

DEALING WITH PLENTY:
BRAZIL IN THE ERA OF SURPLUS OIL

BY

RENATO DE OLIVEIRA

THESIS

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Adviser:

Professor Jose Antonio Cheibub

ABSTRACT

This is a study about the growth of oil industry and its economic and political repercussions in Brazil. It combines an industrial analysis with an empirical assessment of the impact of oil royalties on municipal fiscal transparency in Brazil.

This paper begins with an overview of the future of the oil industry and fleshes out what Brazil's role in this future might be. I show that hydrocarbons will continue to be the main source of energy for the foreseeable future. Despite the negative issues associated with oil, such as its pollutant qualities and abundance in politically unstable countries, its versatile nature and features as a fuel discourage a switch to alternative energies, a very arduous endeavor under present technological constraints.

Next, opposing views regarding the dominance of oil are presented. Some scientists defend that oil production has or is about to peak, while others claim that there is plenty of oil left in unconventional sources, such as tar sands, shale rocks, and offshore oil. This latter source is of particular interest to this study. In 2007, the Brazilian government announced the discovery of huge reserves offshore, reserves with the potential to multiply the country's oil assets. Brazil emerges in the 21st century as an important supplier of oil, a fact celebrated by President Barack Obama in his first visit to the country, when he offered his willingness for the U.S. to be the main customer of such fuel.

For most of its history, Brazil needed to import oil to supply its internal demand. Despite that, this country adopted policies that highly restricted foreign participation in this industry. I show how nationalism played a major role in shaping Brazil's oil legislation from the 1930's until the mid-1990's, when a more liberal legal framework opened the domestic market for oil

exploration. The liberal legislation successfully achieved an increase in production and reserves. Additionally, the mid-1990's legislation also raised the existing rate of oil royalties and created new taxes. The combination resulted in petroleum wealth appearing as a significant source of public revenue, especially at the local government level.

Oil abundance, if not properly managed, can be harmful to economic development. This outcome is counterintuitive but supported by an empirical regularity in cross-country comparisons. In Chapter 2, I present the main arguments attempting to explain the so-called resource curse paradox, a theme extensively studied in development and political science literature. I show that while there is no inherent contradiction between resource abundance and development, there are indeed economic and political challenges. Economically, there is a need to avoid the loss of competitiveness in the non-resource sector of the economy, a phenomenon named Dutch Disease. The existence of oil wealth can also pose a threat to development through political mechanisms. It stimulates rent-seeking behavior and reckless fiscal spending, and it makes reform harder to accomplish. Chapter 2 also contains a brief analysis of the experiences of Norway, Venezuela, and Mexico in managing oil resources.

In Chapter 3, I assess the impact of oil money transfers to municipalities in their compliance with the transparency requirements of the Fiscal Responsibility Law. In 2000, the Brazilian government adopted a law that requires, among other things, that every municipality submit its fiscal data to the central government. If a municipality declines to provide the data, it is penalized with refusal of voluntary transfers from the Union and contracting credit operation. I analyze the pattern of missing information using logit models with fixed effects and pooled data, for 5,561 municipalities in a ten year period (2000 to 2009). The results compellingly illustrate that being an oil recipient increases the probability of breaking the law by up to 16 percentage

points. The model also indicates that structures of checks and balances, like a high voter turnout, encourage more transparent behavior. Consistent with the literature, the models likewise exhibit that the more a municipality is financed by transfers of money, the less the municipality is accountable.

Chapter 4 concludes by pointing to the importance of the findings, particularly when oil revenues, with the recent offshore discoveries, are becoming a major source of public money to all governmental structures in Brazil.

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As always, any remaining errors are solely my responsibility.

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LIST OF ACRONYMS

ANP	–	The Brazilian National Petroleum Agency
BNDES	–	Brazilian National Development Bank.
Bpd	–	Barrels per day
BTU	–	British Thermal Unit
CERA	–	Cambridge Energy Research Associates, Inc.
EOR	–	Enhanced Oil Recovery
GDP	–	Gross Domestic Product
ISI	–	Import Substitution Industrialization
mAh	–	Milliampere-hour
Ni-Cd	–	Nickel-cadmium battery
Ni-Mh	–	Nickel-metal hydride battery
NOC	–	National Oil Company
OECD	–	Organization for Economic Co-operation and Development
OLS	–	Ordinary Least Squares
OPEC	–	Organization of the Petroleum Exporting Countries

Chapter 1

THE FUTURE OF OIL INDUSTRY AND BRAZIL

“By some estimates, the oil you recently discovered off the shores of Brazil could amount to twice the reserves we have in the United States. We want to work with you. We want to help with technology and support to develop these oil reserves safely, and when you’re ready to start selling, we want to be one of your best customers. At a time when we’ve been reminded how easily instability in other parts of the world can affect the price of oil, the United States could not be happier with the potential for a new, stable source of energy.”

President Barack Obama.¹

Hydrocarbons have been driving economic growth since the Industrial Revolution, as early as the 18th century. Fossil fuels were the main energy source during the 20th century and, despite being blamed for a number of political, economic, and environmental problems, will continue their central role for much of the 21st century. Fossil fuels may be non-renewable, but are at present much more abundant and capable of generating power than any other alternative energy source. Thus, it is no surprise from an economic standpoint that almost 90% of the world energy consumption comes from hydrocarbons, namely oil, natural gas, and coal.

¹ Speech made in Brasilia at 03/19/2011 during Barack Obama’s first trip to Brazil. Full speech available at the White House website, at <http://www.whitehouse.gov/the-press-office/2011/03/19/remarks-president-ceo-business-summit-brasilia-brazil>

Within hydrocarbons, oil is king, solely responsible for 34.77% of total energy sources (BP 2010). Natural gas – commonly found in association with oil – ranks third, with 23.76%, and is growing in importance as it is increasingly used as a source of electrical energy and fuel for the transportation sector. The second most used energy source is coal; the fuel that was the icon of the Industrial Revolution and still generates 29.36% of the world’s energy consumption. Instead of vanishing, coal is in fact growing in consumption due to the high demand to generate electricity and its ample availability in several countries, such as China.

The side effects of hydrocarbons are presently well debated, with a particular focus on the problems derived from the consumption of oil, whose use is contested on environmental, economic and geopolitical grounds. Oil is a pollutant, targeted as one of the major sources of human generated carbon dioxide emissions (Hofmeister 2010). According to the prevailing but not uncontested scientific views, these emissions are related to climate change (IPCC 2007). Oil is finite, and its continuous consumption will eventually exhaust current reserves. However, much before it is physically short of supply, oil’s relative scarcity will raise energy price. This may penalize particularly those countries who lagged behind the process of adaptation to a post-oil world. In addition to these objections, there is also the geopolitical anxiety surrounding the dependency on oil. Oil reserves are high in countries that may be either less politically stable or stable only by the force of a dictatorship, such as Saudi Arabia. This fact supports those who envision energy independence on the grounds of both national security and the need to overcome the power of the oil producer cartel, the Organization of the Petroleum Exporting Countries (OPEC). Furthermore, abundance of oil is said to weaken political institutions (Tsui 2005), foster corruption (Ades and Di Tella 1999; Chang and Golden 2010) and favors rent-seeking behavior of economic agents (Mehlum, Moene and Torvik 2006; Torvik 2002). Oil is bad for economic

growth: even after statistically controlling for a myriad of factors, there is a robust negative correlation between the share of oil exports in GDP and economic growth (Torvik 2009). This relationship is the result of what is commonly referred to as the oil resource curse.

Consequently, there are plenty of reasons to seek alternative energies, and indeed the world is seeing a shift toward renewable fuels. However, the pace of this shift will not be as fast as most environmental activists desire. The reason lies in oil's qualities as an energy source, a subject that is seldom mentioned in current discussions.

As Bryce (2010) puts it, an energy source must fulfill four imperatives: power density, energy density, cost, and scale. Oil produces high levels of power using very limited land resources. Renewables, such as biofuels, demand huge hectares of land to produce the amount of energy that would come from a single oil well. This is characterized as power density: the amount of power that can be yielded in a given unit of volume, area, or mass, such as watts per square meter. Energy density refers to the capacity of energy that can be stored in a given unit of volume, area, or mass, such as BTU per gallon. For instance, a common Ni-Cd AA battery of the 1990's would have a capacity of around 800 mAh, while today's Ni-Mh batteries easily achieve more than double the capability with the same size and volume. Lithium batteries, such as the ones used in laptops, can store even more energy, and they are also used in electrical cars. However, when compared by weight, gasoline stores eighty times more energy than the best lithium batteries available in the market. And the amount of time that a user spends fueling a full tank of gasoline is a fraction of completely recharging an electric car battery.

When compared with scale of production, the gap between hydrocarbons and renewables becomes even clearer. Despite a whole network of incentives to increase the production and the use of renewables – which includes subsidies, mandates, state-sponsored research and

development (De Gorter & Just 2009) – they account for only 2% of the world’s energy consumption and are projected to increase to 6% by 2030 (BP 2010). By that date, the role of oil (and hydrocarbons as whole) will be reduced, but will be far from dramatically lower than current levels of use.

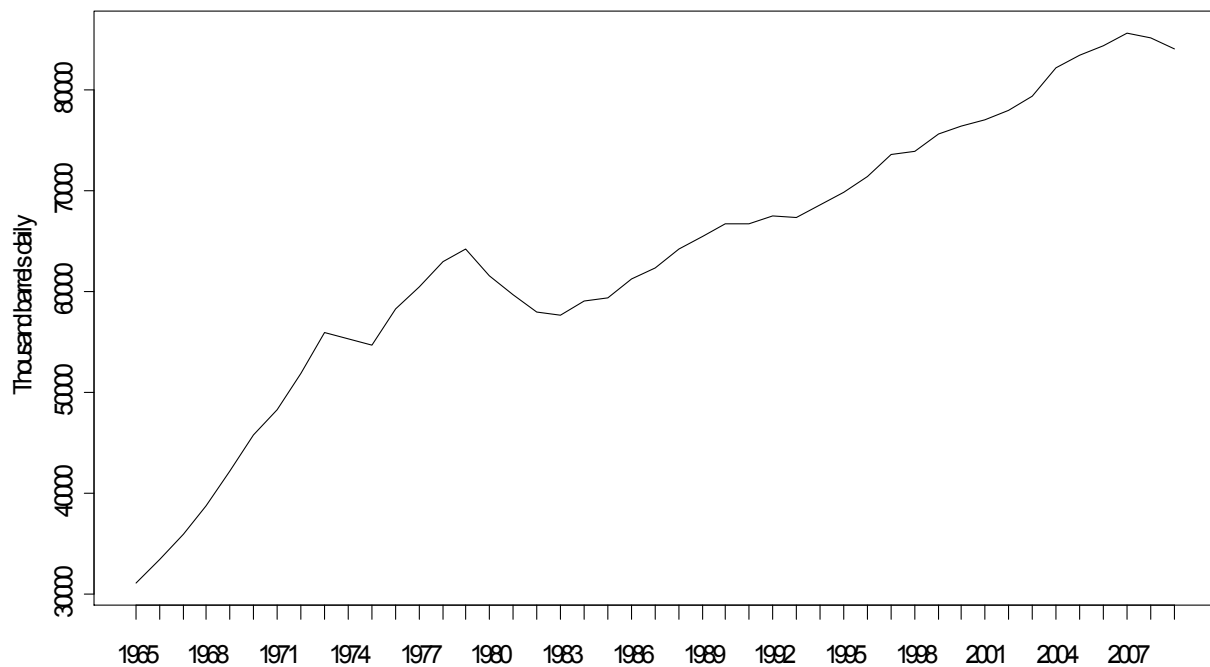
The fast pace of income growth in countries with large population such as India and China will pressure energy consumption by demanding more electricity to fuel a plethora of home appliances and oil for transportation, both for commercial aviation and automobiles. And this trend is already happening: 2005 was the first year that energy consumption from non-developed countries surpassed the consumption of the Organization of Economic Co-operation and Development (OECD) countries (IEA 2008, 38).

Worldwide, 95% of the energy used for transportation comes from crude oil. Moreover, a growing economy will also demand more food, which translates into an increased need for oil, as it is one of the main components of agriculture in the form of fertilizers, agrochemicals and the mechanization of field and crop processing tasks (Smill 2008, 15-16). Petrochemicals, including clothes made from polyester and plastic water bottles, are another reminder that much more oil will be needed as national economies grow. In fact, from 1859 to present day, there has been a consumption of 1.3 trillion barrels of oil, 90% of which since 1960 (Downey 2009, 303), in part due to the versatile nature of oil in industrial processes.

Figure 1.1 shows the world oil consumption in barrels per day, from 1965 to 2009. It has a clear upward trend, with bumps due to OPEC’s oil shock in the 70’s as well as a small recent decline in the late 2000’s. It reaches a peak in 2007, with 85,619 million barrels consumed per day, and slightly declines to 84,077 barrels per day in 2009. To BP (2010), this reduction is a

result of the economic downturn of 2008, originated by the financial crisis that had reached its highest point with the bankruptcy of the investment bank Lehman Brothers.

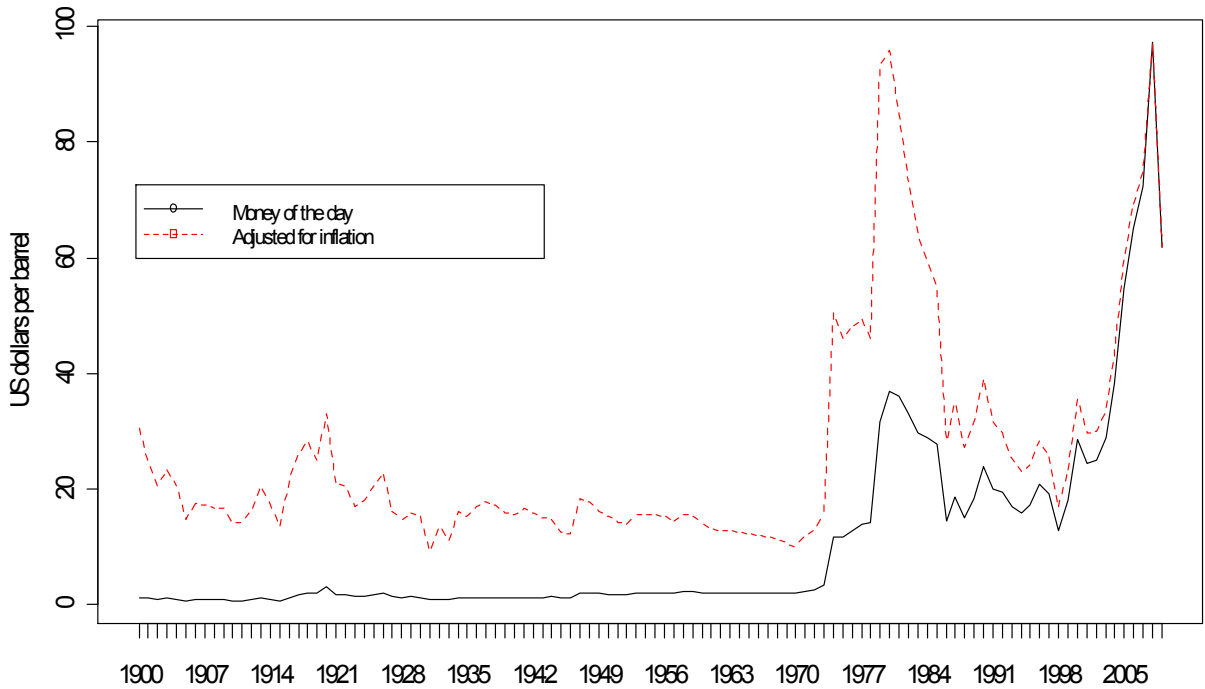
Figure 1.1. World's oil consumption - 1965 to 2009



Source: BP Statistical Review of World Energy 2010

The crisis also had the effect of reducing the international price of crude oil, as can be seen in Figure 1.2. The solid black line shows the average price paid for a barrel of oil each year, without adjusting for inflation. The dotted red line depicts the historical trend of oil prices by adjusting crude price to U.S. dollar inflation:

Figure 1.2. Crude oil price - 1900 to 2009



Source: BP Statistical Review of World Energy 2010

Eventually, the financial crisis will pass away, opening up the demand for energy. BP's most likely projection points to an increase of 40% in energy consumption by 2030, with 93% of the growth coming from now developing countries, outside of the OECD. Natural gas and nuclear energy are projected to occupy most of the space left by oil and coal in the world's energy consumption share. Apart from that, BP projects that oil production by 2030 will supply around one quarter of the world's energy needs. Brazil is noted as a key player in not only the production of biofuels but also in oil production from deepwater reserves. And the exploration of deepwater reserves, as in Brazil, is just one piece of the new technologies being applied to increase the supply of oil in the years to come. Optimists see plenty of energy available in what

today is called unconventional oil. Pessimists believe that the conventional oil product has peaked or is about to, and unconventional supply will not be able to replace it.

1.1 – The Peak oil theory

The energy industry works with different concepts when estimating the amount of available hydrocarbons. The broadest concept is of oil in place, which refers to the amount of oil that is capable of being commercially produced at a site plus the quantity that is estimated to exist but is most likely unrecoverable due to geological characteristics and technological limitations. Oil in place is just an estimate that can be applied to a prospect prior to drilling (Campbell 2005, 128). Only the amount that can be actually produced deserves the name of reserves.

Within the reserves concept, there are three subdivisions: proven, probable and possible reserves. The first refers to reserves that have a probability of 90% or higher of being able to be produced under current economic and technical conditions. Therefore, *proven reserves* is a relative category, susceptible to constant revisions (Graefe 2009, 4). It can change if technological conditions advance and convert unreachable areas – such as extra deep offshore fields – to economically productive areas. Besides, with a higher oil price, it is possible to invest in the development of a field that would not otherwise be profitable, such as new fields with high operational cost or old fields that were once closed due to low production but can now be reactivated to yield as low as ten barrels per day.² To be included in the proven category, a

² Such already developed fields show no technological challenges but their continuous operation can only be justified with high oil prices. However, they have the benefit of being rapidly able to be brought into production, as soon as it is perceived as economically feasible. The United States Department of Energy calculates that around 15% of all the oil produced in the US comes from these stripper wells, which sums to over 340,000 wells. In Brazil, according to the Petroleum Law, Petrobras was allowed to transfer fields of marginal production to the regulatory

reserve has to go through a detailed number of analysis and test wells, and is also referred as measured reserves (Downey 2009, 294).

Probable reserves is used to refer to areas with a probability of being economically exploited ranging from 50% to 89%. Less rigorous assessment, and therefore less amount invested, is needed for an area to be included in this category. Finally, *possible reserves* is used to refer to areas with a 10% to 49% probability of reaching a future production level that is economically viable. They are estimated using a general knowledge of the geology of the area and less reliance on direct measurement. One can also view these three different ways of reserve classification as a reflecting a conservative, a moderate, and an optimistic expectation about economic exploitation.

The difference between the amount of oil in place and the quantity that can be commercially extracted is called the recovery factor. On average, only one third of the oil in place can be recovered by traditional methods (Gorelick 2010, 17). Using advanced methods, such as horizontal drilling and secondary and tertiary recovery, the recovery factor can be significantly increased, thus yielding more oil than initially predicted (Graefe 2009, 8). These methods are known as Enhanced Oil Recovery (EOR) and have been best used in fields located in the North Sea and in Norway, in specific cases increasing the recovery factor from 40% to 70% (Mills 2008, 83).

One way to estimate the rate of oil production in a region or country is to approximate it with the derivative of a logistic distribution curve. This method was first applied by the American geophysicist M. King Hubbert, who in 1956 predicted correctly that by 1970 the oil production of the contiguous U.S. would peak. Instead of focusing on when oil supplies will

agency, ANP. The agency included these returned fields into the bidding rounds and some (not all) were acquired by small and medium sized oil companies. See <http://www.fossil.energy.gov/programs/oilgas/marginalwells/> and Novaes (2010) for an economic analysis of the production of small firms in the mature oil fields in Bahia, Brazil.

expire, the 100% level, the peak theory suggests concentrating on when the production will reach its zenith and inevitably decay. This is known as the Hubbert's Peak.³ If production levels cannot be sustained, as Hubbert's Peak oil theory predicts, the economic effects of the end of oil will start at the point where there is 50% of the recovery factor remaining, a point that is reached well before the complete depletion of a field. The point of highest production would be the same as the midpoint of available reserves left – but the remaining oil is capable of being extracted only in a slower rate due to physical constraints, like reservoir pressure.

Another common assertion of peak oil theorists is that the numbers of current reserves cannot be trusted. There is no standard procedure among countries in the classification and technical estimation of reserves (Graefe 2009, 3). In addition, reserves' reports may lack transparency and external auditing, especially among National Oil Companies (NOC) in OPEC countries. International Energy Agency's (IEA) World Energy Outlook 2010 states that "OPEC figures of proven reserves may be more comparable to figures of proven and probable reserves in other parts of the world" (IEA 2010, 115). If reserves cannot be trusted, we may be even closer to the peak point.

If the Peak oil theory holds true, several important policy implications follow. It makes obvious the immediate need to adapt to a short supply of oil, and that means investing in energy efficiency, regulations to save oil, and development of alternative energy sources. Those countries exporting oil could cut production in order to extend their oil rent for several more years. Similarly, other countries can curb their sales of oil abroad by considering their reserves as

³ The peak concept is notorious nowadays, thanks to a number of mass-market publications and even movies, like "Collapse" (2009) and "A crude awakening: the Oil Crash" (2006). For examples of books, see Worth's *Peak Oil and the Second Great Depression (2010-2030)* and Deffeyes' *Beyond Oil: The View from Hubbert's Peak* (2006). The Association for the study of Peak Oil & Gas (APSO) was founded in 2000. The founder of the concept, M. King Hubbert, was not an obscure man. He was a well-respected geologist, having worked at Shell and the United States Geological Survey (USGS). He later taught at Stanford and the University of California-Berkeley and advocated the development of nuclear energy as a replacement to oil reliance (Gorelick 2010).

an asset that can be used as a competitive advantage to national industrialization. If this strategy is followed, the oil left would be used for internal consumption rather than export.

The main weakness of the peak oil theory is that it has so far been unable to cope with the technological advancements that are constantly adding new reserves and increasing the recovery factor of known reserves (CERA 2009). It is not uncommon for peak oil theorists to make point predictions that have to be postponed. For example, an engineer at the Brazilian Development Bank (BNDES) estimated that Brazil's peak oil would occur between 2010-2020, but most probably around 2010-2015 (Rosa 2007). And he concluded that Brazil would reach its peak oil very close to the world's peak production. In Rosa's opinion, Brazil's national oil self-sufficiency celebrated in 2006 would not last long as Brazil, after all, was not very rich in oil. If the oil offshore from Brazil could speak, Mark Twain's words would be appropriate: "The report of my death was an exaggeration" (Robinson, 1995). In fact, Brazil's government spoke for it and announced in November of 2007 the discovery of a new giant field initially named Tupi⁴, located beneath a salt layer in the Santos basin. New discoveries in the same basin soon followed.

Statistically, it is possible to make predictions that have a higher probability to cover the truth but are yet of little value because of the wide confidence interval used. That seems to be the case of Hallock et al. (2004). They claim results that "predict that global production of conventional oil will almost certainly begin an irreversible decline somewhere between 2004 and 2037, at 22 to 42 billion barrels per year, depending upon how much oil is available from the earth's crust and the growth rate in its use" (2004, 1673). Their analysis of the number of net-

⁴ After having its commercialization declared with the potential certified, Tupi was renamed to "Lula." The field naming rule in the oil industry of Brazil is that producing oil areas are assigned the name of a sea animal and lula stands for squid in Portuguese. It is also the name of the then president of the Republic, Luiz Inácio Lula da Silva. The selection of Lula as the name of the oil field received some criticism in the press, which claimed that it was political.

exporting countries that will become net-consumer countries suffers the same problem: the number of countries, according to their models, can go from 35 as of 2003 to between 12 and 28 by 2030. They also do not account for the existence of Brazil as a country that will transition from net-importer to a net-exporter in the near future. This is a significant change that was only possible due to the development of new technologies that made viable the extraction of oil in the deep water, as far as 200 miles from the coast and drilling thousands of feet in depth (Graefe 2009, 8). This oil can only be produced using cutting-edge techniques and may be classified as unconventional oil.

1.2. Unconventional sources of oil

Unconventional oil is an umbrella term for a variety of methods to produce liquid fuels. It can refer to deep water oil, extra heavy oil⁵, tar sands, or products made synthetically, such as shale oil or oil made from coal⁶ (Mills 2008, 153). Unconventional oil has a higher production cost when compared to conventional oil-fields, demands a more complex operation to be extracted, and may require additional processing to be refined (Graefe 2009, 7). These extraction and refining processes can also pose extra environmental risks (Diamond 2005, 490). Despite these drawbacks, unconventional oil is believed by oil industry analysts to be a major source of

⁵ Oil is measured by its density degree or specific gravity and follows a scale set by the American Petroleum Institute (API). It goes from heavy (0) to light (100). Bitumen, a by-product of oil used to pave roads, has an API gravity of 5° to 9°, while gasoline is 50°. Saudi Arabia's Light Crude produced at the prolific field of Ghawar has a density of 34°, while Venezuela's extra heavy crude can be rated as 10°. Heavy crude can be blended with light crude in the refining process in order to produce light products. Most refineries are set to process light crude and this is the type of oil with most demand, thus heavy oil is traded at a discount. Other factors can also influence the price of oil, such as acid and sulfur content. It can be said that as crude prices increase, crude quality decreases, as a higher volume of lower quality oil reaches the market (Downey, 2009; Mills, 2008; Nikiforuk, 2010).

⁶ The synthetic production of oil from coal is expensive but feasible. It was used by Nazi Germany during the Second World War and also by coal-rich South Africa during the international embargo against the apartheid system. The company Sasol still produces oil from coal in South Africa and expansions are planned. Shale oil is also a synthetic way of producing crude. During OPEC's second oil embargo, Jimmy Carter's administration favored the development of the resources located at Rocky Mountain, Colorado (Gorelick 2010, 176; Hofmeister 2010, 2).

energy to be extracted (CERA 2009, 5), with the additional benefit of being available in countries outside of OPEC's domain, such as Canada and the United States.

Deep water oil is normally categorized as unconventional oil, but that claim is often debated. Campbell (2005, 217) classifies deep water oil – oil found at over 500m water depth – in the unconventional category, while Mills (2008) simply says that it is conventional oil found in unconventional places. In fact, deep water oil is unconventional in the way it is extracted, but the oil itself is comparable to onshore fields, only heavier on average. Deep water is frontier exploration. It typically has a higher cost of operation than an onshore field and is technically more complex. However, as technology advances and oil prices stay high for extended periods of time, there is sufficient incentive to explore oil in these frontier areas, whenever regulations and politics make them available.⁷

Offshore oil has been rapidly developing in several countries as the price of oil stays in historically high levels (providing the necessary incentive to produce) and technology evolves to deal with the challenges of extracting oil in the sea (bringing the cost of operation down). In fact, according to IEA, “since 2000, more than half of all the oil that has been discovered is in deep water” (IEA 2010, 116). IEA estimates a global potential of two to three trillion barrels of unconventional oil (tar sands, extra heavy oil, oil shales) that may be economically recoverable, but with much uncertainty in this number due to the lack of detailed studies. The estimates of CERA are even higher. The UK based research group calculates total global resources to be 4.8 trillion barrels, with 1.1 having been produced so far (CERA 2009, 7). The existence of unconventional oil – even in high amounts – does not settle the dispute between peak oil theorists and analysts who defend the continuous importance of hydrocarbons in the 21st century.

⁷ The oil industry in the United States has long been pressuring for a lift of the ban on drilling in the Arctic National Wildlife Refuge, in Alaska. It is an environmentally sensitive location and has the potential of producing both oil and natural gas, according to the U.S. Geological Survey.

Peak oil theorists argue that the supply of oil is limited by physical and political constraint. The former refers to the limited existence of recoverable oil and to the fact that the rate of production supposedly follows the Hubbert curve. The latter involves geopolitical considerations, such as the fact that most of the reserves are located in unstable countries and controlled by a few critical producers (Campbell 2005, 234). Currently, 70% of the world's total reserves are in the hands of OPEC countries (IEA 2010, 114).

Analysts, like Odell (2004) and Bryce (2010), support the basic economic idea that high oil prices generate incentives to invest in more exploratory efforts and more efficient technologies, which will eventually lead to the discovery of new fields and to old fields producing more oil than initially expected. Supply and demand curves will eventually smudge the market's invisible hand in oil.

The new substantive discoveries made offshore in the Gulf of Mexico and off the coast of Brazil are credited by Gorelick to high prices stimulus, which could in turn lead to new discoveries: “[S]hould oil prices resume their 2005–8 upward trend, it seems likely that the discovery rate will increase” (Gorelick 2010, 136). Furthermore, technological improvements can increase the recovery factor of a field, resulting in sustaining the active life of known oil wells. On the demand side, high prices also act as a stimulus to achieve higher energy efficiency and that the demand is not as inelastic as is normally supposed. Refuting this view, peak oil proponents say that geological discoveries follow a random pattern and that the major discoveries were made in the 1960's, showing no correlation between prices and exploratory success (Downey 2009, 300-301). Neoclassical economics would not be able to surpass a geological limitation. Therefore, models based on neoclassical assumptions and the role of markets should be critically examined for their appropriateness in making judgments about

future oil supply (Hallock et al. 2004). However, even the most prominent peak oil theorist, Campbell, recognizes that tar sand and shale are available in very large amount and may prove to be a valuable source of oil in the future⁸ (Campbell 2005, 218). In fact, when prices allow unconventional oil to be explored with profitability, these resources can be reclassified as proven reserves.

By the account of the Oil and Gas Journal (O&GJ 2009) current worldwide proven reserves are at their highest historical level, summing up to 1.345 trillion barrels. And this record was achieved specially by the inclusion of Canada's tar sands, adding 170 billion barrels to the world's proven reserves. Canada is not the only place where one should expect additional supply to the world's reserves. Brazil, when the pre-salt area passes through full certification and measurement, may add another 70 billion barrels of oil. As a report from the Cambridge Energy Research Associates (CERA) states, "The recent discoveries of ten giant oil fields below a thick salt layer in the Santos Basin, Brazil, may have boosted global resources by at least 25 billion barrels" (CERA 2009, 5). At either 70 or 25 billion barrels of oil, these discoveries will radically change the position of this South American country in the global oil industry.

1.3. Brazil's role in the global oil industry

In order to understand how Brazil is emerging as an important player in the global oil industry, it is necessary first to describe the different sets of public policies that this country adopted throughout the 20th century concerning the extraction and exploitation of hydrocarbons.

⁸ Canada has the biggest deposit of tar sands, lying in the province of Alberta, with mass production starting in the 1960's. It is officially estimated in 170 billion barrels of reserves, 16% of these under active development. The production of oil from these sands is made by surface mining and *in situ* production, demanding an intensive energy and water consumption. That is why this industry requires an oil price of US \$70 per barrel or over to grow and at least US \$50 per barrel to keep the current operations running (McColl 2009, 4-5). For a critical account of the environmental impact of the production of oil from tar sands in Canada see Nikiforuk (2010).

During the early 20th century, Brazil was not believed to be rich in oil. Almost nothing of its geology was seriously known. However, the country bordered oil producers like Venezuela, Bolivia and Argentina, raising hopes that Brazil too could find hydrocarbons. Early attempts to discover oil continually failed, to the amazement of intellectuals and politicians; Brazil was bigger than any other Latin American country and its neighbors were already exploiting oil (Smith 1976). Despite that, a nationalistic campaign moved the country in the direction of state monopoly of exploration rights. The Constitution of 1937 restricted mining activities to native born Brazilians (Constituição dos Estados Unidos do Brasil 1937). One year later, by Decree-Law 538, the National Oil Council was created with the power to authorize research in prospective oil fields. Instead of promoting the research of oil, the council ordered drilling companies to stop operations (Paim 1994, 38-39). Ironically, Brazil had a bureaucracy and a national council in place before finding any evidence of oil. And the bureaucracy made it harder to find it. Critics, like writer and entrepreneur Monteiro Lobato, thought that the red tape imposed was in the interest of foreign companies like Standard Oil, who wanted to avoid the discovery of oil in Brazil.⁹ Lobato, in the book *O Escândalo do Petróleo* (The Petroleum Scandal) published in 1936, helped to propagate the ideas that the subsoil of Brazil was very rich in oil and that state action was necessary to avoid the resource falling into foreign hands.

Only in 1939, in the city of Lobato, in the Northeast state of Bahia, did drilling produce some oil. The finding was only possible due to years of efforts by entrepreneur, Oscar Cordeiro, who since 1933 tried to get authorizations and drilling machines to open a well. When the well resulted in a flow of oil (although not enough to be economically feasible) the federal

⁹ Before the creation of Petrobras, Standard Oil actually attempted to explore oil in Brazil and asked for changes in the legislation to allow foreign companies to explore and develop oil fields. A formal proposal to open a limited liability company that would employ Brazilian technicians was sent to Vargas' government in 1941. The proposal was emphatically rejected by the general Horta Barbosa, who headed the National Oil Council from 1938 to 1943 and was later a pivotal figure in the creation of Petrobras with monopoly rights (Smith 1976, 43).

government nationalized the whole area without any compensation to the owner. In addition to losing his property, Cordeiro was fired from his position as president of the Bahia commodities exchange (Paim 1994, 53; Dias and Quagliano 1993, 87). Monteiro Lobato protested against the government's oil policies and was imprisoned in 1941 by the dictatorship of Getúlio Vargas. The dictator defended the nationalization of all mineral wealth (Vargas 1964, 58-64).

Vargas was ousted from power in 1945, only to return in 1951 as an elected president, following a populist and nationalistic agenda. In 1953, after intense debate inside and outside of the parliament, Petrobras was created as a state-run company with monopoly rights in the exploration, production, and refining of oil throughout the whole country, granted by the Law nº 2.004.¹⁰ This move was motivated more by political considerations, particularly an anti-foreign companies mindset, rather than economic reasoning (Baer 2009, 217). Those who opposed the state monopoly on oil were called *entreguistas*, meaning “sellouts.” This word has ever since been applied to Brazilians who defend increased openness to foreign capital.

An unexpected turn of events had reinforced the popular support for policies against foreign capital in the so-called strategic areas of the economy. In 1954, Gregório Fortunato, the chief of Vargas' personal guard, masterminded a murder attempt against journalist Carlos Lacerda, Vargas' foremost political opponent. Lacerda survived the attack, but the shooting killed an air force major (Skidmore 1967). Investigations showed that the gunman was acting under instructions from Fortunato. Vargas was already facing a popularity crisis and daily corruption allegations in the press (Morais 1994). Adding an assassination attempt to what was

¹⁰ The law established that the few existing private refining companies were allowed to continue operating as long as they did not invest in expanding their capacity. At the time the law was passed, there were six refineries in the country, four of which were bought by Petrobras in the 1970's, while the remaining two continued to operate with a very small capacity and obliged to buy oil from Petrobras (Dias and Quagliano 1993, 148). The draft of the bill prepared by Vargas' government was slightly more liberal and allowed foreign capital to buy non-voting stocks from Petrobras. However, the nationalistic campaign *O petróleo é nosso* – the oil is ours – pushed for even more restrictive legislation that was ultimately approved (Smith 1976, 96).

being called “a sea of mud”, the crisis escalated, and on August 23, twenty-seven generals of the armed forces called for the resignation of the president. The following day, Vargas committed suicide and left a letter proclaiming that he fought against foreign interests in defense of the people. He cited as examples of his nationalistic efforts the creation of Petrobras, Eletrobras – an electrical energy state-run company – as well as a law raising the tax on profit remittance by foreign companies. With this move, Vargas gained huge popular support for his policies and was responsible for a long legacy of nationalism in Brazilian politics shared by both the left and the right.¹¹

According to this nationalistic belief, a country’s subsoil and its resources are part of the sovereignty of the nation. In countries like Saudi Arabia or Iran, oil nationalism and nationalization of industrial operations happened due to a perception that they could reap more benefits than what foreign oil companies were offering. This would include not only more money to the state but also more local technicians employed in the energy industry. Latin America nationalized oil companies years ahead of Middle Eastern and Northern African nations. Argentina instituted a national monopoly on oil as early as 1922. In Bolivia, the assets of the Standard Oil of New Jersey were nationalized in 1937. One year later, in Mexico, President Lázaro Cardenas expropriated the facilities of Standard Oil and Shell, giving birth to PEMEX, an icon of Mexico’s industrialization hopes (Santiago 2006, 353). In 1948, Juan Pablo Pérez Alfonso imposed the 50/50 contract, whereby the Venezuelan state was able to capture more cash to its treasury (Rodríguez-Padilla 2004, 181). In this kind of contract, the profits are equally divided between the government and the operating company.

¹¹ In the view of Skidmore, Vargas’ suicide note was the strongest nationalist appeal he had ever made. And this was particularly harmful for those who opposed him politically. Carlos Lacerda, the victim of the assassination attempt, had to flee the country while Vargas’ supporters attacked opposition newspapers, American diplomatic buildings, a Citibank branch and even a Coca-Cola plant (Skidmore 1967, 142; Morais 1994, 558).

Therefore, Brazil was part of a continent that distrusted foreign oil companies. However, Brazil faced a much different reality than Mexico, Venezuela, Argentina, and Bolivia: there were no already-existing foreign companies to be resented and no oil producing operations to be nationalized. In fact, Brazil was the only non-Communist country to begin oil production by a state-run company (Smith 1976). The development of a national company from scratch would require more effort and risk-taking in a country without known geological potential. Consequently, the initial technical team of Petrobras was composed of dozens of Americans under direction of former Standard Oil geologist Walter Link (Dias and Quagliano 1993, 113). After six years of work, Link presented a report of his work and resigned in 1960. The report was prepared by the technical team of the Petrobras' Exploration Department and was not optimistic about the prospect of finding oil in the majority of Brazil's sedimentary basins. The report was leaked to the press and Link was accused of sabotage and of working secretly for Standard Oil (Smith 1976, 126). The opinion that international companies were always behind failures was commonly voiced throughout Brazil's oil history.

From 1953 to 1995, Petrobras had monopoly rights on the exploration and refining of oil.¹² It was a symbol of nationalism and state sponsored Import Substitution Industrialization (ISI). However, with monopoly rights, Petrobras never achieved full replacement of oil imports and the efficiency of the company was commonly criticized.¹³ Former finance minister and

¹² For a period of time, beginning in 1975, the then military government allowed foreign companies to explore oil in partnership with Petrobras in 'risk contracts.' The terms of the contract were highly unfavorable to other companies, resulting in an unsuccessful venture. Even so, the possibility of 'risk contracts' was completely revoked by the Constitution of 1988 (Dias and Quagliano 1993, 132; Barreto 2000, 40).

¹³ The Brazilian National Alcohol Program, Proálcool, was a by-product of the inability of Petrobras to achieve higher levels of oil production. In 1973, more than 80% of the oil used in Brazil was supplied from foreign sources, which later led to an increasing external debt to pay for these imports. To deal with OPEC's oil shock and the lack of hard currency to finance oil consumption, the Brazilian government sponsored an ambitious program to replace massive amounts of the imported fuel with locally produced ethanol from sugarcane. Brazil already had experience with that. During the 1930's, a 5% blend was introduced and reached a peak in the course of the II World War, when Vargas' government established a mix of up to 50% of anhydrous alcohol to the gasoline. The Proálcool

ambassador Roberto Campos used the term *Petrossauro*, a word play with dinosaur and the name of the company, to define the Brazilian NOC. To him, the company was a symbol of an old era, inefficient, and lacking proper adaptability (Campos 1994).¹⁴ He was, like most of those who criticized Petrobras' monopoly, labeled as *entreguista*.

The policy concerning hydrocarbons production stayed basically the same until the election of Fernando Henrique Cardoso as president in 1994. His first term (1994-1998) was characterized by a number of structural reforms (Power 1998), including privatization and the end of the oil monopoly for Petrobras, a privilege that was written in the 1988 Constitution. The Constitutional Amendment Number 9/1995 changed this condition, but retained the sovereignty of Brazil over its hydrocarbons reserves.¹⁵ Private companies were now allowed to contract with the Brazilian government to explore and refine oil.

The change in legislation was complemented by Law number 9478/1997, known as the Petroleum Law. This law established a regulatory agency, Agência Nacional do Petróleo (ANP)¹⁶, and a National Energy Policy Committee (Conselho Nacional de Política Energética, CNPE), the latter linked directly to the presidency of the country. The new institutional framework was created to attract foreign capital to invest in oil exploration in Brazil, with or without partnership with Petrobras. The company was obliged to transfer their knowledge of

program provided subsidies to the private ethanol distilleries and incentives for the conversion of gasoline-powered cars to run on 100% ethanol. Petrobras was not a key player in Brazil's ethanol program (Smith 1976, Leite et al. 2009, Nardon and Aten 2008, Philip 1982).

¹⁴ Campos also emphasized that Petrobras contributed very little to the Treasury. The government take – a measure of the amount of oil rent that goes to the government – was only 2%. It was much lower than similar national companies in Latin America, like PEMEX (55%), Ecopetrol (19.8%) and Petroequador (63%). The company also had a bad allocation of resources and invested little in the research of new oil fields, which penalized Brazil during the OPEC oil shock, when the national production had fallen between 1974 and 1979. In addition, Campos quoted numbers that showed that the Brazilian company was at the bottom of efficiency in the oil sector for the year 1990: the number of barrels of oil per worker was 130 for the world average, 74 for Latin America and 33 for Brazil. He added that Petrobras could well be considered an evil imperialist expropriator of the taxpayers and producing states (Campos 1994; Campos 1986).

¹⁵ See http://www.planalto.gov.br/ccivil_03/Constituicao/Emendas/Emc/emc09.htm

¹⁶ This agency had their activity subsequently expanded and now also regulates biofuels.

Brazil's sedimentary basins to ANP. The regulatory agency was made responsible for the execution of the national policy for petroleum and natural gas, as defined by CNPE. In 2002, private companies were permitted to import and export oil and by-products, something that had not been possible since the prohibition started in 1963 by the Decree nº 53.337.

In this new framework, which still exists today, exploration of oil and natural gas is open to companies that succeed in obtaining operation rights in public biddings organized by ANP.¹⁷ The National Energy Policy Committee defines which exploration blocks will be offered and ANP promotes and operates the bidding rounds. The bidding companies have to make offers based on how much they are willing to pay for each exploration block (known as the signature bonus), how much they will invest in geological survey (known as the minimum exploration program), and the amount of local goods and services that will be used. The companies that win the bid get a concession that is divided into two stages: exploration and production. If oil is found, commercialization rights accrue to the company, but it has to pay production royalties and, potentially, a Special Participation Tax (a windfall tax charged on fields that are highly profitable).

The 1997 Petroleum Law allowed Petrobras to have an initial preference over the exploratory blocks and fields in development. Consequently, in 1998 Petrobras kept 115 exploratory blocks, fifty-one development fields, and 231 producing fields. The First Round of Public Tender occurred in 1999. So far, ten rounds have taken place and Petrobras has kept their prominence in Brazil's oil industry by bidding aggressively and entering into partnership with foreign companies. Nonetheless, the new legislation successfully attracted national and international companies to the Brazilian oil sector. As of January 2011, seventy-four companies work as oil concessionaries in Brazil. The list includes major companies like Chevron-Texaco,

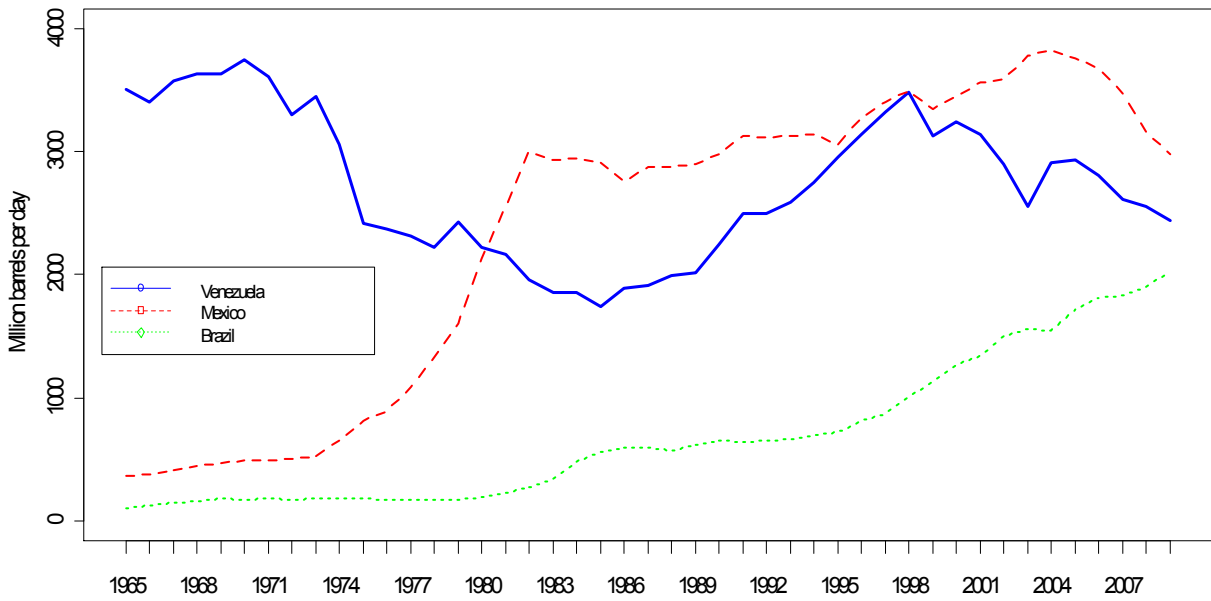
¹⁷ More information about ANP's duties can be found in English at <http://www.anp.gov.br/?dw=2447>

Devon, El Paso, ENI, Esso, Maersk, Repsol YPF, Shell, and Total, among others.¹⁸ In addition to small national companies operating onshore fields in the Northeast of Brazil, the opening of the market also brought into existence a major Brazilian oil company, OGX, which currently is working in twenty-nine exploratory blocks and went public in 2008, raising R\$ 6.7 billion – equivalent to more than US\$ 3 billion – in the Brazilian stock market.

Production numbers give a clear view of the increase in production (Figure 1.3) and reserves (Figure 1.4) achieved after the end of Petrobras' monopoly rights. Figure 1.3 shows yearly oil production for Venezuela, Mexico, and Brazil, from 1965 to 2009. The green line shows a slow growth in Brazil's production that accelerates in the mid 90's. Venezuela, as a member of OPEC, has a more fluctuating production from the 70's onward, but suffers from a clear reduction of output since 1998, almost at the same time that Brazil was increasing its production. Mexico achieved a peak in 2004 of 3.8 million barrels per day with a subsequent decline since then due to the depletion of the supergiant field of Cantarell (IEA 2010, 128). An extrapolation of the graph for upcoming years would easily point to Brazil surpassing the production of Venezuela and Mexico. When considering liquid fuels as a whole – which includes ethanol and biodiesel production – Brazil surpassed Venezuela in 2010 (United States Energy Information Agency 2011). Business Monitor International forecasts an increase in Brazilian oil capacity of 96.5% between 2010 and 2019, reaching a daily production of 4.4 million barrels by the end of this period. Venezuela, by that date, is expected to produce 3.15 million barrels per day and Mexico 2.310 barrels per day (BMI 2010).

¹⁸ The full list is available at the following address: http://www.brasil-rounds.gov.br/ingles_topo/lista_de_concessionarios.asp

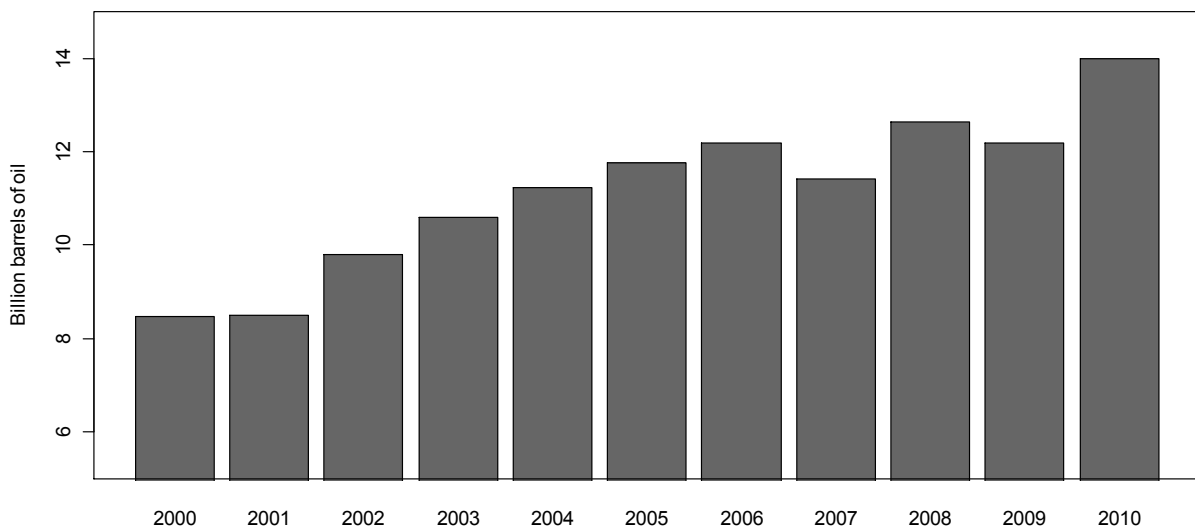
Figure 1.3. Oil production in Brazil, Mexico and Venezuela - 1965 to 2009



Source: BP Statistical Review of World Energy 2010

The recent growth of oil production in Brazil came along with an increase in the proven reserves, as can be seen in Figure 1.4 for data from 2000 to 2010:

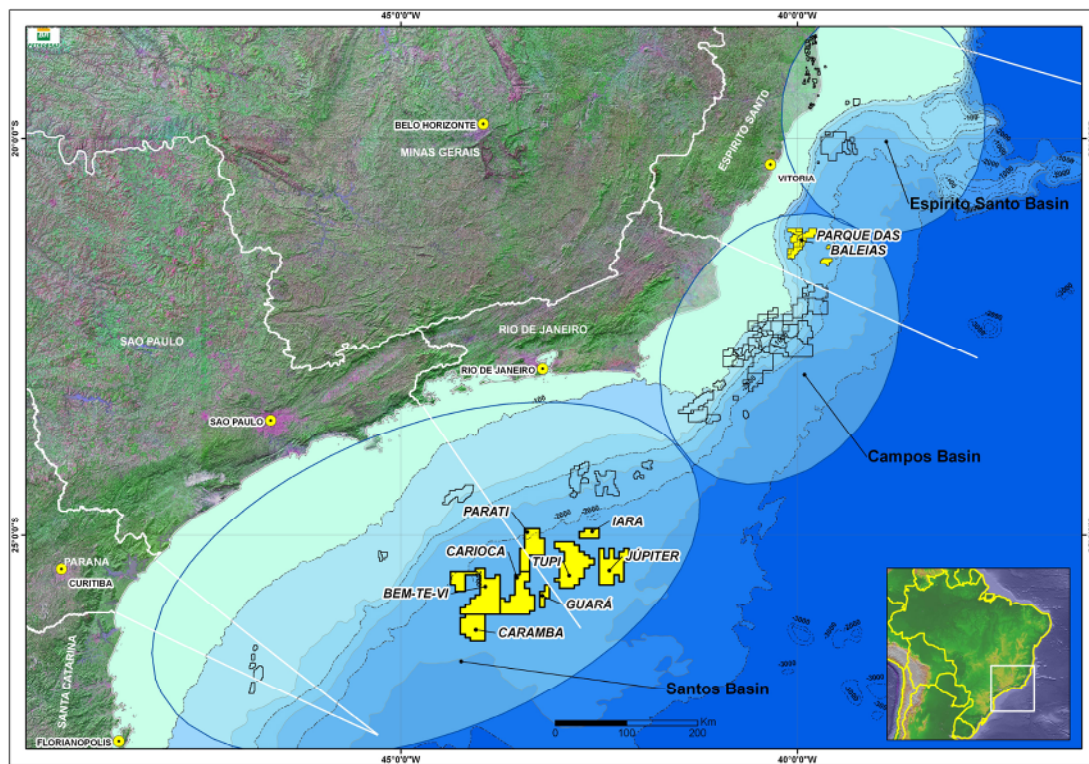
Figure 1.4. Proven oil reserves in Brazil



Source: Agência Nacional de Petróleo (ANP)

The numbers depicted above will probably rise sharply in the short run. In 2007, Petrobras announced the discovery of a new oil province, the pre-salt area in the Santos basin. It is called pre-salt because the oil found is trapped under a layer of salt that ranges from 1 km to 2 km below more than 5 km of water depth and rocks. The first field discovery is located more than 6 km in deep and 340 km away from the coast. This thick layer of salt is a geological formation that is believed to extend from the coast of five states, measuring 800 km in length and 200 km in width, with 28% of it already under concession and currently under exploration or development. At this time, they are still classified as probable or possible reserves and do not appear as proven reserves in the ANP data. The map below, from Petrobras, shows the area that belongs to the Brazilian pre-salt and some exploratory blocks:

Figure 1.5. The pre-salt oil region



Source: Petrobras (2010c)

The development of offshore oil is at the heart of Brazil's production. As early as 1978, Brazil had more reserves of oil in the sea than in its land (Dias and Quagliano 1993, 129), which is the 5th biggest in the world. In the midst of the 1980's, the big fields of Marlin and Albacora were discovered in the Campos basin, moving Petrobras to invest even more in offshore production. However, the discovery of the pre-salt area is more than a simple consequence of the initial development of offshore oil that started in the 1980's. It is a result of several factors. The Petroleum Law of 1997 stimulated more risk taking behavior by Petrobras, which previously did not need to compete in the internal market.¹⁹ Foreign companies entered the market as sole players but above all as partners with Petrobras, providing technical assistance and capital to fund exploratory efforts. In fact, in the pre-salt area, Petrobras is working in partnerships with five different companies: Amerenda, BG Group, Esso, Petrogal, and Repsol YPF. In addition to the new market structure, technological advances played a major role in the exploration of a frontier area. New seismic technology reduces the risk of engaging in the costly operation of drilling an unsuccessful well in the sea.

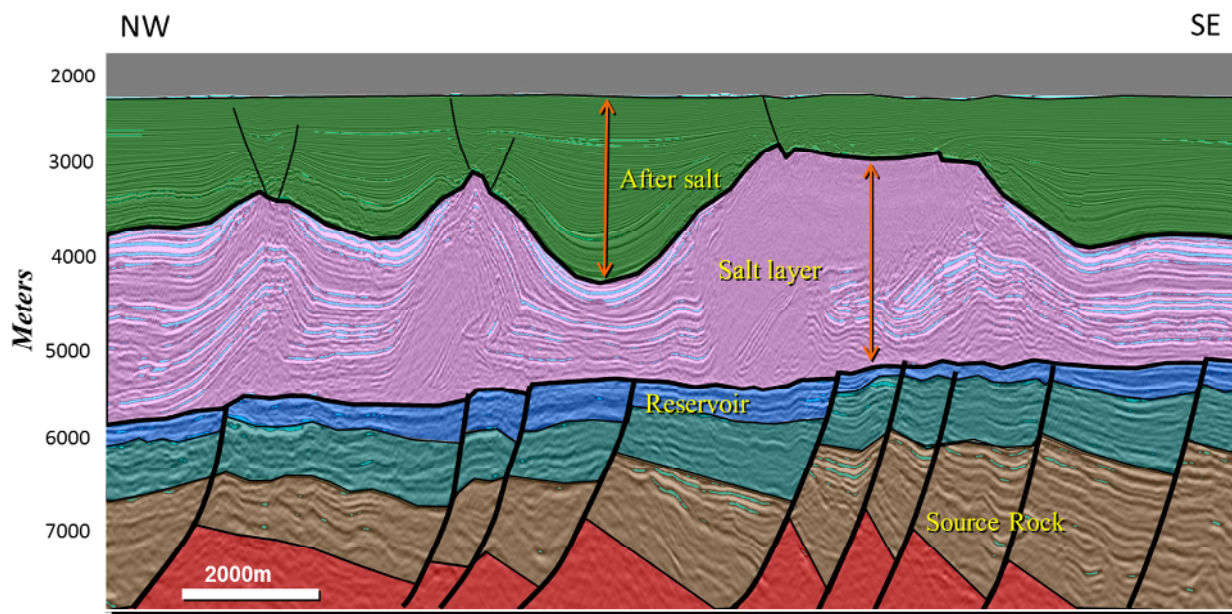
The success of Brazil's oil industry after the opening of the market also proved to be an important source of revenue to the public treasury. The rise in Brazil's oil production (Figure 1.3) along with the spike of international crude prices in the second half of the 1990's (Figure 1.2) resulted in a major increase in oil revenue. The 1997 Petroleum Law increased the government take in the oil through a combination of higher royalties rate (10%), a windfall profit tax (the Special Participation Tax, that can go up to 40% of the profit in a field) and by tying

¹⁹ As George Philip observed in his "Oil and politics in Latin America," by the 1970's Petrobras "was acquiring certain features which are typical of large-scale organisations; it tended to be secretive, risk-averse and rather conservative" (Philip 1982, 385). According to him, Petrobras was commonly described as a state within a state.

duties to the international price of oil. This had a profound impact in the budget of municipalities that were benefited by oil royalties (Afonso and Gobetti 2008).

Petrobras successfully adjusted to a market without monopoly power in the oil exploration (IPEA 2010). In the beginning of 2011, Petrobras was responsible for 92.79% of Brazil's oil and gas production, operating some fields with foreign companies as minor partner.²⁰ Chevron and Shell were the only companies operating major oil fields in Brazil, but with a combined production of less than 200 thousand barrels of oil per day (ANP 2011b, 14). In the refining sector, Petrobras holds a *de facto* market monopoly.²¹ The company also invested heavily in international operations and is a successful example of a *multilatina* (Goldstein 2010).

Figure 1.6. The geology of the pre-salt reservoir



Source: Petrobras (2010d)

²⁰ Petrobras is also growing its operations outside of Brazil. As of February of 2011, the company was producing one quarter of a million barrels per day of oil equivalent, which includes oil and natural gas, in its operations in Africa, North America, and South America.

²¹ The opening of the market allowed by the Petroleum Law of 1997 attracted only the Spanish company Repsol to a minor position (30%) in a refinery in Rio Grande do Sul (Refap) achieved through assets exchange with Petrobras in 2001. Near the end of 2010, Petrobras reached a deal with Repsol to buy the 30% back for US\$ 850 million and return to full control of the refinery plant (Petrobras 2010b).

Notwithstanding Petrobras success in competing in the market, the discovery of the pre-salt resources led the federal government to draft new oil legislation restricting private participation in the oil sector in the newly discovered areas. Once again, the federal government used the nationalistic wildcard to stir support for a new oil regulatory framework (Folha de São Paulo 2010). Furthermore, the legislation crafted for the pre-salt area created a new state-run company and changed the more liberal concession system to production sharing.²² Besides a return to nationalistic policies, the new regulatory framework intended to make Brazil ready to cope with an unprecedented challenge in its history: manage oil wealth that will accrue from future exploitation (IPEA 2010; Leahy 2011).

In conclusion, the world's energy needs are predicted to grow and press for more fuel. Oil is getting harder to find and process as the industry shifts from traditional sources of onshore oil to unconventional sources such as deep water, tar sands and shale oil. In this market that is yet being shaped, Brazil emerges as a contributor to the world's energy supply both as a pioneer in mass scale biofuels and, thanks to new technologies, as a new source of offshore oil (Hofmeister 2010; Sant'Anna 2010). This shift will likely provoke economic and political institutional changes in the country. Since most of the development and political science literature suggest a gloomy future to oil abundant countries, those oil discoveries made in Brazil

²² In 2009, the Federal Government sent four bills to Congress in a regime of fast track. The bills were voted in record time by Brazilian standards. Basically, the only issue that sparked public debate and divergences was the distribution within the country of oil royalties, with producing regions fighting to accrue most of the oil rents and non-producing regions defending an equitable division among states and municipalities. The Bill PL 5941 allowed the transfer from the government to Petrobras the oil rights of an area with estimated five billion barrels. Petrobras would pay for that right with a combination of cash and new shares to the government. This was accomplished in 2010 through a public offer of new shares, which were split between private investors and the Federal Government, resulting in the biggest capitalization of a company in history, raising US\$ 70 billion (Millard 2010). With this operation, the Federal Government increased its participation in the total capital of Petrobras and also received part of the money raised in the market. This one-off receipt was used by the Federal Government to finance higher spending and deficit payment, what could be taken as a bad omen of the way the oil wealth might be spent in the near future. As the IMF noted, "The deterioration in Brazil's fiscal accounts is particularly pronounced, and the government is now expected to miss its fiscal target. . . by a wide margin" (IMF 2011, 4).

may prove to be more of a curse than a blessing. As Naím remarks (2009), Brazil will provide a rare real-life test case of the recommendations to avoid a resource curse. For sure, future exploitation will provide additional challenges. However, the sharp growth of the industry and the rents distributed to the public treasury already provide room to test theories that relate oil booms and states. That is exactly what this work does in the third chapter, where it provides evidence that oil wealth is already causing institutional changes in local governments in Brazil, even before the massive pre-salt discoveries and the beginning of considerable oil exportation.

First, however, it is important to know the issues that commonly arise within mineral exporting countries, which will be addressed in the next chapter.

Chapter 2

THE DANGERS OF OIL SURPLUS

“In the Spain of Charles V and Philip II, the gigantic wealth of the Peruvian silver mines was wasted. The same ‘curse of resources’ has afflicted countries with windfalls ever since, especially those with oil (Russia, Venezuela, Iraq, Nigeria) that end up run by rent-seeking autocrats. Despite their windfalls, such countries experience lower economic growth than countries that entirely lack resources but get busy trading and selling – Holland, Japan, Hong Kong, Singapore, Taiwan, South Korea. Even the Dutch, those epitomes of seventeenth-century enterprise, fell under the curse of resources in the late twentieth century when they found too much natural gas: the Dutch disease, they called it, as their inflated currency hurt their exporters. Japan spent the first half of the twentieth century jealously seeking to grab resources and ended up in ruins; it spent the second half of the century trading and selling without resources and ended up topping the lifespan league.”

Matt Ridley²³

The quote above foreshadows what might happen to a resource rich country, a reality well captured by the Venezuelan statesman and founder of OPEC, Juan Pablo Pérez Alfonso,

²³ From the book *The rational Optimist* (Ridley 2010).

who famously said that oil is the Devil's excrement. He was certainly not referring to oil's intrinsic properties, such as its viscosity and burn content. The phrase can only be understood by examining oil abundance within the context of national politics and economic development.

The notion of oil abundance as a negative reflects the political and economic repercussions when a society engages in massive oil exploitation. A wealth of natural resources might result in poor development of the non-mineral sector of the economy, valuation of a country's currency, weakening of state institutions, and even political struggles (Karl 1997; Ross 1999; Ascher 1999; Stiglitz 2005). These consequences are part of what is called the resource curse, and they can result from the abundance of other minerals, such as diamonds, copper and gold.

It seems counter-intuitive that an abundance of a resource capable of generating growth (such as oil) or hard currency (such as gold or diamonds) could in fact be detrimental. Counter-intuitiveness raises the burden of proof for a theory to be accepted. For instance, the classical economist David Ricardo is well-known for his law of comparative advantage, which counters simplistic reasoning. Ricardo shows that when countries engage in trade (even of the same goods), they both can benefit, as long as both have different relative efficiencies. Both countries can receive benefits from trade if each specializes in what they can produce relatively better.

Resource curse theories, however, are not backed by a simple yet elegant reasoning such as Ricardo's law of comparative advantage. Instead, those theories have their strongest point in an empirical regularity: resource rich countries (measured by the share of resource exports in GDP) tend to perform worse than non-resource rich countries (Gelb 1998; Sachs and Warner 1997). It is, as Karl (1997) puts it, a *Paradox of Plenty*, a situation in which the abundance of a

given resource leads to poverty, or, at least, fails to promote development. To Sachs and Warner (1997), this is a conceptual puzzle.

As the literature on the resource curse grows, new and complex theoretical and empirical models are developed. The negative impact of resource abundance on economic performance is robust to all sorts of statistical models, control variables and samples that are used (Sachs and Werner 1997; Atkinson and Hamilton 2003; Mehlum, Moene and Torvik 2006; Torvik 2009; Morrison 2009).

In sum, by standard neoclassical economic analysis, it would be natural to expect resource rich countries to be benefited by such endowment. However, this is not found in empirical accounts. Based on that, scholars propose possible mechanisms that might lead to the resource curse, but it is yet a contentious topic in the specialized literature. The mechanisms can rely on purely economic explanations or lean to politically based causes. The latter address a range of effects that oil might provoke in a state and society. These effects vary, including fiscal largesse, patrimonialism, and perseverance of autocratic regimes. However, it should be clear that the debates are far from settled. The area is so vast that, for the purpose of this work, I focus on the Dutch Disease model for the economic based explanations.²⁴ For the political economy, I review the contributions of Karl (1977), Ross (2001), Dunning (2008), Mehlum, Moene and Torvik (2006), and Morrison (2009).

²⁴ It should be noted that one explanation of the poor growth of resource rich countries was Raul Prebisch's terms of trade or unequal exchange model. According to this Argentine economist and founder of the Economic Commission for Latin America (ECLAC), countries that exported commodities would be harmed in the long run due to a tendency of declining trade of terms when compared to those that exported industrialized goods (Love 1980). Hirschman (1958) advocated that resource exploitation provided little national growth because it lacked forward and backward linkages, thus it would be necessary to industrialize the production rather than export raw materials. A combination of those theories was behind most of the Import Substitution Industrialization (ISI) efforts in Latin America and the inward looking development. However, they lost their "appeal" due to the failures of autarkic development (Lal 1997; Sachs and Warner 1995).

2.1. The Dutch Disease Model

One of the economic explanations for the resource curse lies in the currency valuation caused by a boom in exports, a phenomenon that is normally referred to as the Dutch Disease. This peculiar name was given by *The Economist* in reference to a currency valuation in Netherlands after the discovery of a large natural gas field (van Wijnbergen 1984). The mechanism of the Dutch Disease can be described as follows: An export boom in natural resources leads to the overvaluation of the exchange rate, increase in imports of tradable goods and the relative decline of the non-resource sector. Ultimately, the boom becomes the source of economic decline as the economy more and more relies on the proceeds generated by the export of the natural resource. When the price of the exported commodity declines, the economy has to adjust to a lower consumption level and, by that time, companies that previously exported can already be out of the market.²⁵

The pattern of actions that follows from an oil boom is well known, as are the recipes to offset its potential harm. It is possible, although not easy when considering political implications, to use resource money to reduce external constraints to growth and promote necessary public investments, as suggested by Sachs (2007). Since mineral resources are dominated or highly taxed by states, a commodity boom normally leads to an enrichment of public treasury. This provides the necessary income for much needed public investment. If a country is able to invest in sound public infrastructure projects, like ports, airports, roads, and sanitation, this will reduce bottlenecks to the growth of the private sector, both creating jobs and reducing dependency on the resource revenues. Hence, the economy as a whole can benefit from a better business climate

²⁵ The model assumes full employment, which makes the booming sector of the economy drive people out of the tradable sector. This assumption, however, far from mirrors the reality in poor countries that faces high unemployment. For more criticism on that see Ross (1999).

due to an increase in competitiveness. Governments can also use oil money to boost basic health care, education and sanitation, creating spillover effects to the rest of the country by reducing diseases and providing a workforce with higher skills, and, consequently higher productivity and standards of living. The stronger the non-resource sector of the economy, the less dependent the public budget will be on the inherent instability of commodity earnings and, of course, the eventual depletion of non-renewable mineral reserves.

Furthermore, resource earnings can be redirected to a sovereign fund, thus avoiding the internalization of the income and hence the valuation of the national currency. This strategy has the additional benefit of serving as tool for the adoption of the principle of intergenerational equity. Oil extraction is a non-renewable source of revenue. Once depleted, the whole economic base built for this activity is no longer able to perform, resulting in a sharp decrease in the quality of life of those who worked in this industry or depended on its royalties. Since it is an exhaustible resource, the consumption of its rents by the current generation could endanger future consumption. Hartwick (1977) observes that there is an ethical problem when the current generation overconsumes its resources. In order to have intergenerational equity, the investment of rents from exhaustible resources should be made on reproducible capitals. This way, investments will provide revenues for future generations. Such strategy would create economic sustainability within generations by saving the resources and establishing a ceiling on the total amount that the national government can withdraw from the sovereign fund at any given time. An additional reason to use the resources in a prudent way is given by Atkinson and Hamilton (2003). They empirically show that resource-rich countries that lagged behind in growth were the ones where the wealth led to a low rate of genuine savings – the savings rate after taking into account the exploitation of the mineral resource. If properly invested, resource rents create new

wealth, thus bringing a net return. Otherwise, if used to finance current consumption, it liquidates national wealth, generating a negative genuine savings rate.

Thus, as we have seen, a resource boom is not necessarily a bad thing. There are ways in which it can be managed so as to strengthen the competitiveness of the tradable sector and provide incentives for long term savings and investment. However, the most common picture is the one described by Naím: “These boom-and-bust cycles have devastating effects. The booms lead to overinvestment, reckless risk taking, and too much debt. The busts lead to banking crisis and draconian budget cuts that hurt the poor who depend on government programs” (Naím 2009, 159). This is also in line with what Tornell and Lane (1999) calls the “voracity effect”, where windfalls are dissipated by a more than proportionate increase in government consumption and transfers during a commodity boom. In their game theoretical model, expenditures are squandered in present consumption, invested in safe but inefficient activities, or transferred overseas. This is so, they argue, because of weak institutional structures and the presence of few groups with sufficient power to extract transfers from the rest of society. The transfer of wealth to inefficient activities – such as the shadow sector – and of money to overseas accounts is justified to avoid predatory taxation or the simple confiscation of wealth. The result, through a different mechanism than the one leading to the Dutch Disease, is poor growth performance.

An economic explanation alone is not sufficient to understand the problems faced by resource rich countries. Economic explanations can describe the circumstances that they face, but to understand the outcomes it is necessary to consider political decisions. It is essential to go beyond the circumstances and analyze the decision processes, in the spirit of the Spanish philosopher Ortega y Gasset:

It is, then, false to say that in life "circumstances decide." On the contrary, circumstances are the dilemma, constantly renewed, in presence of which we have to make our decision; what actually decides is our character. All this is equally valid for collective life. In it also there is, first, a horizon of possibilities, and then, a determination which chooses and decides on the effective form of collective existence (Ortega y Gasset 1993, 48).

Ortega y Gasset captures the difference between a circumstance and the actual outcome, which depends on the individual and collective decisions. Having, thus, exposed the dilemma posed by abundant natural resources, it is time to present the ways in which societies choose to manage resource booms and the impact that their decisions have.

2.2. Political economy explanations of the resource curse

As Ross recognizes, "The failure of states to take measures that could change resource abundance from a liability to an asset has become the most puzzling part of the resource curse" (Ross 1999, 307). To put together the pieces of this puzzle, it is necessary to understand the political mechanisms that lie behind a resource abundance and which makes it become a curse.

A resource boom have more than macroeconomic effects. The exploitation of natural resources creates economic rents, a source of income with peculiar characteristics. Rents are defined as the amount actually received by a factor of production that surpasses the price that would be needed to put it into its current use. Perfect competition generates no economic rents, because any price disparity would attract a competing company, thus putting into effect the law of one price, which implies that all identical goods should have only one price. On the other hand, companies benefiting from monopoly power in the market enjoy economic rents.

Those extraordinary profits create a set of incentives that, in their turn, result in specific policy preferences that with time consolidates themselves as institutional traits. The oil industry is a capital-intensive one and offers limited employment opportunities to non-skilled workers.

Further, it is an activity that has high barriers to entry and exit. Mineral extraction normally depends upon authorization of a state government due to a tradition of public sub-soil ownership. In addition, in most countries oil extraction is presently done by a National Oil Company (NOC) or state-run company acting in partnership with a foreign oil company. Therefore, the income generated by oil exploitation is captured by the state through the tax structure as well as through the operation of a NOC.

In sum, mineral operations generate economic rents, which in turn are captured by the state (Gelb 1988). In addition, it is a capital intensive industry. Its operations are limited in the number of players and in labor opportunities. It generates a considerable amount of rents that is captured by a few actors. And this has political consequences.

The best predictor for democracy is income level. Democracies tend to have a greater rate of survival in countries with higher income rather than in poorer countries (Przeworski et al. 2000). Modernization theorists make even stronger claims. To them, economic development causes democratization (Lipset 1959; Inglehart and Wenzel 2005), although the relationship between growth and democracy is not linear and depends on cultural changes. However, a different outcome may result if the source of growth is oil money. There is a belief in the specialized literature to consider that if a rise in income is due to oil wealth the democratic effect will not take place. Ross (2001) tests the “oil impedes democracy” argument through a pooled time-series cross-national data between 1971 and 1997. He uses a measure of regime type derived using the Polity98²⁶ dataset as a dependent variable. Oil and mineral wealth are used as the main independent variables, in conjunction with a number of control variables, including the

²⁶ The data was originally compiled by Ted R. Gurr and Keith Jagers with one variable measuring democracy and another autocracy. The current version of the dataset has passed through transformations and can be downloaded at <http://www.systemicpeace.org/polity/polity4.htm>

percentage of a country's population that is Muslim.²⁷ He finds a substantial confirmation of the hypothesis of the antidemocratic properties of oil and mineral wealth.²⁸ In fact, when two variables accounting for agriculture production in the share of export earnings are added to the regression model, those two variables contribute positively to the democracy score, while oil and minerals retain their negative effects. Again, the fact that oil and minerals create rents appears to be the key explanation. Oil and minerals impede democracy, while agricultural production for export – which creates few or no rents – does nothing to encumber the democratic state. Ross also finds some empirical support to two other causal mechanisms: a repression effect, by which governments invest heavily in security forces to limit democratic pressures, and a modernization effect, which associates low rates of employment in the industrial and service sector jobs to a milder push for democracy. Moreover, Cuaresma, Oberhofer, and Raschky (2010) recently showed theoretical and empirical confirmation for the thesis that oil endowment prolongs the duration of dictatorships.

As outlined, the rents created by mineral resource extraction generate a set of incentives that lead to policy preferences. Three main concepts try to explain why these preferences emerge and are sustained, even when the policies derived from them seem to be unsustainable.²⁹ A first approach explains the bad policies as a cognitive failure, resulting from short-term wealth-induced myopia. The exuberance provided by the oil wealth would lead to reckless fiscal behavior such as grandiose spending and postponed reformist effort. Second, a societal explanation emphasizes the role of the oil rents. In this model, the rents created induce economic

²⁷ The inclusion of religion as a control is justified by the author due to the great presence of mineral wealth in countries of large Muslim population, not only in the Middle East, but also in Asia and Africa.

²⁸ There is one important caveat. The antidemocratic effect is stronger in poor countries than in rich ones. Therefore, he claims, "large oil discoveries appear to have no discernible antidemocratic effects in advanced industrialized states, such as Norway, Britain, and the U.S., but may harm or destabilize democracy in poorer countries" (Ross 2001, 343-344).

²⁹ A more complete description of these different views can be found in Ross (1999).

agents to compete for political favors enabling them to accrue wealth independently of productivity, an inefficient allocation, sanctioned by the political power, which results in poor growth. Lastly, a combination of the previous explanations in addition to institutional arguments – such as cultural tradition and the degree of expected accountability – can be grouped as state-centered explanations (Ross 1999). All those theories try to explain the resource curse using political mechanisms.

Karl (1997) provides a balanced work that combines economic, political, and historical analysis of mineral wealth and the contemporary configuration of what she calls Petro-States. In her view, the Dutch Disease model is not sufficient to explain the development outcome in oil abundant countries because it does not address the underlying political and institutional processes that bar necessary readjustments. It is, therefore, necessary to study the decision framework that prevents the adoption of a vaccine to the oil disease. In Karl's argument, the way the state is financed matters for the range of policies adopted:

Commodity-led growth induces changes in the prevailing notions of property rights, the relative power of interest groups and organizations, and the role and character of the state vis-à-vis the market. These institutional changes subsequently define the revenue basis of the state, especially its tax structure. How these states collect and distribute taxes, in turn, creates incentives that pervasively influence the organization of political and economic life and shapes government preferences with respect to public policies. In this manner, long-term efficiency in the allocation of resources is either helped or hindered, and the diverse development trajectories of nations are initiated, modified, or sustained (Karl 1997, 7).

Oil wealth generates a set of incentives that constrains the range of options available to policymakers. In this path dependent model, the impact of decisions made in the past continues and constrains future alternatives. The result would be more institutional rigidity, which is

sustained by the interest groups that have a stake in the current set of policies. Inefficient institutions might prevail due to lack of contestation or necessary incentive to change.

And what might freeze an institutional arrangement even if it produces growth-impeding results? Again, the causal link is the way a state is financed. Different sources of revenue (agricultural production, foreign aid, international borrowing, remittances, etc.) impact on the ability of a state to finance its existence and offer services. Therefore, according to Karl, countries that are financed via oil export earnings should share common characteristics.³⁰ One of those common characteristics is the incentive provided by a boom to sustain current economic trajectories, but at a faster pace, using the easy money provided by oil. In a Petro-State there is encouragement to seek a privileged position in the distribution of rents. In this manner, political support is more easily accumulated by the distribution of favors rather than statecraft and long term planning. Gaining political support through favors to certain groups is not unique to oil rich countries. The difference is that, in one case, a politician can use oil rents and, in the other case, he would need to spend money from taxation, for instance, which entails more accountability and public pressure. In fact, Karl limits her analysis to countries where the share of oil production in the GDP and the share of export earnings makes petroleum the center of economic accumulation. In the period analyzed, most of the oil rich countries used the windfall to finance big industrialization projects, but none succeeded in making their country less dependent on oil.

A different explanation is proposed by Dunning (2008), who creates a formal model to explain the variation found in resource rich countries. He challenges the idea that resources must

³⁰ In her analysis, countries that are similar in their source of government revenue should share common characteristics that limit the range of choice of its policymakers. However, she adds, “this should be true unless significant state building has occurred *prior* to the introduction of the export activity” (Karl 1997, 13, emphasis in the original). In this exception lies the idea that institutional development cannot or at least only implausibly will reverse back due to an oil boom. This is a key variable for the analysis of Brazil, a country that already has a strong bureaucracy and will emerge as oil exporter but, until recently, has never financed its activities by oil money.

promote autocracy and proposes a mechanism where resource rents may promote democracy rather than authoritarianism. Citing as examples Venezuela, Bolivia, Ecuador, Chile, and Botswana, Dunning's analysis illustrates how resource abundance can have authoritarian or democratic effects, depending on certain conditions (such as level of inequality on the non-resource sector of the economy). He recognizes that, given the current knowledge of the field, the concept of "crude democracy" – a democracy sustained by oil wealth – is counterintuitive.

To Dunning, resource wealth and democracy can coincide in a country with high inequality because the elite feel less threatened by a democratic state if that state can finance itself by oil rents rather than taxes. If there is oil money to be used in public spending, there will be less pressure to redistribute (via taxation) the wealth of a selected few.

In the same spirit of Dunning's dual effect model, Mehlum, Moene and Torvik (2006) see differing results of resource abundance depending on the prevailing institutional arrangement. In countries with weak institutions, resource abundance leads to poor economic growth. In contrast, institutionally stronger countries are better able to mitigate the effects of resource abundance. In the first case, the institutional arrangement is "grabber friendly," moving scarce entrepreneurial resources from productive to unproductive activities, such as rent-seeking. Countries with stronger institutions are "producer friendly," where entrepreneurs have incentives to remain on the productive side of the economy. Most significant to this analysis of Brazil as an emerging oil exporter, is their assertion that "natural resources put the institutional arrangements to a test, so that the resource curse only appears in countries with inferior institutions" (Mehlum, Moene and Torvik 2006, 3).

Morrison (2009) tells an additional story of the relationship between easy money and politics. He sees oil as a main source of nontax revenues to governments, a way that

governments can be funded without resorting to increased taxes. Oil is a major part of nontax revenues, but foreign aid can also fall into this category. To some countries, like Bhutan, Bahrain, Congo and Iran, nontax revenues can account for more than 80% of the total government expenditure. The raise in this type of revenue would stabilize the regime in power – regardless of whether the regime is a democracy or a dictatorship. He reports consistent results to back his analysis. In the case of oil rich countries that are today democracies, Mexico, for example, Morrison warns that a rapid depletion of resources might result in future political instability. The difference would be that in democracies nontax revenues leads to lower taxation of elites, while in dictatorships nontax revenues are associated with increased social spending.

Since mineral abundance can show different results according to the institutional framework of a country, case studies are valuable to understand how windfalls were used in each society. To make clear what is meant by institutions, it is helpful to use Douglas North's explanation (North 1991). Institutions are the rules of the game in which a society interact. They can consist of formal rules, like laws, or arise from informal constraints, such as customs and traditions. Together, these constraints establish order and reduce uncertainty in exchange. Obviously, different institutions lead to different outcomes. Some of them are more open to impersonal exchanges, leading to a reduced transaction cost, raising the gains from trade. In others, personal ties, clan or party affiliation are key determinants in succeeding economically. As North says, “[i]nstitutions provide the incentive structure of an economy; as that structure evolves, it shapes the direction of economic change towards growth, stagnation, or decline” (North 1991, 97). Since institutions are composed of both formal and informal constraints, the simple enactment of what is considered to be a good law in one country might not be applicable to a different set of countries. As Hayek notes (1973), the basic order of a society cannot entirely

rest on design. In fact, a society is largely organized by rules coming from the interaction and shared knowledge of individuals, giving form to what he called spontaneous order. “Many of the institutions of society which are indispensable conditions for the successful pursuit of our conscious aims are in fact the result of customs, habits or practices which have been neither invented nor are observed with any such purpose in view” (Hayek 1973, 11).

For the purpose of case study analysis, I will briefly summarize the experience of the most praised case of oil wealth management, Norway, and the two most oil-rich Latin American countries, Venezuela and Mexico.³¹

2.3. Barrels are not a destiny: the experiences of oil wealth management of Norway, Venezuela, and Mexico

Like Brazil, the Norwegian government controls licensing of exploration and production, as well as owns the oil company (Statoil) operating the majority of their oil fields. However, Norway’s oil rents are deposited in a sovereign wealth fund. This fund, in turn, invests in financial markets outside of Norway. The government is allowed to withdraw no more than 4% of the fund each year. To illustrate Norway’s sovereign fund, Listaugh uses the image of “a fast growing cake that voters cannot eat” (2005, 839). Despite a population of less than five million inhabitants, Norway produces almost the same quantity of oil per day as Brazil, whose population hovers 192 million people. The Norwegian model addresses the issue of Dutch Disease by investing its rents abroad, thus reducing the valuation of its currency. Its example of converting the principle of intergenerational equity into public policy is unmatched.

³¹ A thorough case study work – encompassing Algeria, Ecuador, Indonesia, Nigeria, Trinidad and Tobago, and Venezuela – can be seen in Gelb (1988).

Venezuela followed a very different pattern. In this Latin American country, oil exploration began in the 1920's and had a profound impact on the development of the country's institutions. Since the 1930's, the belief that oil should be used to foster different economic activities was defended, an idea known as "sow the petroleum." Venezuela, like most of Latin America, adopted Import Substitution Industrialization (ISI) in the second half of the 20th century. However, because of the lack of clear performance guidelines, inefficient companies were sustained only by the protective tariffs imposed by the state (Di John 2009). This led to the creation of incentives for rent-seeking behavior; companies could bid for governmental favors which were available thanks to a treasury full of oil money. In fact, for a time there was a belief that the Venezuelan government could accommodate as many demands as possible. According to Di John (2009), Venezuela successfully used oil money to finance the early stages of import substitution effort. However, the second phase of ISI, which demanded more selective deployment of subsidies, failed due to political constraints. In Di John's evaluation, between 1968 and 2005, Venezuela was a consolidated state with fragmented political organizations. Political contestation became increasingly more clientelist, populist, and polarized. In this scenario, oil money was siphoned to economically unproductive – but politically important – activities.

The failure of the ISI along with the lower price of oil between late 1980's and 1990's led the Venezuelan government to switch from a heavy state interventionist model to liberal reforms. This was, however, unsuccessful and resulted in political turmoil that ultimately led to the rise of current president Hugo Chávez. He has been gradually turning his country toward what he calls the "Socialism of the 21st Century." Nonetheless, Venezuela's oil dependency has increased while the efficiency of PDVSA has diminished drastically (The Economist 2008). The internal

price of gasoline has been historically highly subsidized by the government and this deprives the state of income that could be used for public investments. Moreover, the gasoline subsidy creates an incentive to perpetuate old and inefficient vehicles, thus stimulating reckless environmental behavior and increasing the air pollution (Ascher 1999).

Mexico is another example of a Latin American country that considered oil money as a channel to promote ISI-style development. In the 1920's, Mexico began a massive oil exploration program. As early as 1925, through the Petroleum Law, oil production received priority over all other land uses, resulting in conflicts regarding land tenure, companies, and workers unions (Santiago 2006). Initially led by foreign companies, oil exploitation was nationalized by President Lazaro Cárdenas in 1938. The public company *Petróleos Mexicanos* (PEMEX) emerged as the icon of Mexico's industrialization hopes and the workers of PEMEX were "regarded as the aristocracy of labor in Mexican popular perception" (Santiago 2006, 353-354). However, similarly to Venezuela, the high hopes of economic structural change that prevailed during the two oil shocks of the 1970's and early 1980's were substituted with a state of depression following the oil price collapse of the mid 1980's. The mirage of easy oil money led to reckless spending, equally financed by external borrowing. In 1982, Mexico defaulted on its external debt. At that time, PEMEX was also accused of corruption: awarding exploration contracts without competitive bidding and using non-transparent accounting (Ascher 1999, 203). Nonetheless, Mexico even today relies on its oil resources to raise 30-40% of fiscal revenues and is still vulnerable to short-term fluctuation of oil prices (OECD 2009). Furthermore, the rate of production is declining due to depletion of fields.

2.4. Putting theories to a test: The case of Brazilian municipalities

This chapter summarizes major contributions in the growing field of the resource curse, including the economic explanation of the Dutch Disease and the political mechanism in which oil can influence institutions in a country. It shows that oil wealth can be beneficial if properly managed, as suggested by Sachs (2007) and earlier by Hartwick (1977), but that the most common reality involves wealth squandered in rent-seeking activities.

In Karl's opinion, if significant state building occurred prior to massive mineral export activity, the common characteristics found in Petro-States may not arise. Mehlum, Moene and Torvik (2006) also consider institutional quality – classified as either “grabber friendly” or “productive friendly” – as the key variables to explain the variance between resource rich countries. For the case in analysis (Brazil as an emerging oil exporter), the outcome is yet unknown. But this work proposes to apply the theories discussed in this chapter to Brazilian municipalities, which according to the 1988 Constitution, are positioned as federal entities. These municipalities in particular benefited from the Petroleum Law of 1997 with an increase in royalties and the creation of the Special Participation Tax. The growth of the oil industry during this period allowed an escalation in the number of municipalities receiving a tax charged on oil activity, from 15.3% in 2000 to 20% in 2009, and more than R\$ 22 billion in royalties alone in this period.³² This allowed an enormous transfer of wealth to municipalities that could, with few restrictions, dispose of the money unreservedly. How did this windfall revenue impact key institutional aspects of these benefited municipalities? The next chapter measures that by analyzing the compliance to a law of fiscal transparency. Is there an “oil effect” on fiscal

³² Amount corrected for inflation in the period by the National Consumer's Price Index (INPC). The amount, as of April 2010, would be equivalent to a little less than US\$ 13 billion, and does not include the Special Participation Tax.

transparency? And, if so, what can we learn about the future of Brazil when the pre-salt reserves are developed to their full potential?

Chapter 3

FISCAL TRANSPARENCY IN BRAZILIAN MUNICIPALITIES

As previously discussed, the oil industry is still growing in Brazil and the country is becoming an important player in the global oil economy. This implies increased oil production as well as the resulting additional public resources. In a country that, like Brazil, is highly unequal and has high levels of social and public infrastructure needs, this is potentially a remarkable proposition. However, as noted in the second chapter, development and abundance of mineral resources do not necessarily go together – the opposite is, in fact, more close to the international reality. Institutional traits play a major role in the way oil rents are used. It is thus important to analyze how this wealth has been consumed and how it affects the behavior of the Brazilian municipalities, many of which have been the recipient of enormous resources (both in absolute and relative to the size of their economy) from oil royalties.

The changes introduced in the Petroleum Law of 1997 brought competitive pressures to the Brazilian National Oil Company. Foreign and new local companies entered the oil market competing with Petrobras. The law also brought changes to the tax structure, raising the government take in the oil revenues. In addition, it kept a highly decentralized distribution of oil resources among states and among municipalities that either produce oil or are affected by oil operation. The Petroleum Law of 1997 kept the distributing rule for the 5% royalties that existed in the previous legislation, and created another 5% charge with a new distribution plan. Each arrangement is different for onshore and offshore production. The first 5% of royalty cannot be

used to hire permanent staff, while the rest can be disposed of almost freely by the administration.³³

The change in the amount of oil rents and the way those rents are distributed can be considered a quasi-natural experiment for the purpose of analyzing the performance of municipalities. The discovery of oil, the rate of production of a single oil field, and, consequently, the distribution of royalties to the municipality in which these activities take place are exogenous to any social, economic, or political characteristics of the municipalities. Therefore, oil recipient municipalities were neither originally responsible for the changes in the legislation nor could they affect the amount of royalties that were distributed. This amount is a quantity that fluctuates according to the international price of oil, the output of oil production, and the decision of private companies in allocating their exploratory efforts, which includes geological risk.³⁴

In addition, the discovery of oil and the rate of production of a single field are exogenous to each municipality. In fact, some municipalities are oil recipients by a stroke of luck, for

³³ For onshore oil, the first 5% royalty level is distributed as follows: Producing states, 70%; Municipalities, 20%; Localities that host loading and unloading oil and natural gas installations, known as affected localities, 10%. For offshore oil: States, 30%; Municipalities fronting producing areas, 30%; Ministry of Navy, 20%; Special Fund, a fund that distributes the revenues to all states and municipalities, 10%. For the additional 5% royalties, in the case of onshore oil, the distribution is: Producing states, 52.5%; Ministry of Science and Technology, 25%; Producing municipalities, 15%; Affected municipalities, 7.5%. For offshore oil, the additional 5% royalties are distributed in the following way: Ministry of Science and Technology, 25%; States fronting production areas, 22.5%; Municipalities fronting production areas, 22.5%. In the case of the windfall profit Special Participation Tax – also a creation of the Petroleum Law of 1997 – 40% goes to the Ministry of Energy, 10% for the Environmental Ministry, 40% to producing states, and 10% to municipalities fronting production areas. See the Presidential Decree No 2,705/1998, available at http://www.planalto.gov.br/ccivil_03/decreto/D2851.htm and Bregman (2007, 38), Carvalho (2008), and Afonso and Castro (2010).

³⁴ When the Petroleum Law was approved in 1997, oil production in Brazil was not a significant source of public revenue, and there no expectation that within a decade the country could be on the edge of being an oil exporter. Therefore, during the parliamentary debates that led to the Petroleum Law, the issue in focus was the end of the monopoly of Petrobras – something that was deeply opposed by nationalists and leftists parties – with little attention devoted to the way the rents would be distributed.

happening to confront a field located kilometers away in the ocean, as happens in offshore oil production (Serra 2007).

Hence, oil recipient municipalities provide an adequate testing ground to explore the impact of oil windfall on local government performance in Brazil. In fact, the literature in this area is burgeoning. Bregman's work (2007) analyzes the creation and the distribution of oil royalties in Brazil. Afonso and Gobetti (2008) show how this wealth is being spent in the municipalities that receive significant oil royalties. They point to the fact that the criteria used to distribute the wealth does not follow an intergenerational equity principle and they propose a new distributional plan. Postali (2009) shows that oil recipient municipalities were not able to transform this wealth into an increase in GDP. In fact, according to his results, those municipalities which received royalties grew less than those which did not receive royalties.

In this study, to examine fiscal transparency, I explore the exogenous distribution of oil royalties to Brazilian municipalities by analyzing their compliance to a law that obliges full fiscal disclosure. This chapter will provide a model for this type of analysis, as well as link fiscal transparency with measures of political awareness and competition, like voter turnout and candidates per seat for the position of councilman. It suggests that fiscal transparency and political competition are valuable proxies to institutional change.

In doing this type of analysis, this paper follows the literature that links government transparency to accountability. Rose-Ackerman recommends reforms that increase the transparency level as a way to increase the "accountability of government operations and facilitate the organization of independent watchdog groups" (1999, 228). Bueno de Mesquita et al. (2003) consider transparency as a core public good by allowing citizens to have information about what and how the government is doing. They analyze data from tax revenues that are

reported to international organizations. Undemocratic governments regularly failed to report tax data. The authors conclude that “less democratic, smaller-coalition systems consistently engage in less transparent governance” (2003, 183). Similarly, Rosendorff and Vreeland (2006) employ the method of analysis of missing data to assess transparency level. They use the values reported to the World Bank’s *World Development Indicators* like inflation and unemployment, to distinguish between the transparency level found in democracies and in dictatorships. Their results show that data are not randomly missing. The distribution of missing data on economic performance can be explained by level of economic development, international surveillance, and political institutions. Because of this, the authors suggest “missing data may also be a phenomenon worthy of explanation” (2006, 28).

3.1. Electoral competition and fiscal compliance

Local elections in Brazil are expected to be competitive at all levels, including small towns. In fact, the turnout rate for local elections, where the voter has only to pick a mayor and a councilman from an open list of proportional representation, is very close to the turnout observed in general elections.³⁵ That is displayed in Table 3.1:

Table 3.1. Turnout rate in Brazil - 1998 to 2008

Year	1998	2000	2002	2004	2006	2008
Turnout rate	78.52%	84.00%	82.28%	85.81%	83.27%	84.36%

Note: 1998, 2002, 2006 were years of general elections, all others were local elections

Source: TSE, IPEADATA

³⁵ Presidential elections coincide with gubernatorial and parliamentary elections in Brazil and vote is mandatory. However, the regular punishment for not voting is almost symbolic in pecuniary amount and can be avoided by justifying the abstention in the election day or afterwards. In addition, a recent poll showed that 81% of the respondents said that they would vote even if it was not mandatory (DataSenado 2011). Figueiredo, Hidalgo, and Kasahara (2010) demonstrate with a randomized field experiment in Brazil that turnout rates vary under certain conditions, such as availability of information about corruption of candidates.

The Constitution of 1988 elevated the municipality to the position of a federative entity and decentralized many administrative tasks. Municipalities are important providers of public infrastructure as well as social goods, such as basic health care and primary education. In many poor regions, especially in the Northeast, municipalities are also the main employer of the town.

Authors who address the quality or the prioritization of expenses in oil rich municipalities, such as Afonso and Gobetti (2009) or Bregman (2008), have to rely on the compliance of these municipalities sending their fiscal data to the central government. The Federal government collects and publishes the fiscal data of all Brazilian municipalities, according to a transparency law. The compliance is high, with 75% of the municipalities complying all years, 16% missing just one year, and the remaining 9% spreads between two (4.5%) to ten (0.01%) municipalities missing data for the period of 2000 to 2009. However, a more meticulous analysis on this data set reveals that the missing values are not random. Each municipality chooses not to report its fiscal data and may be penalized in doing so. Are oil rich municipalities more prone to hide their incomes and expenses?

3.2. Data

The data used in this paper comes from five different sources. Data for electoral results and political competition are from the Superior Electoral Court (TSE) and cover the elections of 1996, 2000, 2004 and 2008. Oil revenues data come from the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP), the regulatory agency responsible for establishing the amount of oil royalties and the municipalities entitled to receive it.

The third data set comes from the National Treasury Secretariat (STN), which compiles fiscal data for all municipalities and publishes it in the FINBRA database.³⁶ Each municipality is required by law to report their accounting numbers to this branch of the federal government. Over the years, the information available by STN has become increasingly more detailed and less disaggregated. The database includes (but is not limited to) overall budgets, the amount of taxes collected by municipalities, transfers from the Federal Government and State Government, as well as the areas and subareas of expenses. If every municipality always reported their fiscal data to the STN, ANP's data would not be necessary as an additional source; the amount received as oil royalties would be present in the STN's database. Since ANP independently collects and reports the amount of royalties paid to each municipality, examining ANP's data will reveal if a municipality received oil money and did not report their fiscal information to the STN. Population and GDP estimates are from The Brazilian Institute of Geography and Statistics (IBGE). Oil prices are from BP's Statistical Review of World Energy 2010. In this analysis, 5,561 municipalities were examined.³⁷

3.3. A matter of transparency

Every Brazilian municipality is required to send its fiscal information to the central government. In its annual report, STN stresses that this is a requirement present in the Law N° 4.320/64 and, more recently, in Article 51 of the Supplementary Law 101, enacted in May 4,

³⁶ The database is available at http://www.tesouro.fazenda.gov.br/estados_municipios/index.asp

³⁷ The list excluded three municipalities, Pinto Bandeira (RS), Nazária (PI), and São Vicente Ferrer (MA). The first municipality was emancipated in 2001 and in 2003 was annexed back to the city of Bento Gonçalves (RS). Nazária, was only recognized as a municipality in 2005, and the first election was held in 2008. São Vicente Ferrer is the only case of having not reported fiscal information in any given year. Therefore, these three municipalities would not provide proper data or reflect a typical behavior of Brazil's municipal public finances.

2000. The latter is clear on the obligation of submitting the information and the penalties incurred by the lack of transparency:

Article 51.

By June 30, the Federal government's Executive Branch must consolidate the accounts of the Federation entities for the previous year, at the national level and by sphere of government, and disclose them, including the use of publicly accessible electronic media.

§ 1. The States and Municipalities must submit their accounts to the Federal government's Executive Branch on the following dates:

I – Municipalities, by April 30, with a copy to the Executive Branch of the respective State;

II – States, by May 31.

§ 2. Failure to comply with the deadlines set in this article will impede the member of the Federation, until the situation is normalized, from receiving voluntary transfers and entering into credit operations, except for those aimed at refinancing the indexed principal of securities debt.³⁸

The implementation of the law is done in partnership with the state-owned bank Caixa Econômica. Municipalities send their information to this bank where it is consolidated and sent on to STN. Caixa works closely with municipalities in transferring federal money and in managing social programs, including the very popular Bolsa-Família, a conditional cash transfer (CCT) program. The bank describes itself as “the main agent of public policy for the federal government,” prioritizing sectors such as “housing, sanitation, infrastructure and services” for the promotion of “urban development and social justice in the country” (CAIXA 2011).

The Supplementary Law 101, known as the Fiscal Responsibility Law, was a landmark in the public finances of Brazil and is generally regarded as successful legislation (Lienert 2010). It created penalties for the mismanagement of public money and targets for transparency. Despite this attempt to temper misuse of funds, Brazil is still regarded as a very corrupt country. In the Corruption Perception Index, by Transparency International (2010), the country occupies the 69th

³⁸ The text of the law is available at http://www.planalto.gov.br/ccivil_03/Leis/LCP/Lcp101.htm and a translated version is available at the World Bank website: <http://www1.worldbank.org/publicsector/pe/BudgetLaws/BRLRFEnglish.pdf>

position, behind Rwanda (66th), Ghana (62nd), and Turkey (56th) to name a few. However, a very different picture is presented in the Open Budget Index, prepared by the International Budget Partnership (IBP). Brazil ranks in 9th in their index. Surprisingly, in this scale, Brazil is ahead of South Korea (10th), Germany (12th), and Spain (17th), among others (IBP 2010). According to IBP, budget transparency helps build checks and balances into the budget process, helps the prioritization of policy decisions, and limits corruption and wasteful spending (IBP 2010).

The transparency requirement in Brazil was recently made more stringent. In May 2009, the Complementary Law n° 131 was approved by Congress and signed by the president. This law's only purpose is to increase the transparency level in the budget process.³⁹

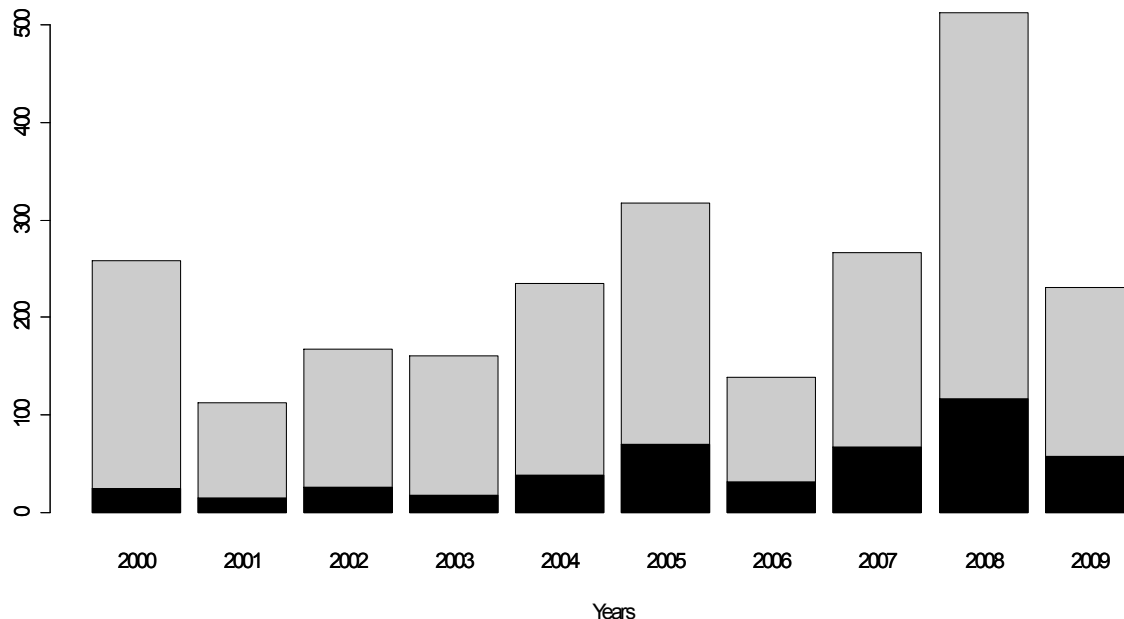
Non-transparent municipalities still receive mandatory transferences of money, including their share of the Income Tax (IR) and if the main State Tax (ICMS). In the Brazilian tax structure, most of the municipalities rely on those transfers to finance their activities. Very few use their own taxing capabilities – such as the taxing of services (ISSQN) and of land (IPTU) – as a significant source of income. In the period of analysis, the average share of municipalities' aggregate taxation in their overall budget was 5.7%; and it never exceeded 6.3%.⁴⁰ The transfers of oil royalties fall in the mandatory category. If oil rich municipalities do not comply with transparency requirements, it will not harm their ability to receive their share of taxes or of oil royalties, the latter of which is not available to the majority of municipalities. Therefore, since they lack access to the windfall profits associated with oil revenues, the group of municipalities

³⁹ The bill established a timeline for publishing on the internet, in real time, detailed information about the budget of every town. Municipalities with more than 100 thousand inhabitants had one year to adopt real time disclosure; those with population between fifty thousand and one hundred thousand had two years; and those with less than fifty thousand inhabitants had four years. This real time disclosure should display any payment to contractors, including what was supplied and the public bidding number, and any income received by the municipality. The text of the bill is available at http://www.planalto.gov.br/ccivil_03/Leis/LCP/Lcp131.htm

⁴⁰ Individual cases can vary considerably. São Paulo (SP), for example, finances its budget with over 40% of local taxes, while Recife (PE) and Porto Alegre (RS) uses around 30%. Some small municipalities, in selected years, show less than 1% of the budget coming from local taxation.

that do not receive oil royalties has the incentive to be more transparent and obtain voluntary transfers from the Federal Government. Figure 3.1 below shows the total amount of non-transparent municipalities per year, with the share of oil recipient municipalities highlighted in black. In 2000, oil recipient municipalities occupied less than 10% of non-transparent municipalities. In 2009, they were responsible for one quarter of the missing values in the STN/FINBRA database.

Figure 3.1. Participation of oil municipalities (in black) in the total number of non-transparent municipalities



3.4. The model

In order to estimate the effect of oil royalties in the compliance with fiscal transparency requirements, I apply a logit model with fixed effects for municipalities using panel data from 2000 to 2009 (T=10, N=5,561). The option for fixed effects is to account for possible omitted variables, due to the large heterogeneity of municipalities in Brazil and regional differences. Additionally, the use of fixed effects is favored by the fact that there is at hand a balanced panel

and a time span that allows such estimation.⁴¹ Pooled data makes no distinction between observations in time and space. Using pooled data with a simple logit regression would result in assuming a common baseline for all municipalities. As Green, Kim and Yoon (2001) contend, pooled cross-sectional data may lead to more biased results.⁴² That notwithstanding, I present estimates using pooled data, as well as another variable for oil dependency. This can be seen as a robustness check of the main results.

The dependent variable is compliance with the fiscal law (the act of sending fiscal data), and the key independent variable is a dummy for receiving oil money in the given year. Controls are used for population, turnout, number of candidates per seat for the position of local councilman, municipal GDP, royalties per capita, proportion of the budget that comes from local taxation and year.

The population is added to capture the diversity of the civil society present in the municipality. A bigger municipality lends to a more diverse population background and to the existence of a free press that acts as a check on the local power. In addition, a larger municipality would also host law enforcing agents, like judges and prosecutors, as well as non-governmental organizations (NGOs). Therefore, the expectation is that a larger population is associated with more transparency.⁴³

Turnout and candidates per seat are added as a measure of political engagement or awareness. A high voter turnout would lead to an expectation that the actions of the local power

⁴¹ A Hausman test (1978) rejected the applicability of using random effects for this estimation.

⁴² Green, Kim and Yoon (2001) exemplifies this bias with a pooled OLS of trade levels between India and China – taking into account population size, GDP, and shared borders. The pooled model leads to overestimation of the actual trade between these two countries, because it fails to take into account the Himalayas, linguistic dissimilarities, etc. Similarly, the same model with pooled data underestimates trade between Belgium and Switzerland. They argue in favor of the use of fixed effects to minimize estimation problems.

⁴³ An alternative measure to population size would be GDP. However, the data lacks one year of observation – the municipal GDP is only available up until 2008, which makes the panel shorter. An additional problem is that a municipality can have a high GDP yet have a small civil society. That can occur, for example, when a town hosts a large factory but has a small population.

are being followed closely, which would make lack of transparency more difficult to sustain and more likely to be detrimental to the administration, thus punishable at the ballot. Likewise, a high ratio of candidates per seat for the position of councilman also indicates a degree of political competition and interest. A councilman in Brazilian municipalities receives a very competitive salary and, among his duties, is to approve the local budget. A high turnout and a high ratio of candidates lead me to a belief that a municipality is expected to be more transparent.

To estimate how the impact of the amount transferred affects the behavior of the municipality in terms of fiscal compliance, the ratio of a municipality's self-taxation to its total budget is used as an additional independent variable.⁴⁴ Because transferences of money make the largest share of a municipal budget in Brazil, a municipality can raise additional money by taxing services and properties. If the aforementioned ratio is low, and a municipality is more prone to hide fiscal information, then oil royalties would be one of the mechanisms leading to less accountability. Since revenues from oil production are transferred instead of being taxed locally, it decreases the ratio of local taxation divided by the total budget.⁴⁵ This effect would also be consistent with resource curse theories that link low taxation (made possible by the existence of windfall revenues) with less accountability of those in power. Moreover, Brollo et al. (2010) found evidence that an increase of transfers of money from the central government to

⁴⁴ Bregman (2007) and Fernandes (2007) use royalties *per capita* to rank the importance of oil money in public finance, particularly in municipalities in the state of Rio de Janeiro. I do not include it because royalties *per capita* is collinear with the oil dummy – only municipalities that received oil royalties would also show a value for royalties *per capita*. In addition, oil royalties is one source of revenue that allows municipalities to fund themselves without resorting to taxing its inhabitants, a measure that I capture through the variable self-taxation.

⁴⁵ For a given year in which a municipality did not send fiscal information, a value was input based on the mean for all reported values. Since the value is a proportion of taxation over total budget, I do not expect this procedure to bias the result. This proportion tends to be stable among the years considered, and 97% of the municipalities reported at least six years, with 91% of them reporting eight years.

municipalities in Brazil raised the corruption rate, as revealed by a national anti-corruption audit program.⁴⁶

The model is presented below:

$$y_{it}^* = \tau D_{it} + x'_{it}\beta + \mu_i + \delta_t + \varepsilon_{it}, \quad (1)$$

where y_{it}^* is a latent variable such that

$$y_{it} = \begin{cases} 0 & \text{if } y_{it}^* < 0 \\ 1 & \text{otherwise} \end{cases}$$

and D_{it} is a dummy variable defined as 1 for oil recipient in time t for municipality i , $x'_{it}\beta$ is a vector of covariates, μ_i is a municipality fixed effect, δ_t is a time fixed effect and ε_{it} an error term. The marginal effect is given by the equation:

$$\begin{aligned} \text{Effect}_i &= \Pr_i(y_{it} = 1 | D_{it} = 1) - \Pr_i(y_{it} = 1 | D_{it} = 0) \\ &= F_i(\tau + x'_{it}\beta + \delta_t) - F_i(x'_{it}\beta + \delta_t), \end{aligned}$$

where F_i is a conditional logit function that is defined as:

$$P(y = 1) = \frac{e^{\tau D_{it} + x'_{it}\beta + \mu_i + \delta_t + \varepsilon_{it}}}{1 + e^{\tau D_{it} + x'_{it}\beta + \mu_i + \delta_t + \varepsilon_{it}}}.$$

3.5. Results

In table 3.2, the marginal effects estimated via equation (1) are presented for four models considered:

⁴⁶ Their assessment did not cover the transfer of oil royalties, but the *Fundo de Participação dos Municípios* (FPM), an automatic federal transfer that is distributed to every municipality according to constitutional rules.

Table 3.2. Fiscal compliance – fixed effects

	Model 1	Model 2	Model 3	Model 4
Oil dummy	0.16** (0.051)	0.11*** (0.031)	0.078* (0.035)	0.107** (0.036)
Log of Population	-0.088 (0.073)	-0.061 (0.054)		
Turnout	-0.196 (0.118)	-0.079*** (0.014)	-0.327*** (0.074)	-0.138*** (0.018)
Councilman per seats	-0.017* (0.007)	0.013*** (0.001)	-0.010*** (0.001)	0.019*** (0.001)
Oil price		0.003*** (0)		0.003*** (0)
Self-taxation	-0.89*** (0.241)	-0.580*** (0.101)	-0.297* (0.102)	-0.436*** (0.086)
Dummies for municipality	YES	YES	YES	YES
Dummies for year	YES	NO	YES	NO
Log likelihood	-3780.0427	-3845.6558	-3849.3412	-3981.6065

Dependent variable: dummy for fiscal compliance

Bootstrapped standard errors in parentheses

p-value: * 0.05 , ** 0.01, *** 0.001

The first model shows, with high significance, that receiving oil rents raises the chance of not-transparency by 16 percentage points. All other variables appear with negative signs, meaning that, as expected, oil resources is the only factor among those considered that contributes to non-transparent behavior by the municipalities. The self-taxation value shows a high significance and magnitude. An increase of 10 percentage points in the ratio of self-taxation over total budget increases the chance of being transparent by 8.9 percentage points. For example, Campos dos Goytacazes (RJ), with a mean self-taxation ratio of just 5%, did not send fiscal data for five of the ten years analyzed. The city of Rio de Janeiro (RJ), which also benefits from oil rents, has a mean self-taxation ratio of 37% and has submitted their fiscal data for all ten years.

In the second model, I added the international price of oil. The crude price is correlated with the amount of oil royalty distributed among the recipient municipalities and is exogenous to the municipal administration. In this specification, the controls for year were dropped due to collinearity – the yearly price of oil is the same for every municipality, thus making impossible to control for year. The oil dummy keeps its significance and the expected sign; oil price (and hence more royalties) increases the likelihood that a municipality will fail to publicize its fiscal information. Models 3 and 4 are alternative specifications, dropping population size (Model 3) and adding oil price without the control for population (Model 4). The main results are the same. The effect of the variable councilman per seat is reversed once year controls are dropped. However, all other variables show signs in line with our theoretical expectations. In particular, the oil dummy proves to be significant in all specifications, including the ratio of self-taxation. Population size did not achieve statistical significance and turnout was significant in three of the four models.

Using pooled data increases the degrees of freedom, while the fixed effects reduce it by adding a dummy variable for each municipality. The pooled data shows more statistically significant results. Again, the oil dummy is positively associated with lack of transparency, but at a lower magnitude. Voter turnout, ratio of councilman per seat, and self-taxation are all significant and have signs in line with the model using fixed effects. Councilman per seat changes sign when the controls for years are removed, similar to what happened in the estimation using fixed effects. Population size, however, appears associated with less accountability, the opposite sign when used with fixed effects.

Table 3.3 shows results from the pooled data:

Table 3.3. Fiscal compliance - pooled data

	Model 1	Model 2	Model 3	Model 4
Oil dummy	0.008*** (0.002)	0.008*** (0.002)	0.012*** (0.002)	0.011*** (0.002)
Log of Population	0.006*** (0.0007)	0.0059*** (0.0007)		
Turnout	-0.089*** (0.013)	-0.0108*** (0.002)	-0.144*** (0.008)	-0.022*** (0.002)
Councilman per seats	-0.005*** (0.001)	0.0014*** (0)	-0.004*** (0.001)	0.002*** (0.0002)
Oil price		0.0005*** (0)		0.0004*** (0)
Self-taxation	-0.421*** (0.027)	-0.4617*** (0.026)	-0.346*** (0.024)	-0.395*** (0.02)
Dummies for municipality	NO	NO	NO	NO
Dummies for year	YES	NO	YES	NO
Log likelihood	-9061.9287	-9164.2422	-9180.401	-9427.3166

Dependent variable: dummy for fiscal compliance

Bootstrapped standard errors in parentheses

p-value: * 0.05 , ** 0.01, *** 0.001

The opposite result for population may arise from the difference between using the data as pooled rather than of fixed effects. Green, Kim and Yoon (2001) show a similar case for bilateral trade. Regression on the pooled data showed the log of population reducing the log of trade, while when estimating by fixed-effects the opposite result was obtained, and both coefficients were highly significant. Since population was not significant in the fixed effects estimation (Table 3.2), it raises doubts as to its merit as a good control for such cases.

As a third check, I replace the oil dummy with a measure of the importance of oil royalties in the local budget. The share of royalties in the budget captures how much the

municipality is financed through transfers of oil royalties.⁴⁷ This variable gives us the degree of importance that this source of revenue has to each individual municipality. The first model of Table 3.4 follows the common specification used in Model 1 of Table 3.3. The second model removes the self-taxation variable due to possible collinearity with the share of royalties in the budget: a municipality that has a high ratio of royalties in the total budget might also show a lower taxation.

Table 3.4. Fiscal compliance - pooled data with share of royalties in the budget

	Model 1	Model 2
Share of royalties in the budget	0.043*** (0.013)	0.041** (0.14)
Log of Population	0.006*** (0.0007)	-0.0006 0.0006
Turnout	-0.089*** (0.012)	-0.139*** (0.014)
Councilman per seats	-0.005*** (0.001)	-0.007*** 0.001
Self-taxation	-0.437*** (0.029)	
Dummies for municipality	YES	YES
Dummies for year	YES	YES
Log likelihood	-9063.1077	-9290.5758

Dependent variable: dummy for fiscal compliance

Bootstrapped standard errors in parentheses

p-value: * 0.05 , ** 0.01, *** 0.001

The results are consistent throughout the specifications used: the chance of non-transparency is higher for municipalities that are oil recipient, have a small ratio of self-taxation,

⁴⁷ As previously done with the variable of self-taxation, a similar procedure was implemented to input budget values for the years that the municipality did not send its fiscal information. I am also only considering the value paid as royalties and not including the amount distributed as Special Participation Tax. This should not cause significant difference because few municipalities receive the Special Participation Tax, and all of those – around 30 in 2009, for instance – are also recipients of royalties.

and low voter turnout. The size of the population and the ratio of candidates per seat, however, were not steadily associated with more transparency.

3.6. Interpretation and conclusions

The results show that receiving royalties from oil increases the probability of being less transparent but that this effect can be mitigated by the checks and balances of the political process (turnout) and the effect of taxation. Holding constant the effects of the checks and balances mechanisms, oil is strongly associated with less transparent behavior. In fact, a description of the data (Figure 3.1) reveals that oil recipient municipalities have increased their share on the group of non-transparent municipalities. The models consistently showed that the pattern of missing fiscal data of oil recipient municipalities is not random. It can be explained as a function of being an oil recipient, financing its activities with transferred money, and having low voter turnout.

Lack of transparency is not a direct malfeasance of public money, but it is also not the proper way to manage public resources, especially when such behavior violates federal law. As the literature states and the models in this study showed, political competition is important to limit the misuse of public money. As Rose-Ackerman describes, “[t]he strength of the competitive political environment raises the stakes and reduces the likelihood of corruption. A competitive political system can be a check on corruption” (1999, 127). However, elections are not the only way to control the acts of those in power. Public accountability is necessary for the control of corruption, and fiscal transparency is a key part of that.

High accountability levels are particularly necessary in places where there are rents to be extracted, as Krueger (1974) and Ades and Di Tella (1999) link the existence of rents to

corruption levels. Furthermore, a large body of literature documents the importance of information flow to uncover malfeasance and hold politicians accountable. Ferraz and Finnan (2008), working with audit reports of corruption in Brazilian municipalities, document that the disclosure of local government corruption practices had a negative effect on the electoral outcomes of incumbents in mayoral elections. Their work reinforces the role of information flow in shaping public policies and determining reelection rates. Similarly, Chang, Golden and Hill (2010) demonstrated that politicians with alleged criminal behavior in Italy were only more likely to be electorally punished when that information was disseminated. They conclude that the informational environment is a critical factor in the ability of voters to hold politicians accountable.

As stated, a typical municipality in Brazil does not rely on local taxes to fund their operations. While this can be economically efficient – the federal and state governments collect the taxes and redistribute them – it can be politically harmful by breaking the relationship between taxation and representation on the local level. This result is consistent to what Guedes and Gasparini (2007) found in their analysis of the fiscal decentralization of Brazil for the period of 1998-2003. In their assessment, fiscal decentralization achieved through transfers was not accompanied by efficiency mechanisms and resulted in an unbalanced system. This led to municipalities growing their sizes but with reduced local accountability. The cost of local services is camouflaged by the transfers, thus distorting the real cost of the government structure to its local taxpayers. In this regard, and to this extended period, this paper additionally shows that the ratio of self-taxation emerged as a good predictor of transparency level – a key aspect of accountability.

Oil royalties, by allowing an additional source of non-local tax revenues, tend to exacerbate this accountability problem. One could argue that expenditures made with oil royalties should be used in a more precautionary and transparent way than those made with ordinary tax revenues. These oil royalties are a source of non-renewable revenues, and future generations would have a stake in the way this money is employed. Further, there are economic gains in applying those rents in sound investments rather than financing present consumption and obtaining a negative genuine savings (Atkinson and Hamilton 2003).

The results above show that political awareness reduces the probability of an oil recipient municipality breaking the Fiscal Responsibility Law in its transparency requirements. By doing so, they incur a cost: the prohibition of receiving voluntary transfers from the federal government. However, the wealth proportioned by oil windfalls softens their budget constraint. This reduces the burden of non-transparency, the penalty of which is the loss of voluntary transfers and contracting credit operations. The results also confirm that the way a municipality is funded reflects on its propensity of being transparent, linking the Brazilian reality of municipal finance with Karl's theory of Petro-States.

In this chapter, I assessed if the lack of municipal fiscal data could be explained by factors such as being an oil recipient, the degree of voter turnout, and the reliance on transferred money. I showed that missing data in oil recipient municipalities are not random and have increased in passing years (Figure 3.1). In the next chapter, I conclude this paper pointing to the importance of these findings for the near future, when the abundance of oil from the pre-salt reservoirs will come to fruition, thus softening the budget constraint not only of municipalities. States and the Federal Government will have an abounding flow of oil revenues and, to avoid the resource curse, institutional shields must be put in place.

Chapter 4 CONCLUSION

This paper illustrates that the oil industry is still growing, despite claims that oil supply has already peaked. This growth can be explained by the additional demand from developing countries – notably China and India – in combination with the perceived inability of renewable fuels, including biofuels (Giampietro and Mayumi 2009), to replace fossil fuels in large scale in the near future. More efficient engines and conservation incentives are reducing the oil-use intensity of the world economy – the amount of oil necessary to increase the GDP per capita in one additional percentage point. Per capita consumption of oil decreased by 10 percent between 1980 to 2007, while the world economy more than doubled in this period (Gorelick 2010; Clarke 2007; Odell 2004). While developing countries still exhibit a very low per capita consumption of oil, as income rises, oil consumption will grow in these places. That is why industry analysts predict the continued importance of oil for the foreseeable future (BP 2010; IEA 2010).

If the peak of oil has been reached, then perhaps it has only been reached for the conventional sources of oil, as additional supplies of oil flow from tar sands, shale rocks, and offshore fields. This last source, in particular, will play a major role in the further availability of oil. Offshore oil is, on average, less expensive than oil produced from shale rocks and tar sands, and the final product is very similar in its chemical structure, requiring less adaption to existing refining plants.

New technologies allow drills to reach depths previously unthinkable in the oil industry. Moreover, although oil exploration miles off the coast is a risky investment, the high price of oil renders it a viable endeavor. Brazil is a showcase of offshore oil exploration due to not only the

impressive water depths reached, but also to the magnitude of the discoveries made.

Technological advances alone, however, cannot explain the surge in Brazil's oil industry. The end of Petrobras' monopoly in the second half of the 1990's brought competitive pressures to the Brazilian oil market, and Petrobras nimbly reacted to a new market structure. This resulted in the rapid growth of oil production, from 718 million bpd in 1995 to 2,029 million bpd in 2009 (BP 2010), allowing Brazil to finally achieve self-sufficiency in oil production, a national aspiration since the creation of Petrobras. The rents of oil money grew alongside this increase in production. The Petroleum Law of 1997 raised the rate of oil royalties and created new taxes on concession and exploitation. In 2007, a new oil province was found beneath a thick salt layer located miles from the coast. These new fields have the potential to multiply Brazil's oil reserves and production, certainly putting the oil industry at the center of national industrial activity.

In the second chapter, this paper explored the political economy of resource abundance. Commodity-led growth can lead a country to currency valuation and to a shift in the factors of production, penalizing the tradable sector. This describes the Dutch Disease model, a phenomenon that can be avoided if proper macroeconomic stabilization plans are fully embraced. However, the adoption of such plans implies a number of policy decisions that, at times, may not be politically feasible. In countries with weaker institutional arrangement, the windfall profit can be squandered in short term spending through myopic behavior (Karl 1997) or in the funding of projects with low selectivity in order to sustain a democracy with fragmented political organizations (Di John 2009). As Mehlum, Moene and Torvik (2006) distinguish, while the curse can be avoided in countries that have "productive friendly" institutions, in countries where the institutions are "grabber friendly," oil money will most likely be dispersed in rent seeking activities.

Institutional quality is the antibody for the resource curse. Consequently, the new phase of Brazil as an oil exporter should not be taken as *a priori* beneficial or harmful event, but as a challenge to its institutions. With this in mind, this work analyze how local governments in Brazil that have most benefited hitherto from oil money are reacting to one institutional requirement of accountability: fiscal transparency.

I proceeded by scrutinizing the pattern of missing data, an approach also undertaken by Bueno de Mesquita et al. (2003) and Rosendorff and Vreeland (2006) in the context of countries, their political institutions, and the data provided to international organizations. The Brazilian Fiscal Responsibility Law, enacted in 2000, mandates that every state and municipality send their fiscal data to the National Treasury Secretariat (STN), which in turn makes them public on the internet. Those who do not comply with the law are penalized by being prohibited to receive voluntary transfers (*convênios*) and contract credit operations. I crossed STN's data (self-reported by municipalities) with ANP's own yearly report of oil royalties' beneficiaries and, consequently, was able to assess when a municipality received oil money but refused to comply with the general transparency requirement. The period used was from 2000 to 2009, from the first year of the Fiscal Responsibility Law up through the latest available data, for 5,561 municipalities.

The models strongly indicate that being an oil recipient increased the probability of a municipality not sending fiscal data, with the effect going by up to 16 percentage points. At the same time, the ratio of self-taxation and voter turnout revealed to be effective predictors of a more transparent behavior. For example, an increase of 10 percentage points in the ratio of self-taxation over total budget raises the chance of being transparent by 8.9 percentage points. High

oil prices (therefore more royalties) also appeared negatively associated with transparency. The main results were robust despite employing different specifications, controls, and techniques.

The mere analysis of the pattern of expenditures in oil rich municipalities in Brazil might lead to partial or even biased conclusions, because those who do not report might be the ones who have more to hide. Taking that into consideration, the silence of oil recipient municipalities in reporting their fiscal data might allude to their behavior in the proper care of public money. As Glenn (2004) argues, silence is as important as speech. It is meaningful, even if it is invisible. But silence can only be understood by putting it into the context where it occurs. In the circumstance of a country regarded as corrupt (Transparency International 2010) but with well ranked-budget transparency (IBP 2010), it is a matter of public concern that being an oil recipient increases the likelihood of breaking the transparency requirements of the Fiscal Responsibility Law. In addition, previous studies have shown that oil recipient municipalities in Brazil have had poor economic growth (Postali 2009), low ability to convert the windfall profits into social goods (Afonso and Gobetti 2008), and diminishing fiscal effort (Postali and Rocha 2009) or fiscal laziness (Nazareth 2007).

It is commonly argued that oil royalties, as a source of revenue from the exploitation of a non-renewable mineral resource, should be spent according to specific rules. Among those rules, is the principle of intergenerational equity, which can also apply to environmental conservation and public pension (Scarborough 2011; Carvalho 2008; Foot and Venne 2005). The current generation is consuming a resource that would otherwise be available for a future generation. Consequently, this type of revenue is similar to borrowing against the future, without bearing the same financial cost of a public deficit. In this regard, it is hardly justifiable behavior of municipalities to increasingly fund their activities with oil royalties rather than taxing the current

beneficiaries. It is particularly true when this is done in conjunction with a reduction of transparency, as shown in Chapter 3.

Oil wealth should be spent with proper guidelines – including measures to avoid the occurrence of resource curse – and with additional transparency. The current legal framework does not provide these guidelines at the municipal level. With a forecast of accelerated growth in the oil industry, more caution will be needed to manage oil rents in a beneficial and sustainable way to the Brazilian economy. And this will be a nationwide challenge.

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AUTHOR'S BIOGRAPHY

Renato Lima de Oliveira graduated from the Federal University of Pernambuco, Brazil, with a bachelor's degree in Social Communication and Journalism in 2004. He worked at *Jornal do Commercio de Pernambuco*, a leading newspaper in the Northeast of Brazil. As a reporter covering business and politics, he received prizes and awards for in-depth series that included the oil industry in Brazil. He also co-founded and co-hosted a radio program about books, occasionally hosted a TV show and collaborated with reportages and Op-Ed pieces to several publications. In 2009, he began his master's degree in Latin American Studies at the University of Illinois at Urbana-Champaign. Following the completion of his M.A., he will begin doctoral studies in Political Science at the Massachusetts Institute of Technology (MIT).