces cash right away. Second, if the assumptions behind Hotelling's rule hold, an auction should yield a result in which the present value of all the rent goes to the party auctioning off the right to extract oil. Under these assumptions, the auction price of an oil field would be:

$$\text{Auction price} = -I + \sum_{t=1}^{T} \frac{p_t \times Q_t - C\left(Q, t\right)}{\left(1 + r_t\right)^t} \tag{3.5}$$

I is the present value of the investment cost, which takes into account the capital costs. The second term is the present value of the economic profit of the oil field. The right hand side of the equation is equal to the net present value of the oil field, which is the same as the present value of the resource rent. This simple model does not take into account factors that complicate the picture considerably. The investment cost is nearest in time, and therefore might be assumed to be the most certain. Experience from for example the North Sea illustrates that different companies and different geologists will assess the amount of recoverable oil and the cost to extract it differently, which will significantly impact the price any given oil company is willing to pay.

Information asymmetry can also benefit oil companies at the expense of governments. Generally, oil companies are better equipped to assess the potential of an oil field. That implies that they have better estimates of the value of a field than the government auctioning it off. By offering less than their assessed value, the company may still receive some of the resource rent. Competition between oil companies could mitigate this however.

Royalties

Royalties are simple to calculate, as they are simply a tax on gross revenue, perhaps with a grace amount allowed for covering costs. A royalty tax would be calculated as follows:

$$\text{Royalty} = p\left(t\right) \times q\left(t\right) \times r\% \tag{3.6}$$

where p is the price, q is the quantity and r is the royalty tax rate. This kind of top line taxation has the potential to make projects that are profitable before tax

unprofitable.

This makes the instrument unsuitable as the only tax on petroleum extraction. From an economic efficiency perspective, the tax should therefore vary according from field to field, in order to take into account differing costs and scale. This would allow governments to tax much of the resource rent, while at the same time allowing before-tax profitable projects to become profitable after tax.

Profit tax

A profit tax would seem to be better suited, as it allows for taxing only net of costs income. By deducting costs from the revenue, a profit tax should allow projects which are profitable before tax, to also be profitable after taxes.

The problem with this approach arises when looking at depreciation. Depreciation is the tax-deductible allowance for paying for capital equipment in each year. Capital outlays generally accrue prior to the start of a project, and the depreciation allowance comes afterwards. Depending on the project length, the time from start of project till start of production, the depreciation allowance in each year and the discount rate, the difference between the present value of the capital outlays and the present value of the depreciation may differ considerably. Table 3.2 illustrates, using a project with 100 in capital outlays initially, and ten following years with 20 in revenue each year.

The project in Table 3.2 is marginally profitable before tax, and a 28 % tax on the net present value would reduce it to 0.27. When the profit is taxed normally however, the net present value is reduced to -13.4, 13.4 % of the original capital expenditure. To put it in other words, in this scenario a project that creates value on the margin would be value depleting for an investor due to taxes, even as the

Year	0	1	2	3	4	5	6	7	8	9	10
Capital investment	-100										
Revenue		20	20	20	20	20	20	20	20	20	20
Depreciation	14 %	14	12	10	9	8	7	6	5	4	26
Tax	28 %	2	2	3	3	3	4	4	4	4	-2
Cash flow	-100	20	20	20	20	20	20	20	20	20	20
Cash flow - taxes	-100	18	18	17	17	17	16	16	16	16	22
NPV											0.4
NPV of cash flow - taxes											-13.4

Table 3.2: Effects of a profit tax. Based on a 28 % profit tax and 14 % diminishing balance method of depreciation.

project is valuable for society.

The simplest way to deal with this problem would simply to allow the whole depreciation at once, and tax only cash flows. This assumes that the company has significant profits elsewhere against which the depreciation allowance can be made. Otherwise, a tax credit must be devised or alternatively, the government could pay companies in years with negative cash flows. The biggest advantage of a tax on cash flow is that it is neutral, i.e. it doesn't make unprofitable projects profitable or vice versa. Any tax credit however, must be carried forward with the same interest rate as the company uses in order to maintain the neutrality of the tax. This information is normally not available to regulators, and even if the company would reveal it, it is not certain that they would be completely honest. The other alternative, that the government pays the company the negative tax in years of negative cash flows, is to the author's knowledge not the case anywhere.

The Resource Rent tax

Garnaut and Ross (1975) attempt to create a neutral tax called the resource rent tax (RRT). They initially suggested it to create a mechanism for developing countries

Year	0	1	2	3	4	5	6	7	8	9	10
Cap. inv.	-100										
Revenue		20	20	20	20	20	20	20	20	20	20
Acc. profit	-100	-95	-89	-83	-75	-66	-56	-45	-31	-16	1.52
Tax	28 %	0	0	0	0	0	0	0	0	0	0.43
NPV accumulated profit											0.38
- after tax											0.27

Table 3.3: The Resource Rent tax. Using the same example as in Table 3.2, with the same tax rate, but with the tax system as outlined in Garnaut and Ross (1975). The discount rate has been set to 15 %.

to devise a tax system that would with relative simplicity enable authorities to tax resource rents. By doing this, the same countries would not need to take part in relatively risky equity investments through state owned enterprises in able to capture the resource rents.

Simply put, it is a tax on cash flows, where negative taxes can be carried forward with interest. The tax is levied on taxable income, which would be all revenues subtracted all allowable deductions. Contrary to conventional profit taxes, deductions for depreciation and interest cost are not allowed, nor for other forms of compensation for capital. Deductions for other payable taxes are allowed however. The investment cost is carried forward with interest. The authors argue that authorities should use only one uniform interest rate for this tax, and not a separate rate for each project or business, as this would complicate its implementation considerably. Interest rates could be varied according to the profitability of a project, but this creates uncertainty. However, they also state that petroleum and gas should have a separate, higher interest rate due to the high capital costs in these areas. The tax itself is only paid after the investment cost is paid in its entirety. Table 3.2 re-examines the example from Table 3.2, should give a picture of how the tax could be.

The result of the RRT, provided that all companies face similar discount rates,

is that all projects that are profitable pre-tax become profitable after tax as well. This is not the case, since different projects will vary in risk level. The setting the interest rates presents other problems too. If it is set too high, the government will lose revenue it would otherwise receive as the loss carried forward will become too big. If it is set too low, marginal projects will not be undertaken. The RRT should allow governments to implement a final tax system that succeeds in capturing the resource rent even with varying oil prices and revenues.

An alternative way of implementing the RRT would be to calculate the annuity, which gives the same present value as the total, accumulated investment cost, and use that as depreciation allowance. In the example in Table 3.2, that depreciation would be:

$$\text{Depreciation} = \frac{100}{1/r - 1/(r \times (1+r)^n)} = 100/a_{r,n} = 19.93 \qquad (3.7)$$

Using this depreciation instead of the diminishing balance of depreciation will yield the same post-tax NPV as the straightforward RRT. Additionally, using this depreciation schedule would give tax income sooner rather than later.

In practice the tax systems change with the circumstances. In Norway for example, the petroleum tax regime has changed as the profitability of the oil industry has varied. After the oil crises in the seventies, the tax system was revised upwards, i.e. taxes became higher, and after the oil price drop in 1986 taxes became lower again. Another consideration to make is that the oil companies' profits must big enough to not only make each project profitable, but also able to cover all other costs associated with exploration and development. There are bound to be exploration costs in areas with no recoverable resources, and ultimately these costs must be paid by profitable projects.

An issue that cannot be dealt with through the tax system per se is the issue of

profit shifting through abusive transfer pricing. However, the nature of the RRT means that the potential tax advantages to the use of internal debt disappear since it doesn't allow for interest deductions. It is not necessary to use the RRT for this to be the case, in Italy for example, interest payments are not tax deductible.

3.2.3 Managing resource wealth

According to Hannesson (1998), the Norwegian petroleum taxation regime has captured around 80 % of the rents associated with the industry, albeit resulting in some inefficient allocation of resources, since "the tax code has been marred by some built-in incentives for inefficiencies".[28]

If the government is successful in capturing the resource rent, this should be managed in some way. As noted earlier, extracting resources is more akin to shifting capital investments from one kind of capital to another than normal industrial or agricultural production. Most notable are perhaps Norway's and Kuwait's petroleum funds, and Alaska's tax refund. Norway's petroleum fund converts the petroleum resources into financial assets. The government receives special tax revenue from the oil industry, and uses this money to buy stocks and bonds in foreign markets. The Norwegian Central bank manages these assets, and the fund is expected to earn a real return of 4 % per year on average. This is also the nominal limit for how much windfall tax revenue the government may spend in a given year — 4 % of the value of the petroleum fund. Managing the wealth this way allows authorities financially engineer Hotelling's rule; if Hotelling's rule truly held, the value of the resources in the ground would be ever increasing at the discount rate. The resources already extracted and invested conform to the rule. The second advantage to this approach to wealth management is that the wealth should

[28] Hannesson (1998, p.114)

last indefinitely, rather than being a short-term increase in tax revenue, followed by a hangover in which the economy must be restructured, and painful spending cuts and tax hikes must be implemented.

There are great differences between theory and reality — in theory, all resource rents should be taxed, and it would not affect economic activity in any way. In reality it is difficult to devise tax mechanisms which fully identify and capture the resource rent.

Chapter 4

Challenges and opportunities

4.1 Brazil's challenges

Even as production from the giants in the Campos basin came online, and the Pro-Alcool programme progressed, Brazil continued to be dependent on foreign oil.[1] The oil price crash in 1985 made the substitution policy less palatable though. Petroleum production increased slowly from 1985 until 1995, as did consumption. Production increased marginally more than consumption though. In 1994, forty years after the foundation of Petrobrás, Brazil was still a long way from achieving self-sufficiency.

In addition to failing in attaining self-sufficiency in production, Petrobrás had emerged as an inefficient producer. That's not to say incompetent: the company won the Offshore Technology Conference award twice for its development of the Roncador field. However, the company had around 51,600 employees in 1992,

[1] In the 80s and 90s, ethanol fuelled cars had some inherent flaws, such as the lack of performance and difficulty in starting them during cold weather (less than 15°C). That made them unsuitable in southern Brazil. Flex-fuel cars can avoid that problem entirely, and use whichever fuel is cheaper or best suited for the weather.

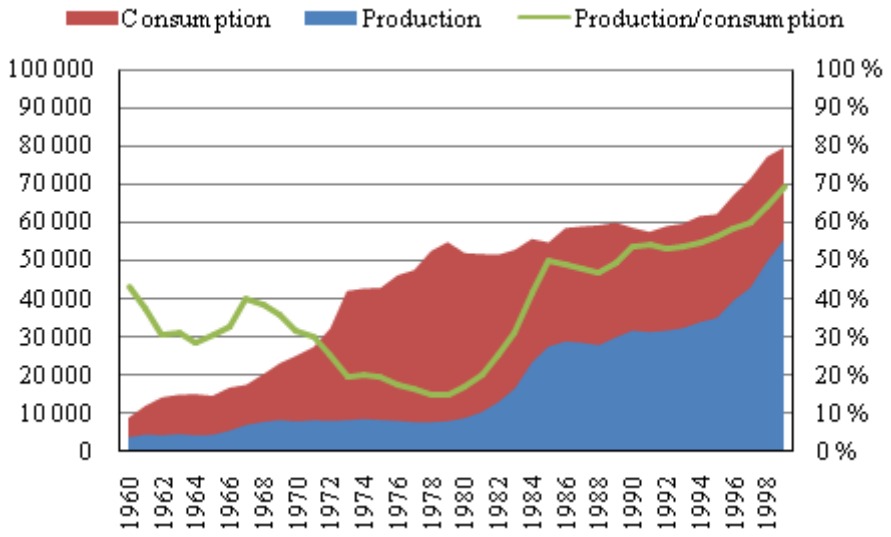

Figure 4.1: Brazilian crude production and consumption, '000 metric tons, 1960-99. Source: Brazilian oil production, consumption, imports 1942-1999 on page IV

with a daily production of around 800,000 barrels. In 2000 the number of employees was down to around 34,320, whereas daily production had reached 1.2 million barrels.[2] Public finances were not healthy, which previously had led to the end of fiscal support for the Proálcool programme.

The 1994 Real plan had given the government credibility enough to be able to finance its deficits through debt. However, during the following years, the need for fiscal adjustment became ever more apparent. After having won support for a constitutional amendment that would allow President Fernando Henrique Cardoso to run for another term, the president turned to these issues. A crisis of confidence in 1998 meant that the country had to turn to the IMF for support, and that helped the president push measures that required more austerity from local governments through Congress. That also meant that there was a need for more tax revenue.

The opening of other sectors in the economy had markedly improved labour pro-

[2]Number of employees is base on the number of *Efetívos* in Petrobrás Holding.

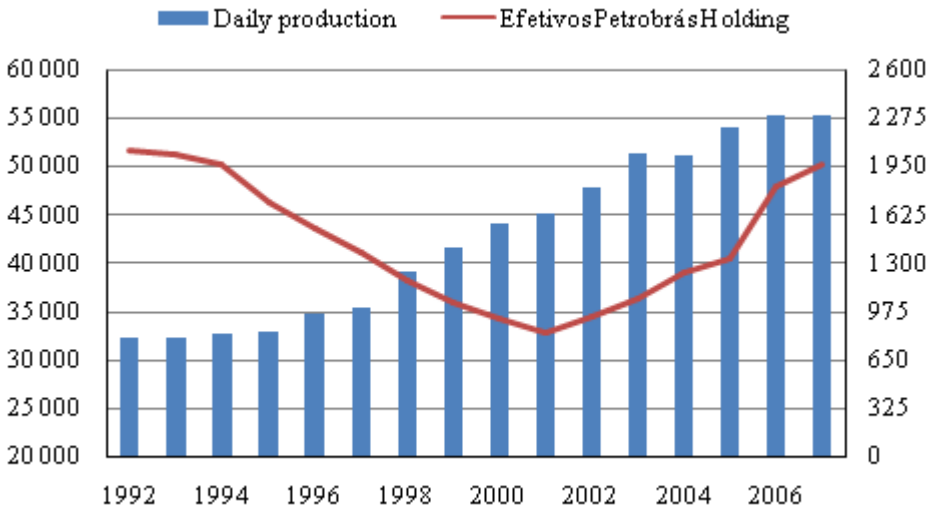

Figure 4.2: Daily production and number of employees in Petrobrás, 1992-2007. Production number in thousand barrels. Source: Number of employees and production on page VI

ductivity, and in the period from 1991 to 1997, labour productivity had increased 8.7 % annually in the manufacturing sector.[3] It made sense to open the petroleum sector too, in order to increase productivity in the sector, increase production and increase tax revenues. Figure 4.2 looks at the number of employees in Petrobrás from 1992 to 2007 versus the amount of petroleum produced, and shows that the company's productivity has increased remarkably.

Concurrent with the liberalisation of the petroleum industry came the part privatisation of Petrobrás.

Even as production increased, the goal of self-sufficiency seemed far off. Nordås et al. (2003) state that is unlikely that Brazil would achieve self-sufficiency soon. However, in 2006, with two new platforms entering production, Brazil has started exporting more petroleum and derivates than are imported.

[3] Baer (2008, p.144)

This trend seems likely to continue. The pre-salt chamber has yielded two giant fields, the two biggest in Brazilian history, and is still being explored. The Tupi field should at maximum production yield around 1 million boe, more than 40 % of daily Brazilian production in 2007. Even before the pre-salt fields were announced in 2007, Szklo et al. (2007) estimated that with 50 % probability, there would be another 42 billion barrels of reserves added between 1996 and 2030. That would mean an additional 30 billion barrels being discovered between 2004 and 2030. They estimate that Brazilian oil production would peak at 3.28 million barrels per day, with production lasting until 2089. Due to the fact that Brazilian offshore resources are relatively unexplored compared to more mature regions, the authors argue that the lower probability estimate, of an additional 60 billion barrels in the 1996-2030 period, may be more appropriate.

This new situation brings about a new set of challenges — the liberalisation process helped bring about an end to import-dependency, now the question of how to manage the windfall profits must be managed. As mentioned earlier, law no. 5938/09 would mandate changes in how the tax revenue is distributed. Figure 4.3 shows how inequitably the reserve are distributed, and highlights the necessity for this change.

The deputy behind the proposed law has also expressed the need for regulating how local authorities may spend the revenue. Otherwise, the fiscal constraint imposed by the *Fiscal Responsibility Act* could disappear.[4]

Some Latin American policymakers have argued that the countries should delay start-up in production of proven reserves, due to possible supply bottlenecks in the future. They argue that the oil may prove much more valuable underground

[4]The Fiscal Responsibility act imposes restrictions on spending for local authorities which are indebted to the Federal Government.

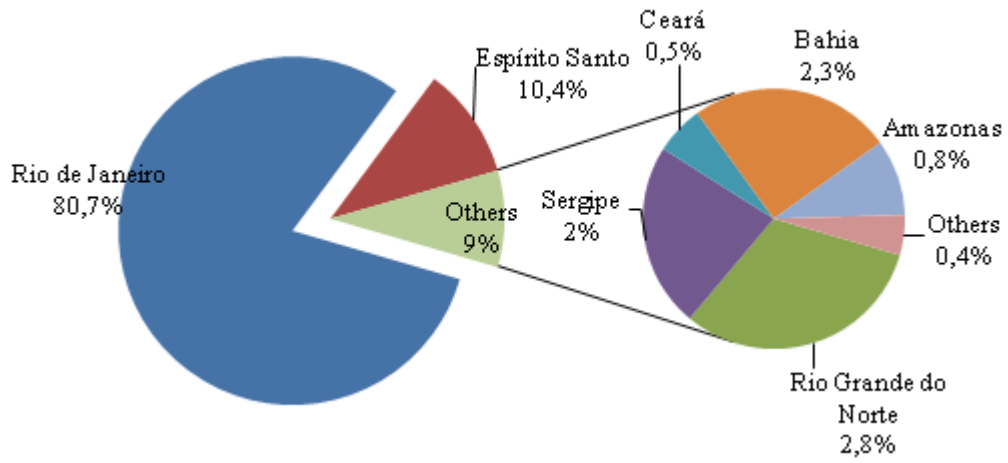

Figure 4.3: Geographical distribution of proven reserves. (ANP, 2009a)

now and available for extraction in the future said bottlenecks appear.[5] Szklo et al. (2008) estimate that the value of a typical Brazilian oil field for an investor would be reduced by 75 % if the production start is delayed by 10 years, and the value of the tax income reduced by the same amount. By using USD 45 per barrel as the baseline price for Brazilian heavy crude, which is sold at a discount compared to Brent or WTI, they also estimate that the break-even price would be around USD 101 per barrel for an investor to be indifferent to a ten year delay. Still, the value of the tax income would be around 25 % lower than in the benchmark. These estimates indicate that only in the case of a price increase of 8.5 % annually would an oil company want to delay production, and the price increase would have to be even steeper for it to be optimal for the government. This suggests that resources discovered today should be extracted as soon as possible.

Large mineral resources inevitably put greater pressure on governments in handling them. President Lula's reaction to the discovery of large reserves in the

[5]Their concern in many ways mirror the concerns that Hotelling (1931) addressed.

Pre-Salt fields was "God is Brazilian". OPEC's founding father would place oil at the other end of the scale of deities; oil is "the devil's excrement".[6] This is the sentiment behind the term the *resource curse*. One would think that large endowments of dear natural resources would be welcome and have a positive impact on economic development. However, after controlling for other factors relevant to economic development, resource rich countries tend to grow slower than resource poor countries. Sachs and Warner (1995) find that resource dependency decreases growth in an economy, controlling for other factors. A one-standard-deviation increase (16 %) in the resource intensity of the economy, measured as primary-product share of exports, reduces the growth by one percentage point, per year. That implies that two otherwise completely equal economies with differing resource intensities, and where one has resource intensity equal to one standard deviation more than the other, the latter will be double the size of the former in 70 years.

Corruption, civil wars and weak democratic institutions are also positively correlated with the presence of large natural resource deposits.

Figure 4.4 shows how low the growth has been in some of the biggest petroleum exporting countries. Saudi Arabia has negative growth of almost 40 % per capita in the 25 years from 1980 through 2005. Venezuela's has been around -14 %. The world average, on the other hand was around 36 % for low income countries, 62 % for middle income countries and 51 % for high income countries in the same time period. That means that none of the big exporters have done better than the average, bar Norway, for the whole period. The governments' ability to capitalise on large oil revenues has been inexistent.[7] Acar (2008) suggests that

[6] Useem (2003)

[7] It should be noted that this data comes from the World Bank, and the deflation method used exaggerates GDP for earlier periods for oil exporters.

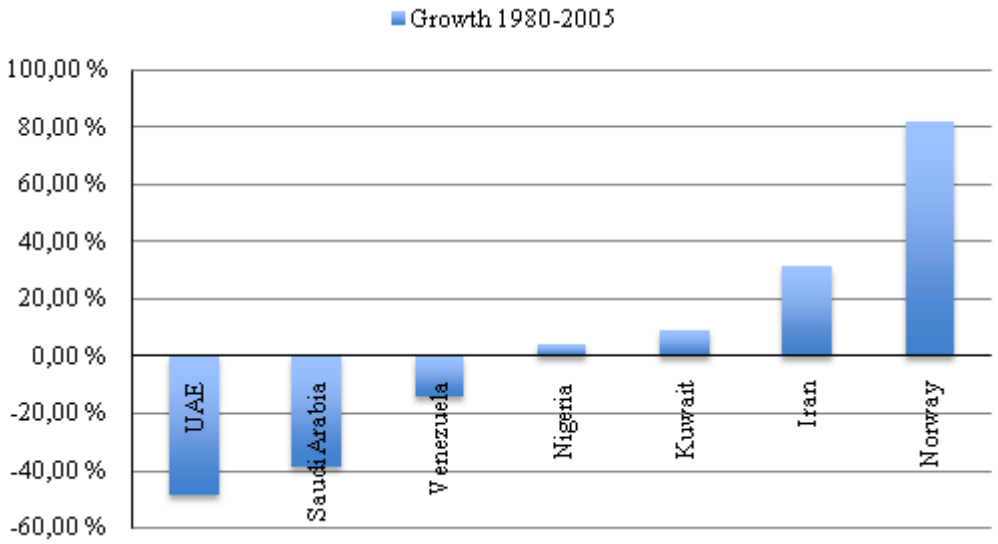

Figure 4.4: Per capita GDP growth for seven of the top eight oil exporters per 2008. (Statistisk Sentralbyrå; World Bank)

ethnic diversity makes the negative growth impact of natural resources worse.

The source of the resource curse can roughly be divided into three parts:

1. The risk of the Dutch disease
2. Increasing corruption and weak democracy
3. Increasing economic volatility

4.1.1 Dutch disease

When large gas deposits were found in the Netherlands, the country spent the windfall on a generous welfare state. The end result was an erosion of traditional industries because workers became uncompetitive. The disease manifests itself by firstly inducing a real exchange rate appreciation due to large exports. This makes imports more affordable for domestic consumers, at the expense of domes-

tic producers of the same goods. Second, domestic production factors, labour and capital, will be shifted towards the resource sector. The factor prices increase and other sectors face rising costs. At its very extreme, the Dutch disease will lead to a two-sector economy: resource extraction and a non-tradable sector.

In a neoclassical framework however, there is nothing inherently harmful about the Dutch disease. The harm only arises when the sector in decline, normally the domestic manufacturing sector, has special characteristics. These can be backward and forward linkages or learning-by-doing effects. There can also be efficiencies of scale. When this sector declines the allocation of resources and subsequent growth will be suboptimal.

Initially, this should not be a problem. Brazil has significant idle capacity in manufacturing, and elsewhere in the economy. Unemployment is high, even amongst skilled workers. The increase of tax revenues can also help in reforming the tax structure, which is based on taxing what can be taxed. Simply put, the Brazilian tax system punishes activity that cannot easily be done at a small scale, hidden from tax authorities.

4.1.2 Increasing corruption and weak democracy

In Brazil, the distance of power is great to begin with. Politicians are generally unaccountable, and corruption is assumed.[8] "Parliamentary immunity is broadly defined, making it possible to criminally suspect persons to seek, and get, protection from prosecution during term".[9] It is also difficult to convict persons of

[8] An exhaustive list would easily be longer than the thesis itself. José Sarney was reported to the police for corruption during his tenure as president. His son, who manages the Sarney clans assets, is accused of numerous crimes, and of trying to censure one of Brazil's biggest daily newspapers. He is also accused for "ideological falsity", which is an excellently named charge for a politician's son. Fernando Collor was impeached for alleged irregularities in his campaign.

[9] Abramo and Speck (2001)

higher social strata, there is little disincentive to corruption in the civil service and "The Judiciary inefficiency reinforces impunity and is perceived as a stimulus to corruption".[10]

According to Kaufmann and Wei (2000), some economists have argued that corruption offers a way around bureaucratic processes, or at least a way to speed them up by putting a price on them. It should also make sure the most efficient firms are awarded projects, since they would have the biggest profits to finance bribes. However, bribes and corruption might give public servants an incentive to work slower in the absence of bribes, and also increase regulatory harassment.[11] There is also no clear venue for contract enforcement. Since the contract itself is illicit, there is no guarantee that the public official will act in the promised way and one cannot sue for breach of contract.

Leite and Weidmann (1999) find that the presence of natural resources in the form of fuels and ores, i.e. petroleum, coal, iron and other minerals, has a significant, adverse effect on the level of corruption in the economy. Agricultural and food resources do not present the same tendencies; in fact these natural resources are negatively correlated with corruption according to the same article. The authors argue that capital intensive industries present better opportunities for corruption than labour intensive industries. They also find that higher levels of corruption cause lower long-run growth.

Increased reliance on revenues from resources rather than taxes from citizens tend to weaken democratic structures in a country. This is not only the case in new democracies; in the US, states with greater reliance on natural resources tend to have less political competition — incumbents hold on to power longer and the

[10] Abramo and Speck (2001)

[11] Kaufmann and Wei (2000) find that not only does bribery not lower regulatory harassment by public officials; it's likely it actually increases it.

states become more hegemonic.[12]

FIESP, the Sao Paulo Federation of Industry, has complained that the tax system is incredibly opaque, and makes it hard for citizens to judge how much they pay in and hold politicians accountable. This is in great part due to indirect rather than direct taxation. Holding politicians accountable is likely to be more difficult as large and increasing tax revenues arrive.

Brazil will have to preserve democratic structures, which is hard in already far more entrenched democracies. The resource wealth will tend to exacerbate clientelist tendencies present, especially in the Northeast.

4.1.3 Increasing economic volatility

Larger dependency on natural resources makes countries more exposed to price changes in the resources they are dependent on. The history of Brazil itself is an example of this, the boom and bust cycles following dependence on different crops led to the rise and fall of both Salvador and Rio de Janeiro, as well as the coffee farmers in Sao Paulo. The collapse of coffee prices during the Great Depression led to a recession in Brazil, which again was partly responsible for the 1930 coup.

The petroleum sector makes up an ever increasing part of the economy, though the extraction business was responsible for only 2.8 % of GDP in 2003.[13] This means that its impact on the economy relatively small still. Increased reliance on primary exports may still make the country more volatile economically.

[12] Goldberg et al. (2005)
[13] ANP (2005)

4.2 Statoil's challenges

Norwegian oil production peaked in 2000, when production volume was 181 million m^3. Increasing gas production maintained an increase in total oil equivalent production. However, the increase in gas production has not kept up with the decrease in oil production, and overall the production volume in terms of million cubic metres of oil equivalents has been slightly decreasing since 2004. In comparison to oil, gas presents disadvantages in that it requires more costly infrastructure investments to facilitate transportation, and the market for gas is fragmented. I.e., most gas is consumed close to the place of extraction. According to Oljedirektoratet (2009), around 50 % of total recoverable reserves have been sold, some of which is conditional on opportunities for increased recovery rates. It is further estimated that there are 3400 million cubic metres of undiscovered resources.

Further discoveries are uncertain, and new areas may not be readily available for extraction, either due to physical or political conditions. There is much debate whether areas outside Lofoten and Vesterålen in Northern Norway should be opened for exploration for instance. Due to its status as one of the most important fisheries in the world, environmentalists are concerned about the effects of a possible oil spill. The oil spill in the Gulf of Mexico will perhaps also have long term effects on the public opinion about this.

Even so, estimates put the amount of recoverable reserves in this region at approximately 1.2 billion barrels of oil equivalents, or 202 million cubic metres. That is approximately the same as average yearly production in Norway from 1996 and onwards. (See Figure 4.5)

The Norwegian Continental Shelf accounts for around 75 % of Statoil's oil and gas production, and Statoil in turn acts as operator for 75 % of all oil and gas

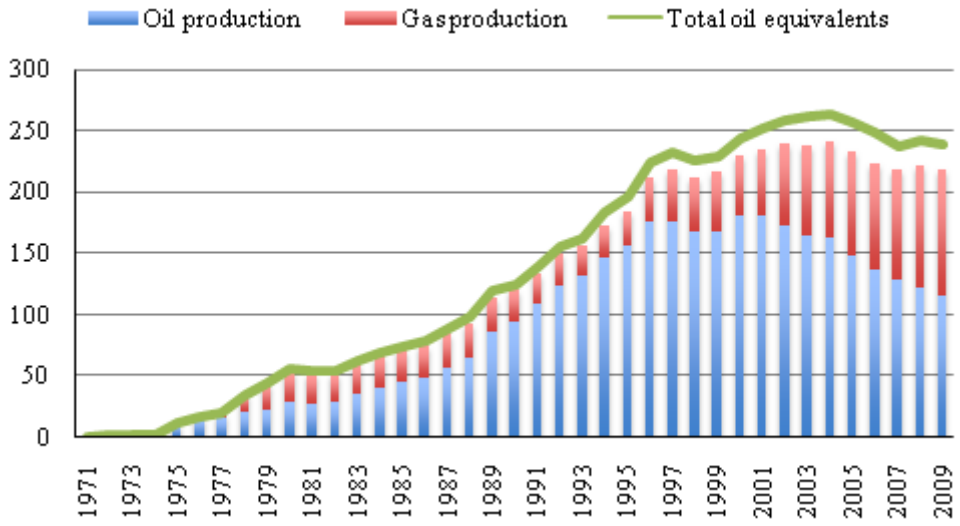

Figure 4.5: Norwegian oil and gas production, 1971-2009. Production in million cubic metres. (Oljedirektoratet, 2010)

extracted in Norway.[14]

The decline on the Norwegian continental shelf presents a problem or a challenge for Statoil. The main source of revenues is declining, and will eventually disappear. Statoil then has two choices — gradually decline and eventually disappear jointly with the Norwegian oil production, or continue operations elsewhere. If Statoil had continued to be only the Norwegian government's industrial instrument in the North Sea, the conclusion might have been easier to reach. Ceasing operations would be a more viable option if that were the case. This is what will happen to the SDFI. The increasing reliance on gas presents another problem for the Norwegian government — the prices of gas in Europe has historically been lower than for petroleum when compared at price per energy output.

As Statoil is run as a commercial company, the most obvious path forward would be to continue business as long as profitable business opportunities exist. In prac-

[14] Statoil (2009)

tice, this is what has been done, and even before the privatisation Statoil had substantial investments in other countries. Today, Statoil is present in 40 countries in all continents but Oceania.

4.3 Opportunities and challenges together

4.3.1 What's in it for Statoil?

The look for new business ventures should go where Statoil has some inherent advantages. Statoil is the world's second biggest deep water operator, after Petrobrás. A large portion of the oil Statoil extracts comes from deep water oil fields, most of that on the Norwegian continental shelf. Statoil was operator for the development phase of the Ormen Lange gas field for instance. Furthermore, the company has ongoing relations with local subcontractors that have experience in the same conditions.

Statoil is a big deep water operator, and has experience in rough waters. That makes Brazil a good fit tor the company's future, since there are large oil reserves in Brazil. Statoil also owns a number of production and exploration licenses in the country.

Statoil's FDI

Statoil's FDI in Brazil is resource seeking FDI. Furthermore, most of the oil is beneath deep water, which is very costly. Why would Statoil choose FDI over outsourcing? Analysing the FDI decision through the OLI-framework can give an indication for the reasons.

Ownership advantages Statoil's ownership advantages are related to its ability to organise its resources more efficiently than others, and its experience in offshore fields. Long experience has built up human capital in the company, and an organisational culture that is capable of operating efficiently in this environment.

Localisation advantage Since this is resource seeking FDI, the localisation advantage is inherent to the business. Still, there are other oil rich places in the world. Brazil presents a scenario which is familiar for Statoil, and therefore a good localisation.

Internalisation advantages The main internalisation advantage is gaining the resource rent, at least the part that is not paid to the government in taxes. It is ironic that Norway, through its majority ownership in Statoil, effectively receives money from Brazil. However, it is important to distinguish between resource rent and Ricardian rent, which is "lowest cost" or "being-more-efficient" rent. If the Brazilian government fails to capture the resource rent through taxation, Statoil would receive part of the public patrimony. If more equitable distribution of income is desirable, this is questionable. However if Statoil is to operate along commercial guidelines, it is inevitable.

Ricardian rents is a different matter, however. If Statoil is in fact more efficient than other competing operators, at least part of that efficiency profit would go into Statoil's pockets. This follows from the auction model, if Statoil is well informed about its competitors capabilities.[15]

Another internalisation advantage is continued ownership over proprietary extraction processes that might give Ricardian rents. Outsourcing either means foregoing Ricardian rents or enabling someone else to capture the same elsewhere, and losing this advantage in the future. Contractual incompleteness means that someone might steal proprietary techniques. If this knowledge is dissipated throughout the industry, the rent would disappear, as everyone would become at least as ca-

[15]The auction price they would bid, if well informed about their competitors, would be an amount high enough to stave off competition, but low enough to allow them to keep some of the rent.

pable as Statoil and all associated rents for Statoil would be resource rents.

What advantages does Statoil have in Brazil?

In Brazil, Statoil should have a couple of advantages not shared by many other oil companies. First and foremost, Statoil comes from Norway, which has had relatively good experiences with the oil industry. Statoil has been Norway's industrial instrument, and has succeeded in building a domestic, competitive oil industry.

In addition, Norway has taxed the oil industry well, in that most of the resource rents have accrued to the government. The Norwegian state has also been able to share the benefits relatively equally. Since the company is partly state owned, that should reflect well on it. The political culture in Brazil means that Statoil is seen as a part of the Norwegian government, not a discrete entity.

The Norwegian state has poured lots of money into preserving the rainforest which would at least shed a positive light on Norwegian companies, especially companies closely associated with the government. The Norwegian government will invest up to USD 1 billion to preserve Brazilian rain forests until 2015, depending on the project's success. According to a source in the Norwegian Ministry for Foreign Affairs, effects for Norwegian businesses in the country were not considered when deciding on the project. However, according to the same source, "Norwegian-Brazilian cooperation has a positive spill-over effect on Norwegian business".[16]

Statoil has used the *Peregrino* field to showcase its knowhow in heavy oil in Brazil. The Peregrino field is relatively typical for the Campos Basin, with heavy oil and reserves of around 300–600 million barrels. Norsk Hydro bought 50 % of the

[16]Høsøien (2008, p.46)

license for around 2.3 billion NOK in 2007, and Statoil bought the rest in 2008. Chinese SOEs Cnooc and Sinochem have since bid 3 billion USD for a 40 % share, which means that the value of the entire field is around 48 billion NOK.[17]

4.3.2 What's in it for Brazil?

Brazil has large discovered, as well as large probable reserves of oil on deep waters. The country wants to extract this oil, to gain tax income from these resources. Statoil can play a role in extracting the resources, since it is second only to Petrobrás in deep water extraction.

There is also a need to avoid the negative factors associated with the petroleum industry. Corruption is probably the biggest pitfall for Brazil; the scale and scope is still not big enough the bring on the Dutch disease or increase the economic volatility much.[18]

Norway is the country that is least negatively affected by petroleum production, of the big exporters. Figure 4.4 shows how the other big oil producers have done economically. Statoil being an integral part of this development in Norway might be helpful to achieve the same thing in Brazil.

However, Larsen (2008) notes that the then two Norwegian oil companies, Norsk Hydro and Statoil had worse environmental records in Angola than in Norway. It is therefore not given that Statoil's relatively positive role for Norway will be immediately transplanted to Brazil. Statoil does for example maintain an internal bank in Belgium, which according to Weichenrieder and Mintz (2008) is a tax haven. [19]

[17] Dagens Næringsliv (2010). $1USD = 6.40NOK$

[18] Whether increased dependance on oil will increase economic volatility is uncertain. It depends largely on the business' correlation with the rest of the economy.

[19] As noted in section 3.1.2, internal banks can be used to reduce the tax liability. The Benelux

If Brazil is to benefit more from Statoil's involvement than any other, privately held company, it is imperative that its status as a SOE makes it different. Cases such as that in Nigeria implies that this is not always the case.[20]

There is nothing that indicates that Statoil is more corrupt than other Norwegian companies, but there are no indications that the company will be *less* corrupt than other Norwegian companies. According to Muir and Saba (1995), Statoil was amongst the best run SOEs in the world.

Ultimately, Brazil's gains from the newfound oil wealth depends on its authorities ability to regulate and tax the industry appropriately. This depends on the institutional quality of the country, and cannot easily be changed by an external company such as Statoil. The company, together with the Norwegian government, may present a manner of doing this in a succesful manner.

The changes made in the last 15 years, and the results obtained indicates that the country is on the right track. The fact that the country has departed from the more classical Latin American strong-man regimes has surely been helpful. The consensus-building and associated continuity imposed by democracy means that for foreign investors, there is more stability, and the political risk decreases. If the country is to be successful in taxing and regulating the oil industry, this trend must continue. It is a paradox that the very industry may counter this very development.

As the pre-salt fields are discovered and developed, and the oil wealth flows in, the authorities will hopefully be prepared to handle the flux of money, and have a plan for investing it in the future. Anything else would be a shame, but for the eternal *Land of the Future*, not completely unexpected.

countries and Ireland act as conduit countries for German FDI, with money flowing in and out to lower the effective tax rate.

[20] Statoil has been sued for breach of contract in Nigeria, due to not paying fees due to Dr. John Abebe, brother-in-law of a former President, after he had brokered a deal which gave Statoil ownership interests in three deepwater oil blocks. (TradingMarkets.com, 2010)

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Appendices

List of acronyms

ANP — Agência Nactional do Petroleo, Gas Natural e Biocombustiveis. Regulatory agency responsible for petroleum, natural gas and biofuels.

CNP — Conselho Nacional de Petroleo. National Petroleum council, regulatory agency. Precursor to ANP.

DASP — Departamento Administrativo do Serviço Público. Principally responsible for the federal budget, and finding ways to improve public services.

MNE — Multinational Enterprise

PTB — Partido Trabalhista Brasileiro. Brazilian Worker's Party.

RRT — Resource Rent tax. See section 3.2.2

SDFI — The State's Direct Financial Interest. The Norwegian state's direct holdings on the Norwegian continental shelf.

SOE — State owned Enterprise

YPF — Yacimientos Petrolíferos Fiscales. Argentinean state owned oil company.

Map of Brazil

Source:

Geographyguide

Brazilian oil production, consumption, imports 1942-1999

All numbers in thousand metric tons

Year	Production (a)	Imports (b)	Total consumption (c)	Self-sufficiency (a/c)
1942	4	11	15	0.266666667
1943	6	37	43	0.139534884
1944	8	18	26	0.307692308
1945	10	10	20	0.5
1946	9	37	46	0.195652174
1947	13	8.7	21.7	0.599078341
1948	19	0	—	—
1949	14	0	—	—
1950	44	59	103	0.427184466
1951	90	20	110	0.818181818
1952	98	18	116	0.844827586
1953	12	30	42	0.285714286
1954	130	142	272	0.477941176
1955	265	3513	3778	0.070142933
1956	530	4889	5419	0.097804023
1957	1321	4846	6167	0.214204638
1958	2473	5652	8125	0.304369231
1959	3083	5742	8825	0.349348442
1960	3870	5684	8966	0.431630605
1961	4549	7549	12098	0.376012564
1962	4367	9961	14328	0.304787828
1963	4669	10375	15044	0.310356288
1964	4353	10803	15156	0.287212985
1965	4488	10247	14735	0.30458093
1966	5548	11322	16870	0.328867813
1967	7079	10559	17638	0.401349359
1968	7823	12525	20348	0.384460389
1969	8360	14910	23270	0.359260851
1970	7980	17366	25248	0.316064639
1971	8303	19864	27470	0.302257008
1972	8138	25257	32342	0.251623276
1973	8276	34879	42194	0.196141632

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Year	Production (a)	Imports (b)	Total consumption (c)	Self-sufficiency (a/c)
1974	8617	34831	42828	0.201200149
1975	8352	35730	43005	0.194209976
1976	8121	40996	46267	0.175524672
1977	7810	40592	47652	0.163896584
1978	7788	44750	52652	0.147914609
1979	8042	50041	54983	0.146263391
1980	8840	43333	52114	0.169628123
1981	10365	42211	51860	0.199865021
1982	12984	39180	51691	0.251184926
1983	16595	36438	52982	0.313219584
1984	23269	32538	55807	0.416954862
1985	27492	27422	54914	0.50063736
1986	28784	29871	58655	0.490733953
1987	28463	30643	59106	0.481558556
1988	27853	31739	59405	0.468866257
1989	29845	29666	60068	0.496853566
1990	31614	28617	58721	0.53837639
1991	31229	26361	57657	0.541634147
1992	31569	26566	59130	0.533891426
1993	32252	25477	59806	0.539276996
1994	33804	27957	61812	0.5468841
1995	34907	25353	62251	0.560746012
1996	39401	28594	67257	0.585827498
1997	42777	29207	71570	0.597694565
1998	49570	27973	77313	0.64115996
1999	55252	24233	79737	0.692928001

For some earlier years, detailed consumption numbers where missing. For those years, production and imports together have been used. The measurement error should be neglible. The import numbers for 1948 and 1949 are obviously wrong, and a proper estimate for total consumption is not available.

Sources:
UNSD (1999, 1995, 1992, 1989, 1985, 1982); Department of International Economic and Social Affairs (1979); Mitchell (1993)

Number of employees and production

Year	Efetívos	Daily production ('000 barrels)
1992	51638	800
1993	51228	800
1994	50295	820
1995	46226	840
1996	43468	960
1997	41173	1000
1998	38225	1238
1999	35891	1404
2000	34320	1566
2001	32809	1636
2002	34520	1810
2003	36363	2036
2004	39091	2020
2005	40541	2217
2006	47955	2298
2007	50207	2300

Sources:
Petrobrás (1997, 1998, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007)

The number of efetívos is for Petrobrás Holding for each year. Given the nature of the labour system in Brazil, efetívo means something akin to worker with tenure. Temporary workers are not part of the numbers, and that may underestimate the number of employees substantially. The leftward swing after Lula's inauguration may have caused less temporary workers and more efetívos, meaning that the time series may not be completely internally comparable. Within the constraints of this thesis it is the best estimate I have however.