2 Does Oil Make Leaders Unaccountable?

2.1 Introduction

Several studies argue that the limited effects of natural resource abundance on long run economic development should be explained by the behavior of those who control the state (Ross (1999); Caselli & Cunningham (2009); Caselli (2006); Robinson et al. (2006)). In particular, a large body of literature argues that natural resource wealth impairs democracy, perpetuates autocratic regimes, and induces misgovernance (Barro (1999); Jensen & Wantchekon (2004); Ross (2001), Tsui (2010)). Most of the studies is inspired by the experience of autocratic governments and focuses on understanding regime changes (Dunning (2008); Haber & Menaldo (2010)), how natural resource abundance can bring about political instability (Caselli (2006)) or can help autocratic rulers perpetuate their power (Acemoglu et al. (2004)). Much less is known about the political economy effects of resource abundance in a democratic context, where elections should make politicians accountable and political competition can balance an incumbent's power.

This chapter examines whether oil booms affect local democracy in Brazil's municipalities. Specifically, we study how electoral outcomes, the behavior of politicians in power, electoral competition and political selection change as municipalities are endowed with a fiscal windfall from oil boom. We do so by using a similar empirical strategy employed in the first chapter of this dissertation, i.e., we explore variation across municipalities benefited from Brazil's recent oil production[1] boom and new rules for distributing oil royalties[2] to drilling regions.

We begin the analysis by developing a theoretical model in order to understand how oil windfall affects politicians' and voters' behavior. In the model, voters know that the municipality receives oil royalties but they cannot perfectly assess the amount received. Voters can only observe the amount

[1]We use the term oil to denote oil and natural gas production since oil corresponds to the bulk of oil and gas production.

[2]We use the denomination royalty loosely throughout the paper to refer to royalties plus special quotas ("participações especiais". ANP calls the sum of both payments as "participações governamentais".

of public goods provided and they know that this depends on the total revenue and on the incumbent's ability, which is not observed. Therefore, oil windfall allows the incumbent to signal a higher ability and voters respond by reappointing the mayor for office. This incumbency advantage can persist as long as voters are sufficiently unaware about the royalty revenue. Once voters become more informed, the difficulty in signaling higher ability reduces the incumbency advantage as well as the incentive to provide more public goods, and mayors end up diverting more funds.

We take these predictions from the model to the data to test the validity of that story. We first analyze oil windfall impact on mayor and party reelection and we provide evidence that royalty payments create a large incumbency advantage in the short run. In 2000, the first election after the boom, when all mayors could run for reelection, a one-standard-deviation increase in royalty value increase reelection chances by 16 percentage points, which implies a increase of 32 percent in reelection chance. However, this effect disappears in the medium run since there is no incumbency advantage in 2004 and 2008. We then analyze political competition and selection and show that the limited impact on these outcomes indicates that the incumbency advantage estimated for 2000 should be explained by the behavior of who are in power rather than through a decrease in political competition or by changes on the pool of candidates. We follow by analyzing the timing and composition of the increase in public employment, which is the main destination of royalty revenues according to the results presented in chapter 1. We show that public employment increased in particular between 1998-2000 and 2002-2004, but the enlargement of public sector in the two years before the election explains reelection only in 2000. This result supports our model prediction, as long as we believe that voters interpret the increase in public employment as a signal of incumbent's ability only in 2000 and information about oil windfall increases over time. We show evidence that confirms these hypotheses by arguing that the pattern of public employment increase is not compatible with a clientelistic story. In addition, we show indications that the awareness level about oil windfall increased over the years and that mayors from municipalities with local media presence have more difficulty getting reelected in 2008.

Taken together, these results do not indicate that oil makes leaders unaccountable. Although oil windfall creates a large incumbency advantage in the election after the boom, voters reward incumbents by reappointing them to office as long as they are not completely informed of the size of the extraordinary revenue and see increases in public employment as an indication of mayor's ability. In the medium run, as information about the resources

increases and a larger public sector does not translate into more public goods and services, citizens oust the incumbent and select new candidates. Thus, our results indicate that a democratic system is crucial to avoid the negative effects of resource abundance and that institutions such as elections, media presence and constraints on executive power play an important role in restraining the irresponsible use of oil revenues.

To the best of our knowledge, this is the first empirical paper that focuses on understanding the political economy effects of resource abundance on a democracy. Our paper is directly related to two theoretical works that analyze the mechanisms through which the natural resource abundance can affect politicians incentives in a democratic context. Caselli & Cunningham (2009) argue that revenue effect occur through two main channels: by increasing the value of staying in power and by increasing the competition for power. Robinson et al. (2006) show that incumbent politicians can spend revenues from natural resources in patronage in order to influence future elections.

This paper relates to recent empirical literature that aims to understand the political economy effects of resource windfalls. Vicente (2010) examines the effect of oil discovery announcements in São Tomé and Principe on measures of perceived corruption. Brollo et al. (2010) investigate the effect of federal transfers on reelection outcomes, political selection and corruption in Brazilian municipalities. They look at different types of federal transfers to municipalities and also show that they increase election outcomes, but, contrary to us, find an impoverishment of the pool of candidates.[3] Litschig & Morrison (2010) estimate that higher federal transfers in Brazil lead to higher spending and educational outcomes, which therefore improve incumbent party reelection probability. Our findings also complement a literature on voters' rationality. In particular, our work is related to Wolfers (2007) who presents a model where voters cannot discern between incumbent's competence and luck. We find results in line with his work, which shows that governors in oil-producing states are likely to be reelected following a rise in oil prices, while their counterparts in the rust-belt are likely to be ousted. However, his analysis does not allow a comparison between short and medium-term effects as we do in this study.

The remainder of the chapter is organized as follows. Section 2 present a brief case study of Campos dos Goytacazes in order to illustrate how oil windfall can impact local politics. Section 3 sketches a theoretical framework. Section 4 explains the empirical strategy that is quite similar to the one

[3]However, the mechanism highlighted in their work is different from ours. Their model states that an incumbency advantage arises due to the impoverishment of the pool of candidates, while in our model there is an incumbency advantage because voters are unable to assess royalty value.

employed in chapter 1 and the data. Section 5 presents the empirical findings. Finally, section 6 concludes the chapter.

2.2 Oil Royalties and Malfeasance: the case of Campos dos Goytacazes

To illustrate how oil windfall can impact the political environment of local economies we now briefly discuss the case of Campos dos Goytacazes, a municipality located in the north of Rio de Janeiro state and the largest beneficiary of royalty revenues in Brazil. It received R$ 1 billion or 24 percent of total royalties distributed to local governments in 2008.

Campos is known for being the political cradle of Anthony Garotinho, an ambitious politician who governed the state of Rio de Janeiro between 1998 and 2002. He was also the second runner-up in the 2002 presidential election. Garotinho started his political career as the mayor of Campos in 1989, two years after the city began to receive revenues from royalties. The oil revenues and his populist profile won him widespread popularity. In 1992, he elected his candidate for succession and in the 1996 ballot he came back to power, where he stayed for two years until successfully running for state governor.

During the 2000's, when oil windfall dramatically increased from R$ 50 million in 1999 to R$ 1 billion in 2008, the municipality witnessed a series of unique political events. The 2004 election was remarkable. There were reports of vote-buying, two radio stations were turned off and charged with illegal propaganda, R$ 316,000 in cash was found in one party's office the day before the election, people were arrested and charged with electoral fraud and federal troops were sent to the municipality in order to guarantee ballot security. In addition, the state governor, Rosinha Garotinho, moved the state office headquarters to Campos a few days before the election in order to influence its outcome. At the end, the incumbent's candidate won over Garotinho's candidate by a narrow margin, but both had their candidature suspended by the Electoral Court. The local legislature president assumed power and was elected mayor by a new election that took place in 2006.

The analysis of incumbents' behavior sheds light on the intention behind all this effort to get in office. Arnaldo Vianna, Campos's mayor from 1998 to 2004, is charged with having US$ 35 million in a private foreign bank account. He was accused of malfeasance by state attorneys and had his candidature for the 2008 election suspended. He became infamous for using public resources to finance free live concerts. His successor, Alexandre Mocaiber, was temporarily suspended from office in 2008 accused of fraud in public procurements. The federal police investigation estimated that R$ 240 million was misappropriated from public resources and that 20,000 public employees were illegally hired only

in the first trimester of 2008.[4]

This type of story is not unique. Other oil-rich municipalities accumulate political scandals as well. Carapebus, the third largest recipient in per capita terms in 2007, almost replicated Campos history in its 2008 election. The frontrunner did not have his votes computed because the Electoral Court suspended his candidature due to improper use of public funds during his previous administration. A new ballot was set since the second place candidate in the election could not be nominated for mayor due to problems with the Justice Department. São Francisco do Conde, in Bahia, which is Brazil's largest per capita GDP due to the location of an oil refinery and 26th place in royalty per capita distribution, almost went to the 2008 ballot without candidates: three out of four candidates faced accusations of malfeasance. At the end, two candidates ran for mayor.

2.3 Theoretical Framework

This section develops a simple framework to understand voters' and politicians' behavior in municipalities affected by oil windfall. We extend Wolfers (2007) model by adding a second source of uncertainty and formalizing the politicians' problem when there are reelection concerns. The basic idea is that voters know that the municipality receives oil royalties but they cannot perfectly assess the amount received. Voters can only observe a fraction of the public budget and the amount of public goods provided. They know that public goods depend on the total revenue and on the incumbent's ability, which is not fully observed. Politicians care about private rents and have reelection concerns. We show that shocks that increase the budget but are not observed by voters create an incumbency advantage, because the resulting benefits are interpreted as due to incumbent's superior ability. In addition, the provision of public goods is positively affected by the unobserved level of royalty shock, while private rents only increase with shock variance.

The mechanism behind this model is that incumbent's main incentive to provide a higher level of public goods is to signal that he is an able politician and increase his reelection chances. The asymmetry of information on the size of public budget increases the attractiveness of this signaling device since more unobserved revenue facilitates it. By facing the opportunity of easily influencing the election, the mayor chooses to increase the amount of public goods and constrain the diversion of public goods in order to provide a strong

[4]Source: `http://noticias.uol.com.br/ultnot/eleicoes/eleito/campos.jhtm` and Globo On Line, 11/03/2008. "Prefeito de Campos é afastado do cargo e acusados de envolvimento em fraudes da prefeitura são presos".

signal.

The model also sheds light on how politician's incentives are different when the revenue shock is observed by voters. When voters are aware about the size of budget shock, the effects are non-linear. At low levels of budget revenue, the reelection chances increases with the size of observed revenue, but after a certain threshold, the effect becomes negative. In this circumstance, his reelection incentive is reduced and he chooses to pocket all the extra revenue.

2.3.1 Basic Model

There are two periods that are divided by an election. In every period, the municipality receives a budget shock whose total value is only observed by the politician in power. Voters are aware that the municipality receives royalties but they assess its value as b_t. However, the total amount also depends on a random shock θ_t, which is not observed by voters and is distributed according to $N(0, v_t)$. In addition, municipalities also receive a constant tax revenue and federal transfers, which generate the revenue T'. Hence, the total budget is composed by an observed part $T_t = T' + b_t$ plus an unobserved component θ_t, such that $B_t = T_t + \theta_t$.

Voters have the same preferences over the public good g.[5] The politician utility is $W_t = r_t + p_I R$, where R is the present value of politician's second period rents. Hence, the politician in power allocates the budget between public goods g and private rents r. Rents are constrained to be nonnegative and smaller than the total budget $0 \leq r_t \leq \bar{r} < B_t$. The government budget constraint is:

$$T_t + \theta_t = \frac{g_t + r_t}{a} \;\Rightarrow\; g_t = a(T_t + \theta_t) - r_t \tag{2-1}$$

where a is the politician's ability. A higher value of a indicates that the politician can provide more public goods or divert more money with the same level of resources. This ability is private information, permanent over time and is a random variable distributed according to $N(\mu, \sigma)$.

The time of the game is as follows: (1) Nature determines royalty value $b_1 + \theta_1$. (2) The politician in power determines r_1 knowing the value of $b_1 + \theta_1$ and his ability. g_1 is residually determined in order to satisfy the budget constraint. (3) Voters observe g_1 and T_1 but neither a nor θ_1. They also do not observe private rents r_1 but compute its value as r_1^e based on the available information. (4) Election takes place. If the incumbent is reelected, the ability of the politician in power remains a. If he loses the election, an opponent

[5]This public good is a generic definition of a vector of public services and goods provided by the municipality such as education, health services and infrastructure.

is appointed with a competence level drawn from the same distribution. (5) Period 2 rents are set and g_2 is residually determined. (6) Game ends.

In period 2, the incumbent has no reelection incentives and sets $r_2 = \bar{r}$ and $g_2 = a(T_2 + \theta_2) - \bar{r}$. In period 1, the politician in power faces a trade-off between pleasing voters and being reelected or diverting all the money for his own enrichment. His optimal decision depends on voters' behavior. Voters want to elect a high ability politician because this provides a high second-period utility. Therefore, voters rely on the observed value of public goods g_1, on their assessment of public budget T_1 and on their estimation of period 1 private rents r_1^e to evaluate the incumbent's ability. This information provides them with the signal $\tilde{a} = \frac{(g+r^e)}{T}$, whose variance is $\tilde{\sigma} = \sigma + \frac{\sigma v + \mu^2 v}{T^2}$. (In these expressions and the ones that follow we omit the subscripts that indicate period 1 in order to simplify the algebra). Voters rely on this signal and uses Bayes's rule to update their prior assessment of the incumbent's ability. They estimate the incumbent's ability as:

$$a^p = E(a/g, T, r^e) = \frac{\mu\tilde{\sigma} + \frac{(g+r^e)}{T}\sigma}{\tilde{\sigma} + \sigma} \tag{2-2}$$

$$= \frac{\mu(\sigma T^2 + \sigma v + \mu^2 v) + (g + r^e)T\sigma}{2\sigma T^2 + \sigma v + \mu^2 v}$$

A citizen will vote for the incumbent if the expected ability of the incumbent plus an idiosyncratic ideological bias for the incumbent $\delta_i \sim U[-\frac{1}{2\epsilon}, \frac{1}{2\epsilon}]$ is greater than the challenger expected ability:

$$E(a/g, T, r^e) + \delta_i > E(a) = \mu \tag{2-3}$$

Therefore, the probability that the incumbent is reelected is:

$$P_I = \frac{1}{2} + \frac{\epsilon\sigma}{\tilde{\sigma} + \sigma}\left[\frac{(g + r^e)}{T} - \mu\right] \tag{2-4}$$

The incumbent set rents in order to maximize his utility, $W_t = r_t + p_I R$, being constrained by the reelection probability (2-4) and the budget constraint (2-1). The first order condition is:

$$F.O.C.: \ 1 + \frac{\partial p_I}{\partial r} R = 0$$

where

$$\frac{\partial p_I}{\partial r} = \frac{\partial\left(\frac{\epsilon\sigma}{\tilde{\sigma}+\sigma}\left[\frac{g+r^e}{T}\right]\right)}{\partial r} = \frac{-\epsilon\sigma T}{\sigma(2T^2 + v) + \mu^2 v} \ < 0 \tag{2-5}$$

This expression shows that the equilibrium level of private rents is constrained by its marginal effect on reelection probability. Anything that decreases this marginal effect will increase the diversion of public funds because

it reduces the punishment that the incumbent suffers in terms of reelection chances. Therefore, *the level of private rents increases with the variance of the revenue shock* (v)*, with the average of politician's ability* (μ) *and with election uncertainty (lower* ϵ*), while it decreases with the variance of political ability* (σ)*. An increase in the size of observed share of public budget* (T) *has a U-shape effect on rents* (See appendix for details).

In order to understand the intuition behind these results, it is necessary to understand first the source of incumbency advantage, whose equilibrium level is:

$$P_I^* = \frac{1}{2} + \frac{\epsilon\sigma}{\tilde{\sigma}+\sigma}\left[\frac{a(T+\theta)}{T} - \mu\right]$$

$$= \frac{1}{2} + \frac{\epsilon\sigma T^2}{(2\sigma T^2 + \sigma v + \mu^2 v)}\left[a + \frac{\theta}{T} - \mu\right]$$

This equation states that *the probability of being reelected increases with the incumbent's ability (a) and the value of royalty shock* (θ)*, while it is reduced with the variance of royalty shock* (v) *and with the average of politician's ability* (μ)*. The effect of the observed budget shock* (T) *on reelection probability is ambiguous.* This expression follows directly when we substitute the budget constraint (2-1) on the reelection expression (2-4), considering the fact that in equilibrium the incumbent optimal choice of r must be consistent with voters' conjectures regarding this choice: $r = r^e$. The partial effects of each parameter are shown in Appendix C.

Finally, the equilibrium level of public goods is:

$$g^* = a(T+\theta) - r^*$$

where r^* is implicitly determined by (2-5). This expression implies that *the period-1 level of public goods increases with incumbent's ability (a), with the value of royalty shock* (θ) *and with the variance of political ability* (σ)*, while it is reduced with the variance of royalty shock* (v)*, with the average of politician's ability* (μ) *and with election uncertainty (lower* ϵ*). The effect of the observed budget shock* (T) *on the level of public goods is ambiguous.*

This model has two sources of asymmetry of information - politician's ability and the size of royalty shock - which reinforce each other and increase the incumbent's incentive to signal that he has a high level of ability. In order to better understand it, suppose first that the royalty shock (θ) is zero and set $\overline{g} = \mu T - \tilde{r}$ as the average level of public goods. In this case, only better-than-average politicians ($a > \mu$) or politicians who restrict the diversion of public funds are able to provide $g > \overline{g}$. Hence, voters would correctly interpret $\overline{g}$ as

a signal of high ability (or low corruption) and mayor would be reelected with probability greater than 1/2. This incumbency advantage increases with the ability difference between the incumbent and the challenger.

The royalty shock changes the incumbent's decision by increasing his capacity to signal that he is a high-ability politician. This revenue enables the mayor to provide a higher level of public goods and since voters do not observe the size of the shock, they interpret any $g > \overline{g}$ as higher political ability. Note that royalty revenue allows even incumbents with $(a < \mu)$ to signal they are high-ability politicians.

The efficacy of this signaling device depends on the parameters of the economy. The incentive to signal increases with the variance of politicians' ability (σ) and decreases with the variance of the signal $(\tilde{\sigma})$. The intuition is that when σ is too high, voters know that the prior does not provide much information on politician's ability and, hence, give more weight to the signal in order to assess incumbent's ability (see expression 2-2). In this case, providing a high g is very effective to attract votes. This also explains why the level of private rents is lower when σ is larger. A similar argument applies to the effect of $\tilde{\sigma}$, which have the opposite effect of σ.

Both the size and variance of the royalty shock affect the mayor's decision. An increase in the variance of the shock (v) reduces the electoral advantage since voters recognize that they are not able to predict the size of total budget and therefore consider that the signal is a poor measure of the incumbent's ability. This motivates mayors to divert more funds. Large unobservable shocks (high θ) increase the incumbency advantage and the provision of public goods, while not affecting private rents.

The effect of the observed budget T on reelection and private rents is less straightforward. The size of revenue has two opposite effects on reelection probability, generating a inverted U-shape relationship between reelection probability and revenue. This happens because an increase in T reduces the size of the signal but also reduces its variance. For low levels of T, the reduction on the signal variance is sufficient to stimulate voters to rely on signal information to assess the incumbent's ability. This increases the attractiveness of the signaling device and make the incumbent divert fewer funds in order to provide a higher signal. As a result, the incumbency advantage increases. However, as T grows, the size of the signal is reduced. Hence, it becomes too difficult to signal high ability, which, in turn, increases the incentive to divert funds and give up reelection.

Therefore, this model predicts that the effect of a budget increase depends on whether this increase is observable or not. A positive budget

shock unobservable to voters increases the supply of public goods and the incumbency advantage. In turn, an observable increase in the budget raises reelection probability and reduces private rents only when the budget size is small, having the opposite effects and the budget increases.

The last parameter which plays a role in an incumbent's decision is ϵ, which measures the election uncertainty. The more uncertain the election outcome (lower ϵ), the lower the electoral advantage and the larger the incentive to seeking private rents.

2.3.2 Discussion

The model sketched above provides predictions for empirical analysis. The main testable hypothesis is that as long as voters are unaware about the size of oil windfall, oil revenues should generate an incumbency advantage and an increase in the public good provision. But as long as voters are informed about the size of oil windfall (b_t or T_t increases relative to θ) this incumbency advantage should be reduced, as well as the provision of public goods. These predictions should be compared with the results shown in the first chapter that indicate that the only impact of oil windfall on public goods and services is the increase in the number of public employees. We can interpret public employment as a public good as long as we consider that voters appreciate the enlargement of the public sector. This can be true because voters believe that a greater number of employees is a precondition for improving public services such as health and education, or because they have ideological preferences for a larger state, or even because they assess a higher probability of being hired as a public employee. However, several authors have argued that public employment is a type of private transfer that politicians make in order to obtain political support (Alesina et al. (2000), Robinson & Verdier (2003), Robinson et al. (2006)). Therefore, in order to validate our model we also need to provide evidence that voters interpret public employment as a public good rather than a private transfer. We assess that issue and model predictions in the empirical section.

2.4 Empirical Strategy and Data

To understand the impact of royalties on local politics we analyze three political mandates: 1997-2000, 2001-2004 and 2005-2008. The empirical strategy is similar to the one employed in the first chapter. We follow an IV strategy where we instrument royalty value by oil output and focus on offshore production variation by looking only at coastal municipalities. However, we do not use municipal fixed effects due to the existence of term limits in Brazil.

The fact that mayors cannot run for two subsequent reelections implies that reelection estimates are conditional on being mayor in the first term. Hence, the sample of municipalities changes every election, which makes the within estimates hard to interpret. Therefore, we run the following equations to estimate royalty effect on political outcomes:

$$y_i = \rho R_i + X_i\beta + u_i \tag{2-6}$$
$$R_i = \gamma_1 Z_i + X_i\gamma_2 + \epsilon_i$$

where y_i denotes municipality i political outcome (e.g. an indicator variable for whether the mayor was reelected, the number of political candidates), R_i indicates royalty value paid to municipality i, X_i is a vector of municipality characteristics such as latitude, longitude, altitude, distance to the state capital, dummy for state capital, population, population density, dummy for coastal municipality and state dummies, and u_i is a random shock. We use royalty and output values in the election year but the results are similar if we use the values accumulated in the political term.

In order to understand short and medium-term effects, we run one regression per election year. We should emphasize that the first political mandate under analysis, from 1997 to 2000, was marked not only by the extraordinary increase in royalty revenue but also by the Reelection amendment, which was enacted in June 1997 and allowed mayors to be reelected once. This period is of special interest because mostly of the revenue shock was arguably unanticipated and all the mayors could run for reelection. Figure 2.1 presents a graph which illustrate the timing of the local elections, the reelection amendment and the enactment of the Oil Law. We also show the evolution of royalty payments made to municipalities, which increased by twenty-seven times in real terms from R$ 167 million in 1997 to R$ 4.7 billion in 2008.

In addition to the data already described in chapter one, we collected further information to understand the royalty impact on local politics. We use electoral data for local elections in 1996, 2000, 2004 and 2008 provided by Tribunal Superior Eleitoral (TSE). We relied on TSE microdata to construct measures of electoral competition and performance such as vote shares, effective number of political parties and margin of victory. In addition, TSE also provided us with a list of candidates and parties elected in 1992, which allowed us to construct the 1996 party reelection variable.[6]

In order to understand the mechanisms that explain reelection results, we collected several pieces of information. To gather information on voters' aware-

[6]There is no available information for 1996 election in Espírito Santo state and most of Rio Grande do Norte municipalities.

ness about oil windfall, we performed a websearch on two newspapers to look for news about 'petroleo' (oil), 'royalties' and 'municipios' that were published in each year from 1998 to 2008. We performed the search for O Globo and Folha de São Paulo.[7] In addition, we got data on local media presence from Donos da Midia, a NGO who built a database which contain the names of all radio, televisions and newspapers which disclose local content. The Donos da Midia database contains information for 2,686 Brazilian municipalities, which include 77 municipalities (out of 157) from our main sample. This data is for 2007. In order to shed light on law enforcement, we got information from Tribunal de Contas do Rio de Janeiro, which is the institution responsible for auditing royalty revenues allocated by Rio de Janeiro's municipalities. They provide us with information on which municipalities were audited between 2003 and 2008. The objective of the audits under analysis is to verify whether the municipality has any irregularities with respect to municipal public employment.

2.5 Empirical Results

We begin this section by investigating whether oil windfall creates an incumbency advantage. We show that there is a large incumbency advantage in the election that follows the oil windfall boom, but this effect disappears in the medium run. We then investigate why there is an incumbency advantage just in the short run. We analyze political competition and selection and show that these channels cannot explain reelection results. We follow by investigating the timing and composition of the public employment increase and show that employment increased mainly in the first two political mandates, but only in the first one did voters reward incumbents that enlarged the public sector by reappointing them to office. Finally, we explore whether an information story, as sketched in the model, is plausible in the context under analysis. We provide evidence on voters' awareness level about oil windfall over the years and on the role of local media in promoting political accountability.

2.5.1 Reelection Effects

Table 2.1 assesses the effects of oil revenue on election outcomes. Panel A looks at mayor reelection in each election after the oil boom (2000, 2004 and 2008) and considers only municipalities where the mayor is in her or his first term and, hence, can run for reelection.[8] The dependent variable is an indicator variable equal to one if the incumbent mayor was reelected. All regressions

[7] These are the only two newspapers we were able to search by key word and data in the internet.

[8] Note that in 2000 all mayors were in their first term since this was the first election for which reelection was allowed.

use oil output as an instrument for royalty payments, and use state fixed effects and municipal characteristics as controls (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). We estimate a large significant effect for 2000, which indicates that a one-standard-deviation increase in royalty value increases reelection chances by 16 percentage points, which implies a increase of 32 percent in reelection chance. The point estimates for 2004 and 2008 are also positive but cannot be distinguished from zero. Note that most of the mayors from oil-rich municipalities were reelected in 2000, which implies that they faced term limits in 2004. Therefore, the test for 2004 may lack power since only 24 oil-rich municipalities were first term mayors in 2004.

In Panel B we repeat this econometric exercise, but use as the dependent variable a dummy indicating whether the political party was reelected. In addition to check the robustness of our results, the use of party reelection allows us to incorporate the 1996 election in the analysis and understand what was happening in these municipalities before the oil windfall boom. In this exercise, municipalities are on the sample no matter whether the mayor is in the first or second-term.[9] [10] The results using party reelection as a dependent variable reassure that oil windfall creates an incumbency advantage in 2000 and also indicate an increase in reelection probability in 2004. The estimated coefficient presented in column 1, Panel B, indicates that an increase of one standard-deviation in royalty payments raises party reelection chances by 20 percentage points in 2000 and in 16 percentage points in 2004. This implies that on average party reelection probability increased by 69 percent in oil-rich municipalities in 2000 and 50 percent in 2004. We also find no effects for party reelection in 1996, when most of the municipalities were already receiving royalties but at much lower levels. This result is very important because it supports the idea that local politics were affected only when royalty values reached a substantial amount, as happened from 1999 onwards, and confirms that our analysis covers the period when most effects occurred.

Table 2.8 shows that these findings are robust to alternative samples. No matter whether we consider coastal municipalities, all the 2,151 municipalities from the nine oil producing states or the 124 onshore and offshore producing municipalities, we estimate that both mayor and party reelection increase in

[9]The sample is composed of 119 municipalities rather than 157 in 1996 because there is no available information on the 1996 election for Espírito Santo state and for most of the Rio Grande do Norte municipalities.

[10]For municipalities created between 1993 and 2001, we use information on the party in power in the original municipality to construct party reelection.

2000. The effects for 2004 are always positive but only statistically significant in some samples, which reinforce the idea that the test for 2004 may lack power. Most importantly, we estimate no oil windfall impact on mayor and party reelection in 1996 and 2008 elections, which confirms the finding that oil windfall creates an incumbency advantage only in the short run.[11]

The comparison between mayor and party effects also deserves some comments. Mayors can run for reelection under a different political affiliation than the one under which they got into power, so party estimates can be an underestimate (overestimate) of mayors' incumbency advantage in the case that mayors are more (less) associated than parties with benefits of royalty revenues. Our results indicate that oil windfall impact is larger in party reelection than on mayor reelection and that parties were able to incorporate the incumbency advantage when mayors faced term limits.

2.5.2 Political Competition and Selection

We next turn to understanding royalty impact on political competition and selection. Our model does not consider entry into politics but other studies have addressed the theoretical channels through which resource abundance can affect political competition. Caselli & Cunningham (2009) argue that resource revenue can increase competition over power because the value of attaining office and capturing oil revenue increase to all individuals and this may affect the entry of challengers and the effort they put on the process. On the other hand, resource revenues also increase the value of staying in power and can give means for incumbents to influence elections. Potential opponents can estimate the advantage of the incumbent and refrain from running for office, reducing political competition. Therefore, the effects on political competition is a matter of empirical investigation. In our context, this channel may explain our reelection results if we estimate a reduction in political competition in 2000 and/or an increase in 2008.

We assess whether oil windfall affects political competition in Table 2.2. We use three measures of political competition: the number of candidates running for mayor, the number of effective candidates and the incumbent's margin of victory. While the first variable gives us an indication of pre-election

[11] We also test royalty impact on mayor reelection using alternative econometric specifications. We use a panel for the 2000, 2004 and 2008 elections and let the royalty coefficient vary per election. No matter if we use municipal fixed effects or not, we estimate a positive and statistically significant effect for 2000 and 2004 and none for 2008. In addition, we use the share of royalty payments in total municipal revenue as an alternative measure of royalty payments. We estimate that an increase in oil windfall equivalent to 10 percent of municipal revenue raises mayor reelection probability by 26 percentage points in 2000 and 22 percentage points in 2004 (results not shown and available upon request).

competition, the other two variables show how competitive each election was by taking into account the vote-shares. We regress each dependent variable on royalty payments per capita instrumented by oil output per capita, and use as controls the state fixed effects and municipal characteristics (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). To compare our reelection results, in all regressions we consider only municipalities where the mayor is in his or her first term.

The point estimate shown in column 1 indicates that oil revenues reduced political competition in 2000, but the effect is too noisy and cannot be distinguished from zero. Column 2 shows that oil windfall is associated with a reduction in the number of political candidates in 2004. A one-standard-deviation increase in royalty revenues decreases the number of candidates by 8 percent in 2004. We don't find a statistically significant effect for 2008. Panels B and C look at post-election competition. Panel B shows that a one-standard-deviation increase in royalty payments is associated with a decrease in the effective number of candidates in 5 percent in 2000 and in 12 percent in 2004. No effect was found for 2008. Panel C indicates that royalty payments dramatically increase the incumbent's margin of victory in 2000. A one-standard-deviation increase in royalty payments doubled the incumbent's margin of victory in 2000 (7 points increase in incumbent's vote share). Overall, the results shown in Panels A-C indicate that there is a negative association between oil revenues and post-election political competition in 2000 and 2004 and no effect in 2008. More importantly, the fact that we don't find effects on pre-election competition in 2000 and 2008 indicates that the incumbency advantage cannot be explained by fewer candidates running for mayor.

Panels D-F look at political selection by analyzing changes in the opponents' average characteristics. The link between oil windfall and political selection can be considered under a citizen-candidate framework, where any citizen can enter the electoral race if the benefits of entry exceed the costs (Osborne & Slivinski (1996)). Oil revenues can induce the entry of citizens with high opportunity cost, since it may increase the rewards from office.[12] We try to assess this channel by considering the opponents' average education and previous experience. In Panels D and E , we regress opponents' average years of schooling and the percentage of candidates with college degree on royalty payments using the same econometric specification used in Panels A-C. We find no effects of oil windfall on opponents' education in all the three

[12]These rewards from office are not necessary private rents and can include ego-rents and present and future financial compensations.

elections under analysis. Finally, Panel F shows royalty effect on the percentage of candidates that had a highly skilled occupation before running for mayor. We coded as highly-skilled any occupation that requires a college degree or is associated with civil service. We see that oil revenue is not associated with changes in this variable.

Overall, Table 2.2 indicates that the incumbency advantage estimated for 2000 should be explained by the behavior of those in power rather than through a decrease in political competition or by changes on the pool of candidates.

2.5.3 Timing and Composition of Public Employment

In the first chapter we showed that oil windfall is associated with a large boost in the public sector. In order to understand whether this fact can explain the incumbent's electoral advantage, we need to understand in which political mandate this increase was most remarkable. Table 2.3 investigates this issue by analyzing the variation of the number of employees in the two years before each election. This exercise follows the econometric specification used in chapter one. Each column shows the coefficients of a regression that include two years of data - the election year and 2 years before - and as controls use the population, municipal fixed effects and year dummies and instrument royalty value by oil output. We analyze royalty impact on three measures of employment: total employment, non-tenured employment and percentage of non-tenured employees. Employment data refers to September 30th of each year, which is the register closest to the election.[13] We consider just the municipalities whose mayors are in the first term to be able to understand electoral motivation but the results are similar with we include the 157 municipalities. Column 1 shows that an one-standard-deviation increase in royalty revenues between 1998 and 2000 is associated with 2.2 additional employees per 1000 habitants, which is equivalent to an increase of 9 percent. Columns 2 and 3 indicates that this increase was driven mostly by tenured employment. The number of non-tenured employees decreased 22 percent for every standard-deviation increase in royalty revenues between 1998-2000. Alternatively, the percentage of non-tenured employees decreased by 6 percentage points in the same period. Columns 4-6 indicates that the boost in the public sector was even larger in the second political mandate under analysis. Between 2002 and 2004, a one-standard-deviation increase in royalty revenues raised the number of employees in 5 per 1000 habitants, which represents an increase of 15 percent (column 4). However, the composition changed toward more non-tenured employees, which constitute the majority of vacancies filled in this period. A one-standard-

[13]Elections take place every four years in the first weekend of October.

deviation increase in royalties between 2002 and 2004 is associated with an increase of 5 percentage points in the share of non-tenured employees in the total employment (see column 6). Finally, Table 2.3 indicates that no new jobs were created between 2006 and 2008 due to an increase in oil windfall. These results confirm the trends we see on Figure 1.5 in the first chapter: total public employment in oil-rich municipalities began to increase in 1999 and followed an upward trend until 2006 and stabilized in 2007 and 2008. In addition, Figure 2.2 shows that in 1999 and 2000, there was a marked change in employment composition, when tenured employment suffered a huge boost and non-tenured jobs decreased. In 2001-2004, the increase in public employment was led by new non-tenured jobs.

Table 2.3 shows that the incumbency advantage more or less followed increases in public employment. This evidence supports our model's predictions as long as we show that municipalities that experienced the largest increases in the public sector were the ones whose voters reappointed the mayor for office with a higher probability. Table 2.4 investigates that question. For each election year, we regress a variable indicating whether the mayor was reelected on the two-year variation of the total number of employees per capita (columns 1, 4 and 7), on the two-year variation of number of non-tenured employees per capita (columns 2, 5 and 6) and on the variation of the proportion of non-tenured employees (columns 3, 6 and 9). All employment measures are instrumented by the two-year variation of oil output. We observe that each employment per 1000 habitants created between 1998 and 2000 caused by oil output variation is associated with an increase of 5 percentage points in reelection probability. However, the composition of public employees does not affect mayor reelection. We also see that more public employment is not associated with reelection in 2004 or in 2008. These results indicate that employing more people was an effective strategy to attract votes in 2000 but not in 2004 and 2008. According to our model, this is explained by voters interpreting public employment as a signal of political ability only in 2000.

However, two other stories are compatible with the employment and reelection results and do not necessarily support our model. The first one is that voters have preferences for a large public sector but there is a limit on how much the mayor can enlarge it. Once you reach that limit, mayors cannot keep hiring people, and thus lose the election. Indeed, there are several laws in Brazil that limit mayors ability to keep hiring people. First, 'Lei de Responsabilidade Fiscal' determines that municipal and state governments cannot spend more than 60 percent of the net current revenue on payroll.[14] Second, the royalty law

[14]Lei Complementar n 101, 4 de maio de 2000.

does not allow the use of royalty revenues to hire employees on a permanent basis. Finally, the government can hire new employees on a temporary basis just to perform very special duties, such as to combat epidemics and carry out the census.[15] Therefore, the fact that we find that public employment does not increase between 2006 and 2008 can be a result of law enforcement. We analyze this issue by gathering information on which municipalities were audited by Tribunal de Contas of Rio de Janeiro state from 2003 and 2008. The audits under analysis had the specific aim of investigating public employment irregularities. In Table 2.5, we regress the number of employees per capita on royalty revenues, a dummy variable indicating whether the municipality was audited in the current or previous year and an interaction variable of auditing dummy and the amount of royalties received on that year. We also include the geographic controls and instrument royalty value and the interaction variable by oil output and oil output interacted with the auditing dummy. We observe that in 2004, an increase in royalty revenues is associated with a large increase in public employment but no differential effect is found for municipalities which were audited in 2003 and/or 2004. However, in 2008, the interaction variable has a negative and significant effect of similar magnitude of royalty effect. This implies that the audit process was effective in 2008 in restraining public employment increases, since municipalities that received royalties and were audited in 2007 and/or 2008 did not increase the number of employees, while the other non-audited oil-rich municipalities enlarged the public sector in that year. Therefore, Table 2.3 cannot allow us to disregard the idea that public employment halted its increase due to constraints on the executive branch, and this caused the loss in incumbency advantage.

The second alternative story is the clientelistic story, as rationalized by Robinson & Verdier (2003) and Robinson et al. (2006) models. The argument in Robinson & Verdier (2003) is that offers of employment in the bureaucracy is a credible policy to obtain political support because optimal employment contracts concede rents to workers due to moral hazard and employment in the bureaucracy is an attractive way for politicians to generate rents.[16] Therefore, our results could simply indicate that as long as incumbents exchange jobs for political support, they can get reelected. Once they stop doing it, they are ousted from power. Although it is difficult to assess the clientelistic story, the analysis of composition of public employment can shed light on it. The

[15]Lei n 8.745, 9 de dezembro de 1993

[16]There is a large number of papers which relate patronage and resource-rich economies. Collier (2007), for instance, points out that "patronage politics can be a more cost-effective use of public money to attract votes than the provision of public goods, yet it is too expensive to be feasible". Therefore, we could see more patronage practices in resource-rich economies just because resource wealth provides funds to bribe voters.

clientelism story sketched in Robinson & Verdier (2003) is consistent with an increase in non-tenured employment since according to their model it is crucial for mayors to be able to fire workers, otherwise voters' promise of political support would not be credible. Table 2.4 indicates that it is the total number of employees rather than the number of non-tenured employees that guaranteed electoral success in 2000. In addition, the most remarkable increase in the number of non-tenured employees occurred in the second political mandate under analysis (2001-2004), when most of the mayors from oil-rich municipalities faced term limits and when we don't estimate a positive association between more employment and higher reelection probability. Table 2.6 confirms this argument. We show the increase in public employees per political term, splitting the sample in 2004 and 2008 by whether the mayor is in a first or second term. We see that the increase in public sector in 2004 happened in both types of municipalities, while in 2008 oil windfall is not associated with more public employees in both groups. In order to support the clientelistic story, we would need to see an increase in public employment just in municipalities where the mayor is in his first term.

Thus, the results presented in this section indicate that mayors from oil-rich municipalities used royalty revenues to hire tenured employees at the beginning of oil boom and then changed their strategy toward non-tenured employees. These results also suggest that voters from oil-rich municipalities have become more demanding throughout the years and are no longer satisfied with increases in the public sector. Although this result support our model and may indicate that voters stop to interpret public employment as a signal of incumbent's ability, we cannot rule out the story that public employment stopped increasing due to constraints on the executive branch. Finally, we don't find support for the clientelistic story in which public employment is a type of private transfer used to obtain political favors.

2.5.4 Information

To reconcile our model with the results presented, we still need to provide evidence regarding model's main hypothesis, i.e., that voters are not fully informed about oil windfall. In addition, we need to show that voters' awareness increased throughout the years. Unfortunately, we don't have any objective measure of voters' information about oil windfall that varies over time, but we circumvent this caveat with alternative evidence.

We believe that the characteristics of Brazilian oil production and royalty distribution rule challenge voters' assessment of royalty value. The lion's share of oil production in Brazil is located offshore and the inland basis is

concentrated in one municipality (Macaé). Therefore, voters would be unaware of this oil windfall unless this revenue is made public by the media, politicians or informed citizens. Even more difficult for voters to assess is the exact amount received. Royalty payments depend on the international oil prices, the exchange rate, the production and quality levels of each oil well and their proximity to oil fields. Therefore, royalty revenue varies a great deal across municipalities and over the years and voters need to update their information frequently. Although they can do that by assessing the ANP website, there is evidence that, in the first years of oil boom (at least), the awareness level was quite low. A survey carried out on September 2002 in Campos dos Goytacazes, the largest beneficiary of royalty revenues, indicates that 58 percent of the respondents were not familiar with the term royalties.[17] For those who knew the meaning of royalties, 56 percent pointed out that they didn't know how the revenue was invested.

However, we believe that voters' awareness has increased along the years and with the increase in oil windfall. In municipalities where this money represents a key part of the total budget, informed citizens, the media, political challengers and think tanks improved their technologies to disclose information to the average citizen. Local initiatives to disclose information on royalty values have come out since 2004, at least in the most benefited municipalities. The InfoRoyalties website was created in June 2004 by a local research center in order to deliver information on royalty payments and their use. Regional blogs have been posted in order to freely discuss local politics and public budget.[18]

Two other facts suggest that voters awareness has increased over the years. One is related to voters' and politicians' capacity to predict royalty payments. Although most of the municipalities under analysis have produced oil since the mid-1980s, the stake that they get from this production increased dramatically with the Oil Law in a way that was difficult to anticipate. Figure 2.3 shows the actual and predicted value of royalty payments for 1997-2000, 2001-2004 and 2005-2008 periods.[19] This figure shows that the values received in 1999 and 2000 were much larger than what was possible to predict based

[17]Survey of 1,400 respondents detailed at UCAM, Petroleo, Royalties e Regiao, Boletim, Ano 1, Numero 1, Setembro/2003.

[18]Roberto Moraes blog is a case in point. Posted for the first time in August 2004, it has drawn more than 1.4 million readers since then and had an active role in the 2004 and 2008 election debate.

[19]To predict 1997-2000 royalty payments, we first used the royalty payments average annual growth rate from 1994 to 1996 to calculate $PredictedRoyalties_{1997} = Royalties_{1996} * (1 + AverageGrowth1994 - 1996)$. We then used the formula $PredictedRoyalties_{t+1} = PredictedRoyalties_t * (1 + AverageGrowth1994 - 1996)$ where $t = 1997, 1998, 1999$. We follow the same procedure to predict royalty payments for 2001-2004 using the 1997-2000 average real growth rate; and to predict 2005-2008 payments based on the 2001-2004 average real growth rate.

on previous revenues. Therefore, it was harder for both politicians and voters to estimate royalty revenues. However, for the periods of 2001-2004 and 2005-2008, the previous revenue growth rate was a much better proxy of the following years payments. What we want to emphasize with Figure 2.3 is that it became easier over the years to predict royalty payments.

In addition, in 2007, a particular event increased the information provided regarding royalty payments. In November, Petrobras announced the discovery of Tupi, a giant oil field equal to all Norway's reserves. As noted by Economist (2007), Tupi was the world's second largest strike in 20 years. Two other announcements followed Tupi in early 2008, and the Federal government launched a huge propaganda campaign about what were termed 'pre-sal discoveries', which promised to put Brazil among the five largest oil producers in the World. The promise of a huge windfall spurred politicians to debate the royalty rule, which until then was considered undebatable by the Federal government.[20] A special concern is to increase the number of beneficiary states and municipalities, since the current rule determines that the state of Rio de Janeiro and its municipalities received 43 percent of all oil royalty payments in 2008. In order to follow and stimulate this discussion, newspapers have produced many articles about royalty payments, their beneficiaries and their use. Figure 2.4 shows the number of articles with the words 'petróleo" (oil), 'royalties" and 'municípios" (municipalities) published by year since 1998 by Folha de São Paulo and O Globo, two Brazilian major newspapers.[21] We see that the average number of articles were about ten until 2006. In 2007, the year of the first major discovery announcement, the number tripled to 30 and in 2008, an election year, 100 news articles were published about the topic. We believe that this graph indicates that more information was provided to voters in 2008 than in previous elections.

Another way to investigate whether information play a role in voters' decision is to explore variation in media coverage across municipalities. Table 2.7 shows the effect of the presence of media with local content on the 2008 reelection outcome. We regress mayor reelection on royalty payments, a variable indicating whether the municipality has local media and an interaction variable of royalty payments and a media dummy. We also include the geographic controls and instrument royalty value and the interaction variable by oil output, and oil output interacting with the media dummy. Along the columns, we vary the measurement of media presence among local radio, television and

[20]See `http://oglobo.globo.com/pais/noblat/post.asp?cod_post=80899`

[21]Information for O Globo is only available from 2003 onwards. We are still trying to obtain the same information from other newspapers from the beneficiary states.

newspaper.[22] These regressions only include the 77 municipalities (out of 157) for which the measures of media presence are available. We observe that mayors from oil-rich municipalities have a lower probability of getting reelected when there is a local TV or a local newspaper. Although we don't have information on the content disclosed by these medias, the fact that they are local imply that they have a higher probability of disclosing information on local issues than other state or national medias. The size of royalty payments in oil-rich municipalities budget and the threat of losing this revenue turn royalty revenues into an important topic for discussion. Unfortunately, we just have data on local media presence for 2008, which does not allow us to understand how their impact changed over time which is crucial to understand the differential effect of royalty rents on the 2000 and 2008 elections. However, Table 2.7 supports the idea that information is crucial for political accountability in oil-rich municipalities.

2.6 Conclusion

In this paper we empirically assess the political mechanisms that explain how natural resource booms affect economic development. We do that by studying the recent boom of oil production in Brazil and the distribution of oil royalties to municipalities. We provide evidence that royalty payments create an incumbency advantage in the election that follows a oil windfall boom. We estimate that a one-standard-deviation increase in royalty value raised reelection chances by 16 percentage points in 2000 (an increase of 32 percent in reelection chance). However, we show that this effect disappears in the medium run, by estimating no incumbency advantage in 2004 and 2008. We also show that the incumbency advantage estimated for 2000 and 2004 should be explained by the behavior of those who are in power, since oil revenues do not impact political selection in any election or pre-election competition in 2000.

We then investigate why voters reelected the incumbents only after the beginning of oil boom. We first analyze whether the enlargement of public sector can explain reelection results. In particular, we investigate when the boost in public sector occurred and whether the municipalities that experienced the larger increases in the public sector are the ones whose voters were more likely to reappoint their mayor for office. We show that municipalities increased the number of public employees mainly in the 1997-

[22] In column 1, we use the number of local radio stations rather than an indicator variable for whether the municipality has a local station because almost all municipalities have at least one local radio.

2000 and 2001-2004 political mandates, but while the first increase was based on more tenured employees, the expansion of the municipal public sector in the second political mandate under analysis relied on non-tenured jobs. The efficacy of this strategy as a way to obtain political support changed over time. Only in 2000 did voters reward the incumbents who created more jobs. We also show that two institutions were able to constrain the irresponsible use of oil revenues. Audits restrained the increase in public employment and local media exerted a pressure on mayors from oil-rich municipalities, who had more difficult in getting reelected.

Our findings are compatible with a learning story presented by our model. The idea is that voters are not fully informed about the amount of royalties received by the municipality where they live. This revenue enables the mayor to provide a higher level of public employment and since voters do not observe the size of the revenue shock, they interpret increases in public employment as a signal of political ability and reward the incumbent by reappointing him to office. Oil revenues have continued to increase throughout the years, as well as voters' awareness about these resources, which increases their demand for improvements and consequently the level of public goods that mayors need to provide to signal high ability. If mayors face a trade-off between diverting money for private use or providing public goods and being reelected, the increase in voters' awareness can make the second strategy less attractive, due to the increasing difficulty in influencing election outcome. Therefore, changes in voters' awareness decrease the probability of reelection and increase the diversion of public funds. However, the result that audits stopped the increase in public employment does not allow us to disregard the idea that constraints on the executive branch restrained the enlargement of the public sector and this caused the loss in incumbency advantage.

Thus, our results indicate that oil does not make leaders unaccountable, and that a democratic system is crucial to avoid the negative effects of resource abundance. Elections, media presence and constraints on executives are all institutions that play a role in restraining the irresponsible use of oil revenues. However, these institutions were not sufficient to guarantee prosperity since our results indicate that Brazilian oil-rich municipalities missed a great opportunity to develop economically after their windfall.

Table 2.1: Mayor and Party Reelection

	1996	2000	2004	2008
	(1)	(2)	(3)	(4)
	A-Dependent variable: Mayor reelection			
Royalties pc		0.59	0.17	0.07
		(0.15)***	(0.18)	(0.14)
Municipalities		157	79	117
	B-Dependent variable: Party reelection			
Royalties pc	1.28	0.72	0.32	-0.00
	(1.53)	(0.16)***	(0.14)**	(0.05)
Municipalities	119	157	157	157

Notes: This table reports the effects of royalty payments on mayor and party reelection in municipalities located on the coast of the nine oil producing states (CE, RN, AL, SE, BA, ES, RJ, SP and PR). Regressions exclude the municipalities on the top 1% of royalty distribution (Quissamã and Rio das Ostras). All regressions use oil output as an instrument for royalty value and control for population, state fixed effects and municipal characteristics (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). Each column indicates one election year: 1996, 2000, 2004 and 2008. Panel A dependent variable is a dummy variable indicating whether the mayor was reelected. Regressions on Panel A consider only municipalities where the mayor is in his first term. Panel B dependent variable is a dummy variable indicating whether the party was reelected. For municipalities created between 1993 and 2001, we use information on the party in power in the original municipality to construct party reelection. The sample in column 1, panel B, is smaller because there is no information on 1996 election for Espírito Santo state and for most of Rio Grande do Norte's municipalities. We use the contemporaneous value of royalty rents and oil output. Both are measured in R$ 1000 per habitant and are deflated by the consumer price index, representing 2008 values. Robust standard errors are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

Table 2.2: Political Competition and Selection

	2000	2004	2008
	(1)	(2)	(3)
	A-Dependent variable: Number of candidates		
Royalties pc	-0.47	-0.65	0.27
	(0.38)	(0.32)**	(0.56)
Municipalities	157	79	114
	B-Dependent variable: Effective number of candidates		
Royalties pc	-0.45	-0.56	-0.05
	(0.18)**	(0.22)***	(0.17)
Municipalities	157	79	114
	C-Dependent variable: Incumbent margin of victory		
Royalties pc	0.26	-0.03	0.06
	(0.07)***	(0.08)	(0.07)
Municipalities	127	61	83
	D-Dependent variable: Opponents' years of schooling		
Royalties pc	0.68	0.63	0.77
	(1.37)	(0.88)	(0.64)
Municipalities	155	78	117
	E-Dependent variable: Opponents' college degree		
Royalties pc	0.06	0.16	0.12
	(0.16)	(0.12)	(0.10)
Municipalities	155	79	117
	F-Dependent variable: Opponents' highly-skilled occupation		
Royalties pc	-0.00	-0.02	0.13
	(0.20)	(0.10)	(0.11)
Municipalities	154	77	117

Notes: This table reports the effects of royalty payments on political competition and selection in municipalities located on the coast of the nine oil producing states (CE, RN, AL, SE, BA, ES, RJ, SP and PR). Regressions exclude the municipalities on the top 1% of royalty distribution (Quissamã and Rio das Ostras). All regressions use oil output as an instrument for royalty value and control for population, state fixed effects and municipal characteristics (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). Each column indicates one election year: 2000, 2004 and 2008. All regressions consider only municipalities where the mayor is in his first term. Panel A dependent variable is the number of candidates who run for mayor. Panel B dependent variable is the effective number of candidates who run for mayor, which is computed by dividing one by the Herfindahl index. Panel C dependent variable is the incumbent's margin of victory, which is the difference in vote-share between the incumbent who is running for reelection and the closest opponent. Panel C considers only municipalities whose mayors ran for reelection. Panel D-F considers opponents' average characteristics. College degree indicates the percentage of candidates with a college diploma. Highly-skilled occupation in column F refers to the percentage of candidates that have a highly-skilled occupation before running for mayor. We use the contemporaneous value of royalty rents and oil output. Both are measured in R$ 1000 per habitant and are deflated by the consumer price index, representing 2008 values. Robust standard errors are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

Table 2.3: Public Employment by Political Mandate

	Total	Non-tenured	% non-tenured	Total	Non-tenured	% non-tenured	Total	Non-tenured	% non-tenured
	1998-2000			2002-2004			2006-2008		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Royalties pc	10.33	-10.37	-0.27	10.63	10.56	0.11	-2.01	1.90	0.05
	(4.49)**	(3.31)***	(0.11)**	(1.47)***	(1.51)***	(0.05)**	(2.60)	(2.47)	(0.05)
Observations	274	274	274	146	146	146	232	232	232
Municipalities	137	137	137	73	73	73	116	116	116

Notes: This table reports the effects of royalty payments on municipal public employment by political mandate. The dependent variable is the total number of public employees per 1000 habitants in columns 1, 4 and 7; total number of non-tenured employees per 1000 habitants in columns 2, 5 and 8; and the percentage of non-tenured employees on total employment in columns 3, 6 and 9. All employment measures are from September 30th of the years indicated in the columns. All regressions consider only municipalities where the mayor is in his first term. Royalty payments are the value received in the contemporaneous year, are measured in R$ 1000 per habitant and are deflated by the consumer price index, representing 2008 values. Population, municipal fixed effects and year dummies are included as controls and royalty value is instrumented by oil output. We consider only municipalities from the nine oil producing states (CE, RN, AL, SE, BA, ES, RJ, SP and PR) and exclude the municipalities on the top 1% of royalty distribution (Quissamã and Rio das Ostras). Robust standard errors clustered at municipality are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

Table 2.4: Public Employment and Reelection

Dependent variable:	Mayor reelection 2000			Mayor reelection 2004			Mayor reelection 2008		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total employees pc	0.05			-0.01			-0.07		
	(0.03)*			(0.02)			(0.04)		
Non-tenured employees pc		-0.08			-0.00			-0.38	
		(0.07)			(0.01)			(1.09)	
% of non-tenured employees			-4.85			-0.25			19.77
			(7.31)			(0.73)			(52.23)
Observations	137	137	137	73	73	73	116	116	116
F-stat	3.423	1.431	0.358	7.476	13.78	6.055	2.973	0.111	0.110

Notes: This table reports regressions coefficients of a dummy variable indicating whether the mayor was reelected on two-year change of municipal employment instrumented by two-year change of oil output per capita. These regressions use as controls state fixed effects and municipal characteristics (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). The sample used include only municipalities whose mayor is on his first term. We consider only municipalities from the nine oil producing states (CE, RN, AL, SE, BA, ES, RJ, SP and PR) and exclude the municipalities on the top 1% of royalty distribution (Quissamã and Rio das Ostras). Robust standard errors are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. F-stat is the Kleibergen-Paap Wald rk F statistic for a weak instruments test.

Table 2.5: Auditing

Dependent variable:	Number of employees pc	
	2004	2008
	(1)	(2)
Royalties pc * audit	2.72	-21.58
	(23.69)	(5.70)***
Royalties pc	25.11	23.97
	(12.65)**	(5.47)***
Audit	-3.77	17.50
	(4.61)	(6.89)**
Observations	88	88
F-stat	37.41	87.00

Notes: This table reports the effects of royalty payments and audits on municipal public employment. The dependent variable is the total number of public employees per 1000 habitants on September 30th of the years indicated in the columns. Audit is a dummy variable indicating whether the municipality was audited by TCE-RJ in the current and/or previous year. These regressions use as controls municipal characteristics: population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital. We instrument royalty value and the interaction variable by oil output and oil output interacted with the auditing dummy. Royalty payments are the value received in the contemporaneous year, are measured in R$ 1000 per habitant and are deflated by the consumer price index, representing 2008 values. The sample includes only Rio de Janeiro municipalities. Robust standard errors are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. F-stat is the Kleibergen-Paap Wald rk F statistic for a weak instruments test.

Table 2.6: Public Employment and Electoral Incentives

Dependent variable:	Number of employees pc				
	First term 1998-2000	First term 2002-2004	Second term 2002-2004	First term 2006-2008	Second term 2006-2008
	(1)	(2)	(3)	(4)	(5)
Royalties pc	10.33	10.63	8.36	-2.01	-0.21
	(4.49)**	(1.47)***	(2.91)***	(2.60)	(0.23)
Observations	274	146	154	232	76
R^2	0.12	0.18	0.27	0.18	0.25
Municipalities	137	73	77	116	38

Notes: This table reports the effects of royalty payments on municipal public employment by political mandate. The dependent variable is the total number of public employees per 1000 habitants on September 30th of the years indicated in the columns. First term (second term) indicates municipalities where the mayor is in his first term (second term). Royalty payments are the value received in the contemporaneous year, are measured in R$ 1000 per habitant and are deflated by the consumer price index, representing 2008 values. Population, municipal fixed effects and year dummies are included as controls and royalty value is instrumented by oil output. We consider only municipalities from the nine oil producing states (CE, RN, AL, SE, BA, ES, RJ, SP and PR) and exclude the municipalities on the top 1% of royalty distribution (Quissamã and Rio das Ostras). Robust standard errors clustered at municipality are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

Table 2.7: Media Presence

Dependent variable:	Mayor reelection in 2008		
Media variable:	Number of local radio stations	Local TV	Local newspaper
	(1)	(2)	(3)
Royalties pc * Media	-0.02	-0.26	-0.29
	(0.02)	(0.16)*	(0.19)
Royalties pc	0.18	0.19	0.17
	(0.15)	(0.15)	(0.18)
Media	0.04	0.09	0.06
	(0.03)	(0.23)	(0.20)
Observations	77	77	77
R^2	0.17	0.17	0.17
F-stat	8.041	9.482	7.015

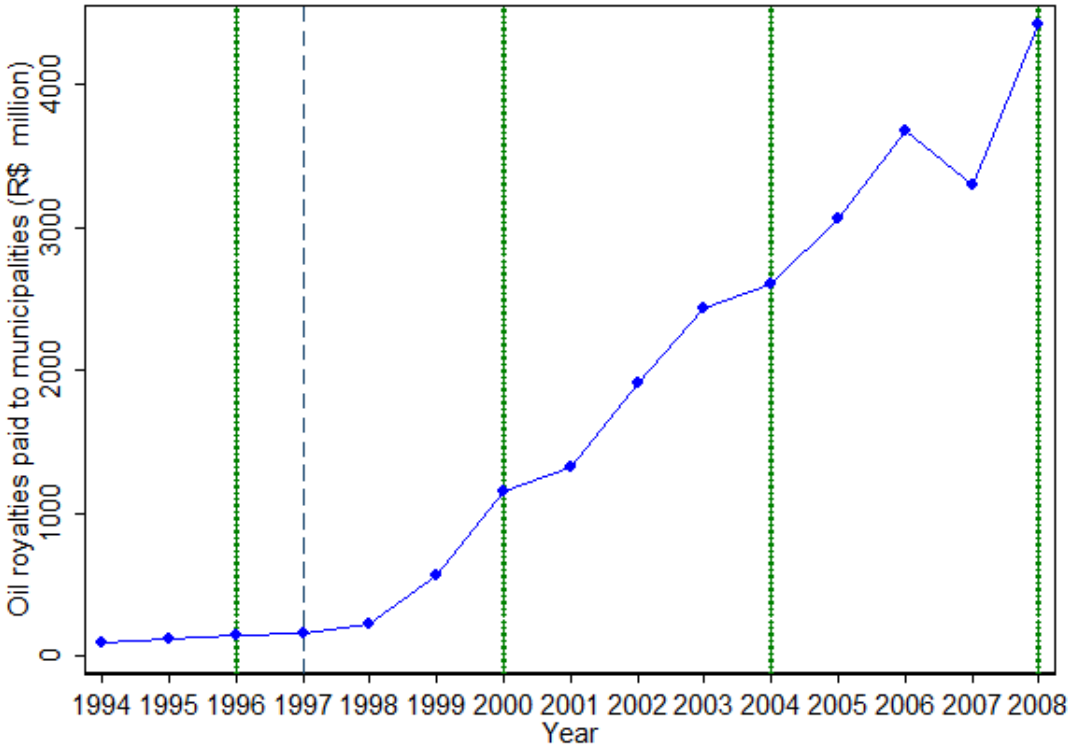
Notes: This table reports the effects of royalty payments and local media presence on mayor reelection. The dependent variable is a dummy indicating whether the mayor was reelected in 2008. In column 1, media is the number of local radio stations. In column 2, media is a dummy variable indicating whether the municipality has a television channel with local transmission, while column 3 media variable is a dummy indicating whether the municipality has a local newspaper. These regressions use as controls state fixed effects and municipal characteristics (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). We instrument royalty value and the interaction variable by oil output and oil output interacted with media dummy. Royalty payments are the value received in the contemporaneous year, are measured in R$ 1000 per habitant and are deflated by the consumer price index, representing 2008 values. The sample includes only 77 municipalities out of the 157 coastal municipalities for each the media information is available. Robust standard errors are reported in parentheses. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. F-stat is the Kleibergen-Paap Wald rk F statistic for a weak instruments test.

Table 2.8: Robustness of Reelection Results

	Coastal municipalities	All municipalities	Oil producing municipalities
	(1)	(2)	(3)
Panel A - Mayor reelection			
Royalties pc 2000	0.59	0.26	0.47
	(0.15)***	(0.13)*	(0.25)*
Obs	157	2151	124
Royalties pc 2004	0.17	0.32	0.53
	(0.18)	(0.19)*	(0.26)**
Obs	79	1236	65
Royalties pc 2008	0.07	0.04	0.06
	(0.14)	(0.08)	(0.18)
Obs	117	1608	91
Panel B - Party reelection			
Royalties pc 1996	1.28	0.90	0.86
	(1.53)	(1.04)	(1.47)
Obs	119	1867	99
Royalties pc 2000	0.72	0.68	0.62
	(0.16)***	(0.15)***	(0.27)**
Obs	157	2151	124
Royalties pc 2004	0.32	0.32	0.22
	(0.14)**	(0.11)***	(0.21)
Obs	157	2151	124
Royalties pc 2008	-0.00	0.00	0.02
	(0.05)	(0.05)	(0.07)
Obs	157	2151	124

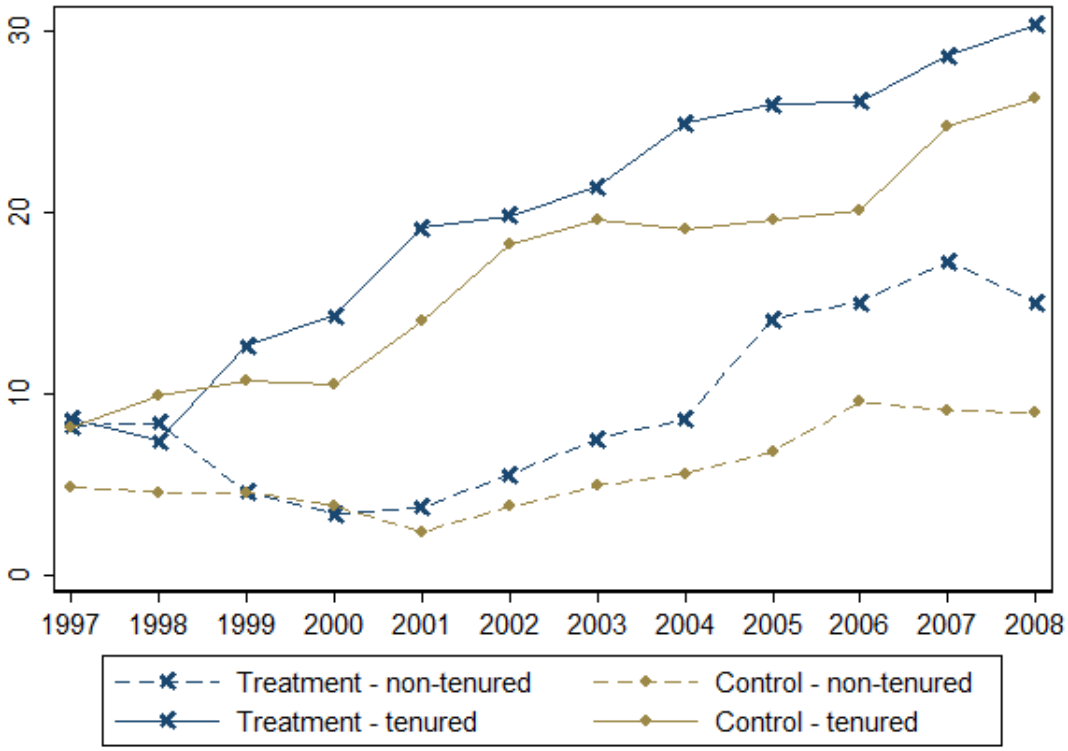
Notes: Each entry is the coefficient and correspondent standard-error of a regression of mayor reelection (Panel A) and party reelection (Panel B) on royalty value per capita instrumented by oil output per capita. Each line refers to a different election year and each column indicates a different sample as explained in the top of the table. All regressions control for population, year effects, state fixed effects and municipal characteristics (population, urbanization rate, population density, distance to the state capital, altitude, longitude, latitude, area, a dummy for whether the municipality is a state capital). Regressions on Panel A consider only municipalities where the mayor is in his first term.

Figure 2.1: Royalty Payments to Brazilian Municipalities 1994-2008



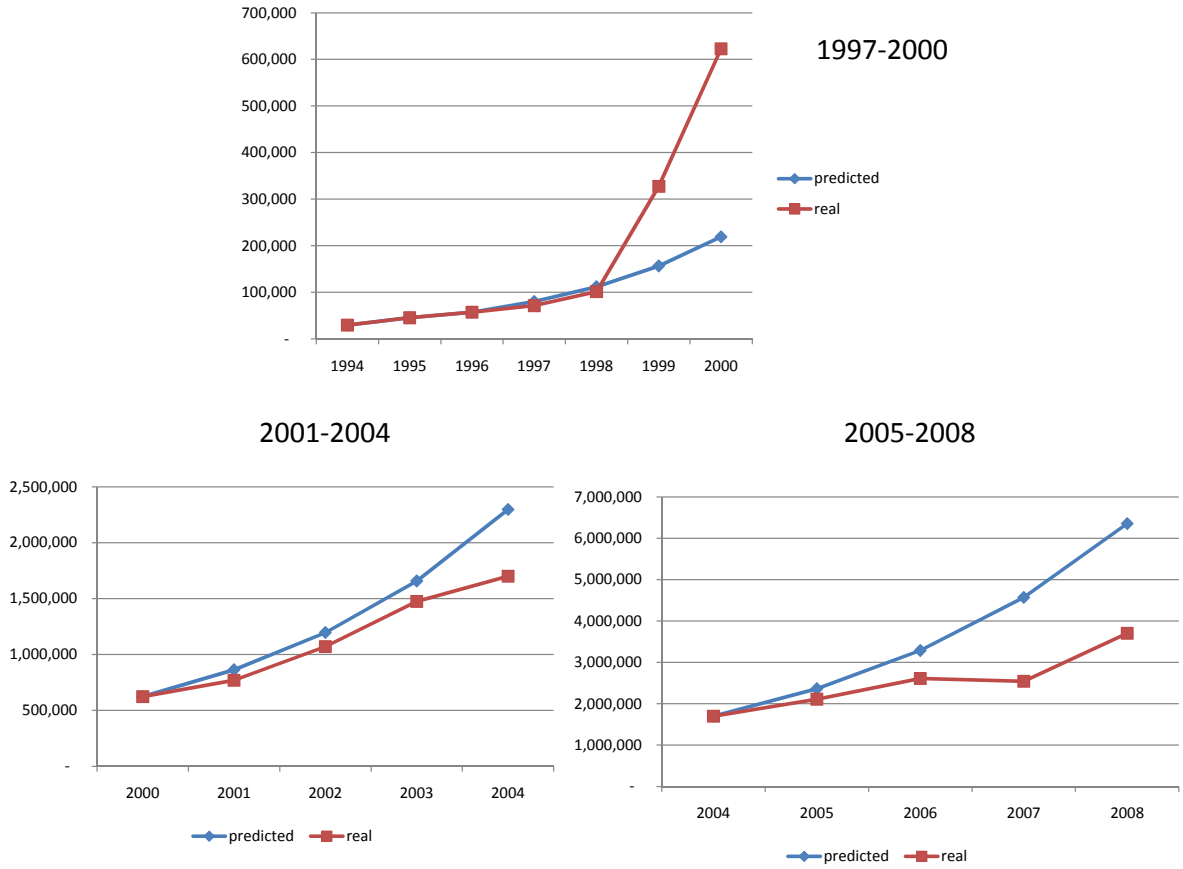
Notes: This figure show the evolution of royalty payments to municipalities from 1994 to 2008. Royalty payment unit is R$ million and corresponds to 2008 real value. The solid vertical lines indicate municipal election years. The dash vertical line indicates the year of enactment of Oil Law.

Figure 2.2: Number of Tenured and Non-tenured Employees 1997-2008



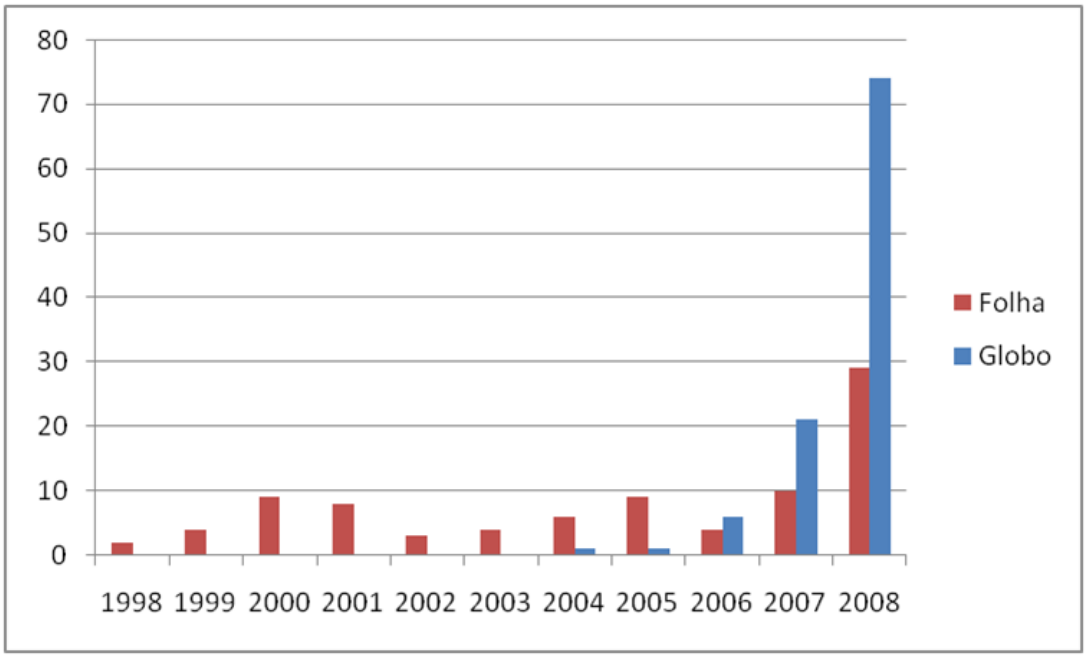
Notes: This figure shows the median number of tenured and non-tenured municipal employees per 1000 habitants on September 30th between 1997 and 2008 for two group of municipalities. Producing municipalities are coastal municipalities that have oil extracted from an oil field within their borders in the reference year. Non-producing municipalities are coastal municipalities which do not produce oil.

Figure 2.3: Actual and Predicted Royalties



Notes: This figure shows the actual and predicted values of royalty payments for 1997-2000, 2001-2004 and 2005-2008 political mandates. To predict 1997-2000 royalty payments, we first use the royalty payments average annual growth rate from 1994 to 1996 to calculate $PredictedRoyalties_{1997} = Royalties_{1996} * (1 + AverageGrowth1994 - 1996)$. We then used the formula $PredictedRoyalties_{t+1} = PredictedRoyalties_t * (1 + AverageGrowth1994 - 1996)$ where $t = 1997, 1998, 1999$. We follow the same procedure to predict royalty payments for 2001-2004 using 1997-2000 average real growth rate; and to predict 2005-2008 payments based on 2001-2004 average real growth rate.

Figure 2.4: Newspaper Coverage



Notes: This figure shows the number of articles with the words 'petróleo" (oil), 'royalties" and 'municípios" (municipalities) published by year by Folha de São Paulo (since 1998) and O Globo (since 2003).