NATURAL RESOURCE RENTS AND PUBLIC EMPLOYMENT: AN EMPIRICAL INVESTIGATION

By

Papp Róbert

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Supervisor: Assistant Professor Michael Dorsch

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ABSTRACT

Excess public employment in natural resource-rich countries is claimed to be a mechanism through which the resource curse operates. Previous studies posit that governments distribute natural resource – in particular, oil – rents partly through overemployment and/or above-market wages in public sectors, which leads to the crowding out of more productive private employment and the entrenchment of political clientelism. Empirical evidence for this argument has so far been only anecdotal. I fill this gap by statistically analyzing data from 91 countries, mostly from 1999-2011, on government wage bills and measures of dependence on and abundance in various natural resources. My most robust and important finding is that oil rents have an economically and statistically significant negative effect on how much governments spend on compensating their employees. This may reflect lower investments in state capacity to tax and regulate, which contributes to resource curse effects.

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1 INTRODUCTION

Having natural resources such as oil, natural gas, and minerals gives great development opportunities for countries. However, the so-called "resource curse" literature contains mounting evidence that it often leads to a number of political and economic problems instead.

Auty and Gelb (2000) and Robinson, Torvik and Verdier (2006) claim that one of these problems is excess public employment. They argue that is a way for governments to redistribute natural resource rents. This would be problematic because of the crowding out of more productive private employment and the entrenchment of political clientelism. So excessive public employment may be a mechanism through which the resource curse operates. Yet, the authors do not provide more than anecdotal evidence for their theories.

My thesis seeks to fill this gap in knowledge. It asks whether, how, and why natural resource rents affect public employment. The hypothesis that – consistent with Auty and Gelb (2000) and Robinson, Torvik and Verdier (2006) – there is a positive effect is tested through statistical analysis of data from 91 countries, mostly from the period between 1999 and 2011. I put to novel use the National Accounts Official Country Data dataset of the United Nations Statistics Division by gathering data on government wage bills from it. This addresses many of the data availability issues that probably have been hindering research about the topic.

My most robust and important finding is that, contrary to what the work cited above posits, on average higher natural resource – in particular oil – rents in fact lead to economically and statistically significantly lower public employment and that this effect is driven by dependence rather than abundance. I present four potential explanations for this. First, Chaudhry (1997)'s observation that oil rents have a negative effect on states' taxation and regulation capacities may account for decreases in the need for civil servants performing

these functions. Second, it is possible that the reason is actually the lack of redistributive public employment in oil-rich countries, as their governments prefer more visible and easier-to-reverse redistribution mechanisms. Third, lower public employment may result from the outsourcing of public administrations' functions and thus personnel to state-owned oil companies. Fourth, it may be that governments of oil-rich countries employ a relatively large number of relatively low-skilled – and thus low-paid – bureaucrats, which totals to lower wage bills.

The negative effect of oil rents on government wage bills and the potential explanations – especially the first, third, and fourth of the above theories – suggest that a causal mechanism linking richness in oil to adverse development outcomes may involve public employment. However, contrary to what the existing literature argues, this mechanism probably does not include excess government employment. Rather, consistent with Chaudhry (1997) and Besley and Persson (2010), oil rents may inhibit the development of state capacity to tax and regulate, including reducing the number and/or wages of civil servants performing these functions. This, in turn, hinders the economy's potential (Besley and Persson 2010). It is also possible that the outsourcing of public administrations' functions and personnel to state-owned oil companies reduces the transparency and accountability of governments. Such an explanation claiming a negative effect of oil dependence on institutional quality and through it on economic growth would be consistent with Leite and Weidmann (1999) and Luong and Weinthal (2010).

The body of the thesis is comprised of four chapters. Chapter 2 reviews the literatures on the resource curse, redistributive public employment, and public employment in natural resource-rich countries. Chapter 3 presents my data. Chapter 4 contains the results of these data's statistical analysis. Finally, chapter 5 discusses the main finding by giving potential explanations for it.

2 LITERATURE REVIEW

This chapter of my thesis summarizes what has been said about public employment in natural resource-rich countries and related topics. Section 2.1, by reviewing some prominent studies of the resource curse literature, establishes that – somewhat paradoxically – richness in resources can lead to adverse development outcomes through different mechanisms. Section 2.2 references claims and some evidence that richness in resources and resource booms lead to overemployment and/or above-market wages in public sectors. To start explaining this phenomenon, section 2.3 puts together some basic insights of political economy to sketch a framework based on the concept of rent seeking that can be used to analyze income redistribution even in the most repressive dictatorships. Section 2.4 makes clear why this is relevant by drawing on two studies presenting the idea that excess public employment may be the result of governments' use of it as a redistributive device. Section 2.5 returns to the context of resource-rich countries by reviewing arguments about how resource rents tilt politicians' and interest groups' incentives towards more income redistribution through indirect mechanisms. Section 2.6 considers the only two theories specifically about the political economy of public employment in natural resource-rich countries. Based on them it concludes that overemployment and/or above-market wages in the public sector in resource-rich countries may be the results of public employment as an opaque and costly-to-reverse means to redistribute resource rents to the unemployed and through clientelistic networks.

2.1 THE RESOURCE CURSE

The first section of my literature review summarizes the most prominent studies of the literature on the so-called resource curse. The main message of the "resource curse" term, the literature unfolding it, and this section is that natural resource richness can lead to adverse

development outcomes. This message is counterintuitive. It also contradicts findings of economic historians and scholars of the industrial revolution (for example Wrigley 1988). However, evidence that it is true is mounting, causal mechanisms are being identified, and theories are becoming more nuanced.

The longest researched topic of the resource curse literature is the relationship between richness in natural resources and economic growth. Nevertheless, a consensus about the topic seems yet to come. Sachs and Warner (1995, 1) show that "economies with a high ratio of natural resource exports to GDP in 1971 […] tended to have low growth rates during […] 1971-89." The authors' main explanation for this is a decline in manufacturing associated with resource richness through a mechanism known as the Dutch disease, which will be elaborated on later. Gylfason (2001, 847) finds that "[e]conomic growth since 1965 has varied inversely with the share of natural capital in national wealth across countries." The study argues that the main reason for this is the neglect of education. Leite and Weidmann (1999) similarly conclude that resource richness leads to relatively slow growth. The authors identify corruption as an important causal link between the two (see also Sala-i-Martin and Subramanian 2003). However, Alexeev and Conrad (2009, 586) demonstrate that "the effect of a large endowment of oil and other mineral resources on long-term economic growth of countries has been on balance positive." Similarly, according to Cologni and Manera (2013, 48), "since the mid-1990s, in the GCC [Gulf Cooperating Council] countries, economic growth has accelerated."

Besides hindering national income growth, natural resource richness is associated with other bad development outcomes like poverty (Sala-i-Martin and Subramanian 2003; Kale and Mazaheri 2014); wealth inequality (United Nations Development Programme Arab Fund for Economic and Social Development 2003); and little human capital (Gylfason 2001;

United Nations Development Programme Arab Fund for Economic and Social Development 2003).

Among the causal mechanisms linking richness in natural resources to underdevelopment, resource-fuelled violent conflict – obstructing economic activity and damaging physical and social infrastructure – stands out. Collier and Hoeffler (2004, 588) show that "primary commodity exports substantially increase conflict risk." The authors argue that this is "due to the opportunities such commodities provide for extortion, making rebellion feasible and perhaps even attractive" (Collier and Hoeffler 2004, 588). Their theory is built on by Fearon and Laitin (2003) and Fearon (2005), who argue that civil war risk is specifically associated with substantial oil production, a major component of primary commodity exports, because "oil producers have relatively low state capabilities given their level of per capita income and because oil makes state or regional control a tempting 'prize'" (Fearon 2005, 483). Ross (2012) also links resource richness to civil conflict.

A link between resource richness and autocracy also seems established (see Barro 1999; Ross 2001; 2012; Wantchekon 2002; Jensen and Wantchekon 2004; Aslaksen 2010; Tsui 2011; Ramsay 2011). In turn, many – for example Acemoglu and Robinson (2012) – doubt that autocracies can sustain economic development in the longer term. Importantly, Ross (2001; 2012) and Tsui (2010) explain the resource richness-autocracy association by the presence of an environment conducive to political clientelism. It is easy to see that clientelism in itself harms development, as it trades off the economically efficient allocation of resources for a politically desirable one.

A number of other phenomena has been identified as links between richness in natural resources and adverse development outcomes. Among these are gender inequality (Ross 2008; 2012) and limited social welfare provision (Kale and Mazaheri 2014).

There is also mounting evidence, however, that resource curse effects are avoidable. In particular, a substantial literature points to the role political and economic institutions play in determining whether natural resource richness becomes a curse or a blessing. Mehlum, Moene and Torvik (2006, 1) show that "[m]ore natural resources push aggregate income down, when institutions are grabber friendly, while more resources raise income, when institutions are producer friendly." Tsui (2010) comes to a similar conclusion. However, it is often argued that institutional quality is endogenous, as richness in resources has adverse effects on institutions. Chaudhry (1997) analyses institutional changes in Saudi Arabia during the 1970s oil boom and the bust of the 1980s. Because of its direct relevance to public employment, I return to her theory later. According to Ross (2001, 2012), lack of taxation in resource-rich countries leads to a lack of representation. He also emphasizes the problems of shortsightedness induced by revenue volatility. Luong and Weinthal (2010) explore the effects of oil industry ownership structures on institutions constraining executive power. Alexeev and Conrad (2009) question the negative effect of oil and mineral wealth on institutions.

2.2 Overemployment and/or Above-Market Wages in Public Sectors as Part of the Resource Curse

The previous section showed that natural resource richness can lead to a number of adverse development outcomes through different mechanisms. This section reviews claims and suggestive evidence that a phenomenon linking richness in resources to underdevelopment is overemployment and/or above-market wages in public sectors. This is the mechanism my thesis seeks to explore.

Auty and Gelb (2000, 4) note that "[a] […] characteristic of resource abundance […] is a chronic tendency for the state to become overextended, especially in the face of large

fluctuations in the value of natural resources." Robinson, Torvik and Verdier (2006) remark that "resource dependent economies and resource booms seem to lead to […] large public sectors." Indeed, there are a number of cases in which public employment rates or public sector wages of natural resource-rich countries grow excessively after a resource windfall. They include 1973-1987 Nigeria (Gavin 1993); 1975 Trinidad and Tobago (Gelb 1988; Auty 1999); 1973-1982 Ecuador; Venezuela (Gelb 1988); Mexico (Auty 2001); 1972-1985 Zambia (Bates and Collier 1995); and 1985-1988 Peru (Sachs 1989). Overemployment, above-market wages, and low productivity characterize a number of state-owned extractive companies as well (Barma, et al. 2012). An example from the developed world is provided by Milke (2015), who concludes that in the oil-rich states of Alberta and Texas since 2010, high oil prices and government revenues were associated with increasing public employment, especially in the fiscally imprudent Alberta.

My thesis tests the hypothesis that excess government employment is a plausible mechanism through which the resource curse may operate. Whether, how, and why natural resource rents affect government wage bills is its particular focus. This is important because there is mounting evidence that developing countries in general are characterized by public sector overemployment. Heller and Tait (1983) find that public employment constituted 44% of non-agricultural employment in 23 developing countries and only 24% in 14 developed ones. In the sample of Gelb, Knight and Sabot (1991), employment in public sectors grows faster than private employment. Sachs (1989) mentions growing public employment in Latin America.

2.3 RENT SEEKING AND CREATION

Sections 2.1 and 2.2 established that natural resource richness can lead to adverse development outcomes and that a mechanism through which this happens is overemployment

and/or above-market wages in public sectors. This section builds the foundations of a theory of why richness in resources may lead to excess public employment. Cologni and Manera (2013, 49) give a purely economic explanation, positing that "[t]he diminishing marginal product of labor in the public production function determines the reallocation of factor across sector." Building on Auty and Gelb (2000), Auty (2001) and Robinson, Torvik and Verdier (2006), my thesis evaluates the idea that the reasons are only partly economic, and partly political. The next paragraphs summarize some basic insights of political economy about rent seeking and creation in a framework that will be used to identify the political reasons for overemployment and/or above-market wages in public sectors.

My point of departure is the classic argument by Olson (1965) and Becker (1983) that governments should not be viewed as maximizers of social welfare. Instead, the latter studies suggest that public policies are essentially responses to pressure from interest groups. Bates (1983) claims that rulers play a more proactive role and sees them as organizers of political support for staying in power. Finally, Killick (1978) and Acemoglu, Verdier and Robinson (2004) argue that governments can become largely independent from political pressures and attend solely to their own glorification and consumption.

Ideas explicitly or implicitly based on the concept of rent seeking arguably combine all the above theories. Rent seeking is defined by Murphy, Shleifer and Vishny (1993, 409) as "any redistributive activity that takes up resources." The authors distinguish between private rent seeking, meaning transfers between private parties, and public rent seeking, that is, redistribution from the private sector to the state or government bureaucrats.

Rent-seeking politicians use their political powers to maximize their own utilities. These comprise not only of income accruing to them directly (Killick 1978; Tsui 2010), but also of income accruing to their own castes (Kale and Mazaheri 2014), parties, clans, ethnic (Robinson, Torvik and Verdier 2006), income, racial (Alesina, Baqir and Easterly 2000) or

other kinds of groups whose utilities they to some extent internalize. Incumbents' rent-seeking activities thus include channeling fiscal revenues to their private bank accounts and public policies disproportionately benefitting their own groups. The framework can also be used to explain benevolent policies if one thinks of politicians' own groups as some disadvantaged parts of society. In any case, staying in power for as long as possible is part of incumbents' utility maximization strategies, as it allows them to capture and redistribute rents longer (Tsui 2010).

To stay in power, elites can use repression. However, doing so is costly (Tsui 2010) and remaining in power is impossible without at least some level of popular support (de Mesquita, et al. 2003; Tsui 2010).

At the same time, rent seeking is also appealing to interest groups, broadly conceived. Pressuring governments into rent creation is a common practice in perhaps all countries of the world. For example, when a company lobbies the government to adopt a policy that limits competition can be categorized as such an activity (Stigler 1971). As noted by Alesina, Baqir and Eastely (2000), voting is only one of the many ways to do so. Hyden (1983) describes how members of kinship and client groups lobby politicians in developing Africa. Thus, importantly, these ideas can be applied to democratic contexts as well as authoritarian ones.

Because incentives for politicians to supply rents and demand for them by interest groups meet, "[t]o governments the creation of economic rents represents a relatively costless way of acquiring political resources" (Gelb, Knight and Sabot 1991, 1188). Inefficiencies can therefore be rational from the perspective of both politicians (de Mesquita, et al. 2003) and the beneficiaries of their policies (Krueger 1974; Bhagwati 1982). Reform of such inefficiencies is difficult, because it requires that the beneficiaries of the status quo give up their privileges (Buchanan 1980). It is hard for opposition forces to convince current beneficiaries to give up

the status quo, in particular because they cannot commit credibly to compensating or rewarding them (Buchanan 1980).

Gelb, Knight and Sabot (1991), Bates and Collier (1995), and Tornell and Lane (1999) remark that good institutions constrain rent seeking and creation, similar – and arguably linked – to how good institutions can mitigate the resource curse.

2.4 THE REDISTRIBUTIVE FUNCTION OF PUBLIC EMPLOYMENT

The previous section patched together different arguments, all based on the concept of rent seeking, into a logical framework that can be – and indeed often is – used to analyze income redistribution policies from a political economy perspective. This section reviews claims about and evidence for how public employment fits into the framework. Most of these claims and evidence are from Gelb, Knight and Sabot (1991) and Alesina, Baqir and Eastely (2000). These studies recognize the redistributive function of public employment and thus are essential clues in my own investigation.

Both Gelb, Knight and Sabot (1991) and Alesina, Baqir and Eastely (2000) observe that public employment rates and public sector wages are often higher than the demand for goods and services produced by it would suggest. They also agree that this is only partly a result of unintended inefficiency, and in part a consequence of the kind of the rent-seeking and rent-creating activities whose logic section 2.3 introduced. As Gelb, Knight and Sabot (1991, 1196) put it, "[r]ent seeking and rent creating behavior can give rise to a wasteful diversion of resources into the public sector over and above the derived demand for resources." Alesina, Baqir and Eastely (2000, 219) similarly argue that "[the level of public employment in American cities] is not chosen only from the point of view of 'productive efficiency.'"

In both models, excess public employment exists because incumbents redistribute income partly through political clientelism. The practice has been analyzed extensively, for example by Achebe (1964), Weingrod (1968), Price (1975), Chubb (1982), Shleifer and Vishny (1994) and de Mesquita, et al. (2003). Importantly, Chubb (1982) shows that income is redistributed to and political support is expected from not only the client, but also from their social networks.

Gelb, Knight and Sabot (1991) and Alesina, Baqir and Eastely (2000), however, give different answers to the questions of (1) why exactly do governments assign a redistributive function to public employment; (2) members of which group or groups receive the relevant jobs; and (3) what are the consequences of using public employment as a redistributive device.

Gelb, Knight and Sabot (1991) theorize about why developing countries tend to have overemployment and/or above-market wages in the public sector. They argue that this is because the urban unemployed lobby for the creation of public sector jobs. The government – motivated to stay in power – responds positively to their demand, unless it faces strong countervailing pressures from taxpayers and creditors. Considering the importance of unemployed city-dwellers from the perspective of both electoral and contentious politics, the authors' expectation of a positive response seems reasonable. It is no wonder then either that "[t]he phenomenon of public sector surplus labor has been most obvious under populist, highly interventionist leaders" (Gelb, Knight and Sabot 1991, 1197). Their argument is also in line with Freeman (1984), who remarks public sector unions' potential to shift demand curves outward through the political process.

Gelb, Knight and Sabot (1991) see the principal flaw of providing public employment for redistributive purposes in that it crowds out productive activities. Importantly, they conclude this after assuming that the jobs created to meet the demand of the employment lobby are

unproductive. As Gelb, Knight and Sabot (1991, 1193) put it, "[unproductivity] can represent an average of positive and negative products, or it may incorporate negative externalities, for instance, morale effects on other public sector employees." Productive activities are crowded out through a vicious circle of rent seeking and creation: Agricultural workers move into the city to lobby for further public employment provision and politicians act on their demands, financing the policy by increasing taxation of the private sector. Because of this, urban unemployment does not decrease either. The vicious circle does not break unless an exogenous factor – for instance political pressure from a foreign or international actor – changes the balance of demands the government faces. Arguably economic pressure from international credit markets can play a similar role. One may also add that the crowding out of more productive private employment by excessive public employment seems to be a problem only in economies that are already close to full employment.

Empirical evidence for the Gelb, Knight and Sabot (1991) model is only anecdotal. It includes examples of rent-containing public sector wages (Heller and Tait 1983); public sector "overmanning," implying both relatively big sizes and relative unproductivity in Egypt (Hansen and Radwan 1982) and Latin America (Pfefferman 1987; The World Bank 1979), lobbying for public employment in India (Chaudhuri 1978; Jha 1980; Bhagwati 1983; Bardhan 1984), relatively unproductive public undertakings in Turkey (Walstedt 1980; Krueger and Tuncer 1982; The World Bank 1982) and Indonesia (Hill 1982), and governments acting as employers of last resort in Egypt, Ivory Coast, Mali, Mauritius, and Sri Lanka (The World Bank 1983).

Alesina, Baqir and Eastely (2000) seek to explain variation in the number of public employees across cities in the United States. In their model, local governments – especially those headed by politicians favorable to the poor – redistribute funds to the poor and to disadvantaged ethnic groups through public employment. They do so because, as Rodríguez

(1999) points out, the wealthy are often willing and able to successfully lobby against explicit redistributive policies. The advantage of using public employment as a redistributive device is that politicians can state that labor is necessary for the production of goods and services which the wealthy can enjoy. Redistribution through public employment can thus hide from upper and middle-class voters the fact that redistribution happens and help avoid losing their support. The authors note that public employment provision as a redistributive device may be superior to cash transfer also because whereas cash transfers may be wasted by their recipients, having a job may have positive effects, for example on work ethics.

Importantly, Alesina, Baqir and Eastely (2000) show quantitative empirical evidence that higher income inequality and ethnic fragmentation – as well as to a lesser extent unemployment – are associated with higher numbers of public employees in U.S. cities. The finding about income inequality is supported by Alesina, Danninger and Rostagno (1999, 2), who demonstrate that "about half of the wage bill in the [less wealthy] South of Italy can be identified as a subsidy [from the North]. More generally, Alesina, Baqir and Easterly (1999) and Banerjee and Somanathan (2007) show that ethnicity can affect redistribution.

2.5 Rent Seeking and Creation in Natural Resource-Rich Countries

After the excursion of sections 2.3 and 2.4, this section returns to the context of natural resource-rich countries. It establishes why redistributive public employment may be more prevalent in resource-rich contexts than elsewhere. In particular, it reviews some arguments about how richness in resources affects decision-making processes of politicians and interest groups using the framework presented in section 2.3.

It is now established that politics play a key role in translating natural resource richness to adverse development outcomes (Newberry 1986). As Tsui (2010, 472) puts it, "[t]o better understand the nature of the resource curse, one needs to study how economic factors shape political institutions and how political institutions affect the economy."

My points of departure to this understanding are the characteristics of natural resource revenues that distinguish them from other kinds of income. Perhaps the most important of such characteristics is that from the perspective of the producing country, resource revenues are by definition economic rents in the traditional sense, that is, benefits derived from "free gifts of nature". In relation to oil revenues, Ross (2012) concludes that what makes them special is that they are massive, state-owned or controlled, unstable, and easily hidden. This observation can arguably be extended to a number of – although not all – other resources.

It is because of such characteristics that natural resource revenues can create perverse incentives for both politicians and interest groups. As Gelb (1986, 343) puts it, the question is "how you spend rent income relative to other sources." According to Robinson, Torvik and Verdier (2006, 447), "the political incentives that resource endowments generate are the key to understanding whether or not they are a curse", and "policy mistakes [are in fact] rational political strategies as politicians respond to the incentives induced by resource rents" (Robinson, Torvik and Verdier 2006, 448).

In particular, natural resource revenues generate incentives for increased rent seeking and creation. The existence of higher rents means that there are more to be captured by politicians. No wonder that Leite and Weidmann (1999) find a positive association between natural resource richness and corruption. Resource rents can also be imagined as a honey pot attracting potential political competitors (Auty and Gelb 2000; Tsui 2010; Ross 2012). This, in turn, together with better financial capacities and a stronger will to remain in power, induces incumbents to be more repressive (Tsui 2010; Sköns, et al. 2000; Ross 2012).

Alternatively, politicians can redistribute part of the rents to "buy off" would-be opponents and interest groups (Auty and Gelb 2000; Robinson, Torvik and Verdier 2006).

For citizens as well, the more the resources, the bigger the incentives to seek rents instead of engaging in productive activities (Tornell and Lane 1999; Baland and Francois 2000; Torvik 2002; Lagerlöf and Tangerås 2008; Alichi and Arezki 2009).

The increased willingness and ability of politicians to create rents, and the stronger will of interest groups to seek them is argued to result in higher levels of income redistribution. Tornell and Lane (1999, 22) define this "voracity effect" as the phenomenon "by which a shock, such as a terms of trade windfall, perversely generates a more-than-proportionate increase in fiscal redistribution and reduces growth." Mahdavy (1970), Gelb (1988) and Ross (2008) come to similar conclusions.

2.6 THE REDISTRIBUTIVE FUNCTION OF PUBLIC EMPLOYMENT IN NATURAL RESOURCE-RICH COUNTRIES

Section 2.5 established that stronger incentives for politicians to seek and create rents and for interest groups to seek them in natural resource-rich countries are expected to increase the level of income redistribution. This section reviews how the same incentives change the preferred means of this redistribution and identify public employment as one favored channel. It does so primarily by reviewing the studies of Auty and Gelb (2000) and Robinson, Torvik and Verdier (2006), containing theories specifically about the redistributive function of public employment in natural resource-rich countries. The literatures reviewed so far are brought together at his point.

My point of departure here is that natural resource richness induces not only quantitative increases in the level of income redistribution, but also qualitative changes in its means. Auty

(1999) finds that natural resource richness is negatively associated with investment efficiency. Cologni and Manera (2013) extend this observation to government expenditures. Both Auty and Gelb (2000) and Robinson, Torvik and Verdier (2006) argue that inefficiency also characterizes resource-rich countries' redistribution policies.

Auty and Gelb (2000, 4) note that in natural resource-rich countries "[o]nly rarely is it politically expedient (or technically possible) to use transparent mechanisms such as direct redistribution to households through vouchers." According to their study, clientelistic mechanisms redistributing income specifically to politically important groups in ways lacking transparency are usually preferred instead as more effective and efficient means to staying in power. The three main avenues they identify are "extended periods of protection for import-competing sectors; the creation of employment through growth of the public sector; and overextended public expenditure" (Auty and Gelb 2000, 4). They observe that resource rents make it possible to sustain such inefficient policies with distortionary effects on the economy. Auty (2001) comes to a similar conclusion.

Most importantly for the purposes of my thesis, Auty and Gelb (2000, 5) state that "[p]ublic employment can be a politically appealing way to redistribute rents." They apply to resource-rich countries the already presented theory of Gelb, et al. (1991), which posits that non-productive public sector jobs are provided to the urban unemployed, of whom politicians are afraid. Indeed, Basedau and Lay (2009) find that large-scale redistribution – party through public employment – is an effective way for oil-wealthy countries to maintain political stability. Auty and Gelb (2000)'s idea is also interesting because public employment is a direct response to the problem of urban unemployment – and indeed, unemployment in general – which may be a more pressing issue in countries rich in natural resources than elsewhere. This is possible because, as a substantial literature points out, richness in certain natural resources – particularly oil, natural gas, and minerals – is likely to crowd out labor-

intensive private sector industries. Small economies are especially prone to such lack of diversification (Auty and Gelb 2000, 9). Reasons include the overconcentration of economic activities in capital-intensive extractive industries (Hischman 1958; Auty 2001; Mishra 2010; Kale and Mazaheri 2014), the so-called Dutch disease by which currency appreciation as a result of resource exports makes labor-intensive export products uncompetitive (van Wijnbergen 1984; Neary and van Wijnbergen 1986; Sachs and Warner 1995; Murshed 1999; Sachs 1999; Sachs and Warner 1999; Auty 2001; Papyrakis and Gerlagh 2004; Auty and Gelb 2000; Bravo-Ortega and De Gregorio 2002; Ross 2012; Cologni and Manera 2013), and the already emphasized stronger incentives for firms and households to engage in rent seeking instead of productive economic activities.

Auty and Gelb (2000) also suggest that decreases in resource revenues may not reduce public employment, straining government budgets. This is problematic, because revenue volatility is one of the most distinct challenges natural resource-rich countries face (Hirschman 1958; Mahdavy 1970). Regnier (2007, 405) finds that "crude oil, refined petroleum, and natural gas prices are more volatile than prices for about 95% of products sold by domestic [U.S.] producers." Besides their volatility, Robinson, Torvik and Verdier (2006), Ross (2012) and Cologni and Manera (2013) among others also consider the uncertainty and exogenously determined nature of oil prices. According to Auty and Gelb (2000, 5), "[p]olitical competition for rents, combined with nontransparent mechanisms of redistributing them (and in some cases of accounting for them), makes it more difficult for governments to moderate spending levels in response to fluctuations." This is because reforms would be unpopular among the status quo's politically important beneficiaries. The authors also note that sustaining the policies require either borrowing or increasing the taxation of the private sector's competitive part.

Similar to Auty and Gelb (2000), Robinson, Torvik and Verdier (2006) explain public sector growth following resource booms by political incentives. In their model, public employment is provided to members of incumbent politicians' own groups or networks, be those parties, clans, ethnic or other kinds of groups. The incumbents' purpose is to bias outcomes of elections and political contests to stay in power. Public employment is preferred over other means of redistribution because it can be decided before elections or political contests and is costly to reverse, which makes it a credible commitment device. Based on the assumption that public employment is less efficient than private, the authors conclude that this practice decreases national income. They also remark the role of institutions, by arguing that they "clearly influence whether or not political criteria can be used to determine public sector employment, rather than say merit." In a similar vein, Kale and Mazaheri (2014) show how caste affects redistribution in general and public employment in particular in India's natural resource-rich state Bihar.

Neither Auty and Gelb (2000) nor Robinson, Torvik and Verdier (2006) provide more than anecdotal evidence for their claims. My thesis aims to fill this gap.

3 DATA

The previous chapter reviewed a handful of studies claiming that natural resource rents have an effect on public employment. On the one hand, Auty and Gelb (2000) and Robinson, Torvik and Verdier (2006) argue that the effect is positive, because public employment is a means for elites to redistribute resource rents to politically important groups. None of the papers support its claims with more than anecdotal evidence. On the other hand, Chaudhry (1997) writes about the deconstruction of state capacity to tax and regulate during the oil boom of the 1970s in Saudi Arabia. Extending her argument, one may claim that resource rents are negatively associated with state capacity in general and public employment in particular. I evaluate these arguments using cross-country yearly data.

This chapter introduces my cross-country yearly data, which I use to estimate the relationship between natural resource rents and public employment. Below is the presentation of my dependent and independent variables, followed by a table providing summary statistics.

3.1 DEPENDENT VARIABLES

My dependent variables are the government wage bills as a percentage of gross domestic product (GDP) and as a percentage of general government final consumption expenditure (GGFCE). Measuring public employment by how much the government spends on compensating its employees as a percentage of GDP and of government expenditure is endorsed by Clements, et al. (2010) and Mills, et al. (n.d.). The compensation of government employees data cover in cash and in kind payments (United Nations Statistics Division 2015) to employees of government units, social security funds, and Non-Profit Institutions controlled and mainly financed by government units (Inter-Secretariat Working Group on National Accounts 1993).

To construct these variables, I put to novel use the National Accounts Official Country Data dataset of the United Nations Statistics Division (UNSD). The database contains the most recent data for as many countries as possible. It is based on reports by National Statistical Offices (United Nations Statistics Division 2015).

The government wage bills as a percentage of GDP and of general government final consumption expenditure (GGFCE) data cover 91 and 89 countries respectively from 1950 until 2013. However, statistics on more than 70 countries a year are available only for the period 1999-2011. Therefore, I use country averages in this period to provide summary statistics (see table 2) and for my scatterplots and initial regressions. Table 1 lists the countries for which data on the compensation of government employees are available.

Armenia	Ecuador	Kuwait	Portugal
Austria	Egypt	Kyrgyzstan	Qatar
Azerbaijan	Estonia	Latvia	Romania
Bahrain	Finland	Lesotho	Russia
Belarus	France	Liechtenstein	San Marino
Belgium	Germany	Lithuania	Saudi Arabia
Bolivia	Germany, West	Luxembourg	Senegal
Botswana	Greece	Macedonia	Serbia
Brazil	Guatemala	Malta	Slovakia
Bulgaria	Guinea	Mexico	Slovenia
Burkina Faso	Honduras	Micronesia	South Africa
Burundi	Hungary	Moldova	Spain
Cameroon	Iceland	Mongolia	Sweden
Canada	India	Morocco	Switzerland
Chile	Iran	Mozambique	Timor-Leste
China	Iraq	Namibia	Trinidad and Tobago
Colombia	Ireland	Netherlands	Tunisia
Cote d'Ivoire	Israel	New Zealand	Turkey
Croatia	Italy	Nicaragua	Ukraine
Cyprus	Japan	Niger	United Kingdom
Czech Republic	Kazakhstan	Norway	United States
Denmark	Kenya	Philippines	Venezuela
Dominican Republic	Korea, South	Poland	

Table 1: Countries with available compensation of government employees data

So far no study has considered using the UNSD data to measure public employment. Clements, et al. (2010) and Mills, et al. (n.d.) suggest International Labour Organization

(ILO) (n.d.) and International Monetary Fund (IMF) (n.d.) statistics instead. I argue that the UNSD data have advantages over these. The UNSD statistics are much more comparable across countries and years than the ILO ones, because the former dataset uses the uniform classifications of the United Nations System of National Accounts 1993 (United Nations Statistics Division 2015). I prefer the UNSD data over the IMF ones because they provide a much better spatial and temporal coverage.

3.2 INDEPENDENT VARIABLES

My independent variables are from the Quality of Government (QoG) Time-Series Data dataset of the QoG Institute (Teorell, et al. 2015).

To measure countries' natural resources rents, I use four sets of variables. The first group includes total natural resources, oil, natural gas, mineral, coal, and forest rents as percentages of GDP. These rents are the differences between the values of production and total costs of production. The second set is made up of fuel, ores and metals, and agricultural raw materials exports as percentages of manufacturing exports. These data are originally from the World Development Indicators (WDI) dataset of the World Bank (World Bank 2015). The third group comprises of net oil and gas exports values per capita in constant 2000 dollars. The fourth set includes constant price of oil in 2000 dollars/barrel and constant price of gas in 2000 dollars/million barrels of oil equivalent. The original source of the third and fourth groups is the Oil and Gas Data, 1932-2011 database of Michael L. Ross (2013).

Arguably, the first three independent variable sets measure different concepts: the first two that of natural resource dependence, while the third that of natural resource abundance. Norway and Chad illustrate the difference. Norway's average net oil exports value per capita between 1999 and 2011 was $7151.19, while that of Chad was only 161.91. Nevertheless, Norway's oil rents comprised just 12% of the country's GDP. Chad's much lower oil rents, at

the same time, made up 35% of GDP. Such differences result mainly from differences in the diversification of the economy, but different domestic consumption/export ratios and production costs also play a role.

To control for business cycles and the level of industrialization and economic development, I use GDP per capita converted into 2011 international dollars using purchasing power parity (PPP) exchange rates and the value added by manufacturing as a percentage of GDP. These data are also originally from the WDI dataset.

Summary statistics of country averages for the period between 1999 and 2011 are provided below in table 2.

Variable	Source	Observations	Mean	Standard Deviation	Skewness
Compensation of government employees (% of GDP)	United Nations Statistics Division (UNSD), National Accounts Official Country Data	89	10.11303	3.580631	1.585266
Compensation of government employees (% of general government final consumption expenditure)	UNSD, National Accounts Official Country Data	87	57.50789	13.17483	-.5064377
Total natural resources rents (% of GDP)	World Bank, World Development Indicators (WDI)	188	10.42905	15.25999	1.859399
Oil rents (% of GDP)	World Bank, WDI	138	7.624829	14.5749	2.213463
Natural gas rents (% of GDP)	World Bank, WDI	136	2.269425	5.893372	4.375448
Mineral rents (% of GDP)	World Bank, WDI	188	1.104098	3.2963	5.193403

Table 2: Summary statistics, 1999-2011 country averages

Variable	Source	Observations	Mean	Standard Deviation	Skewness
Forest rents (% of GDP)	World Bank, WDI	180	2.330104	4.6709	3.686182
Fuel exports (% of merchandise exports)	World Bank, WDI	172	17.00725	27.5567	1.824934
Ores and metals exports (% of merchandise exports)	World Bank, WDI	173	7.791537	13.59997	2.786228
Agricultural raw materials exports (% of merchandise exports)	World Bank, WDI	173	4.472138	8.8809	4.836826
Net oil exports value per capita, constant 2000 $	Michael L. Ross, Oil and Gas Data, 1932-2011	170	337.2561	1833.234	4.175638
Net gas exports value per capita, constant 2000 $	Michael L. Ross, Oil and Gas Data, 1932-2011	170	86.30569	643.0349	7.213282
Constant price of oil in 2000 $/brl	Michael L. Ross, Oil and Gas Data, 1932-2011	170	45.476	-	-
Constant price of gas in 2000 $/mboe	Michael L. Ross, Oil and Gas Data, 1932-2011	170	2.60e+07	-	-
GDP per capita, PPP (constant 2011 international $)	World Bank, WDI	180	15177.39	18943.53	2.630842
Manufacturing, value added (% of GDP)	World Bank, WDI	179	13.08892	7.012996	.7179777

Table 2: Summary statistics, 1999-2011 country averages (continued)

4 ANALYSIS

The previous section introduced the cross-country yearly data on government wage bills and natural resource rents. This chapter uses these data to test the following hypothesis, formulated based on the literature reviewed in the introduction:

H: Natural resource rents have a positive effect on government wage bills.

The hypothesis is framed in terms of causality rather than correlation because I suspect no or minimal omitted variable bias or endogeneity. To mitigate potential omitted variable bias, my regression models control for (1) GDP per capita as a measure of economic development, (2) the value added by manufacturing as a percentage of GDP as a measure of industrialization (this is especially important because natural resource-rich but otherwise underdeveloped countries may have high GDP per capita values), and, (3) in the case of regressions on panel data, country and year fixed effects capturing the effects of time-invariant characteristics and events like the 2008 global economic crisis that affected all countries similarly. Regarding potential reverse causality, although elites may want to bring extraction projects online to finance their expenses (see the example of Chad in Coll 2013), in particular to finance excess government employment, their opportunities to do so seem limited.

In the following, I first show graphics to give an intuition about the relationship between natural resource rents and the compensation of government employees. I then run ordinary least squares (OLS) regressions on country averages for the period from 1999 until 2011. This allows for seeing the effect different natural resources have on government wage bills. Finally, my fixed effects models will allow for analyzing within-country variation over time and will provide the most robust results.

4.1 CHARTS

This section shows figures depicting relationships between different measures of natural resource and government wage bills. Figures (1) to (5) aim to give an intuition about variation across countries and thus plot country averages for the period between 1999 and 2011.

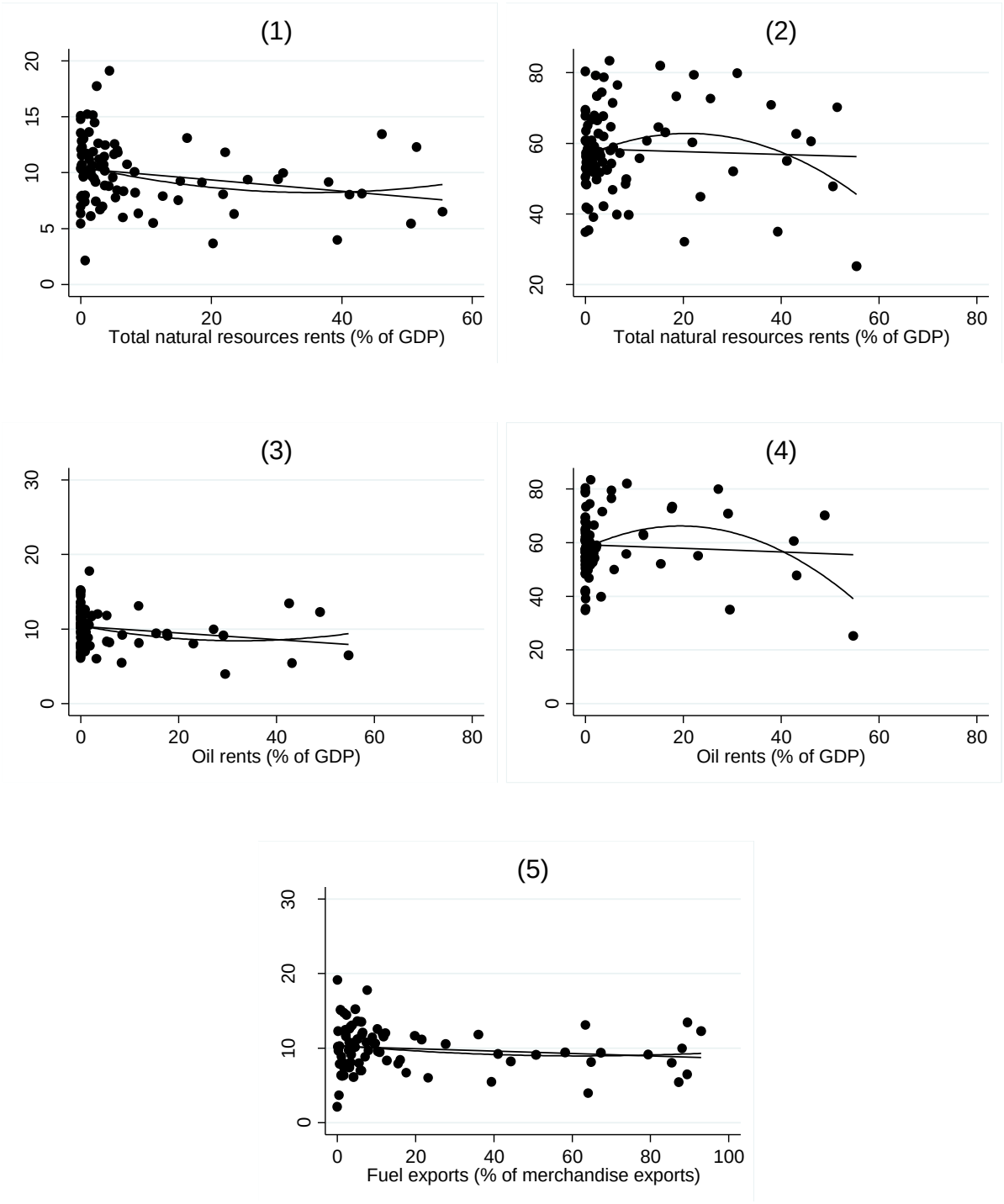

Figure (1) plots each country's average total natural resources rents as a percentage of GDP and compensation of government employees as a percentage of GDP for the period from 1999 until 2011. Micronesia is excluded as an outlier, because its exceptionally high wage bill may bias the estimates. The graph suggests that the relationship between resource rents and government wage bills relative to GDP is either linear and negative or U-shaped.

Rather than as a percentage of GDP, figure (2) measures government spending on employee compensation as a percentage of general government final consumption expenditure (GGFCE). Timor-Leste is excluded as an outlier because of its exceptionally low wage bill. The emerging pattern is an inverted U-shaped, a slight linear negative, or no relationship between total natural resources rents and government wage bills.

Figures (3) and (4) depict the relationships between oil rents as a percentage of GDP and the compensation of government employees as a percentage of GDP and of general government final consumption expenditure (GGFCE), respectively. They suggest that the correlations are very similar to those between total natural resources rents and government wage bills.

Figure (5) plots data on another measure of oil richness, fuel exports as a percentage of merchandise exports, and the compensation of government employees as a percentage of GDP. It also suggests that the correlation between oil rents and government wage bills is either linear and negative or U-shaped.

4.2 REGRESSIONS ON 1999-2011 COUNTRY AVERAGES

In this section I show results of regressions on country averages for the period from 1999 until 2011. Every regression uses the OLS estimation technique and controls for the log of GDP per capita. To demonstrate effect sizes, I calculate the effects of a standard deviation increase in the independent variable in question on the given dependent variable, again measured as a fraction of its standard deviation. When I mention employing additional robustness checks, I mean running a regression that controls for both the log of GDP per capita and the value added by manufacturing as a percentage of GDP, estimates heteroskedastic robust standard errors, and excludes Micronesia and Timor-Leste as outliers.

In the following I present regression tables containing results related to each of my independent variable sets: total natural resources rents as percentages of GDP (table 3); oil, natural gas, mineral, coal, and forest rents as percentages of GDP (table 4); and fuel, ores and metals, and agricultural raw materials exports as percentages of merchandise exports (table 5). In each table, the first two models estimate the relationships with the compensation of government employees measured as a percentage of GDP, while the second two models estimate the relationships with the compensation of government employees measured as a percentage of general government final consumption expenditure (GGFCE).

	(1)	**(2)**	**(3)**	**(4)**
	Compensation of government employees (% of GDP)		**Compensation of government employees (% of GGFCE)**	
Total natural resources rents (% of GDP)	-0.0643**	-0.132	-0.0116	1.093***
	(0.0269)	(0.100)	(0.104)	(0.370)
Total natural resources rents (% of GDP)^2		0.00153		-0.0248***
		(0.00217)		(0.00801)
GDP per capita, PPP (constant 2011 international $, log)	0.634**	0.536	1.485	3.136**
	(0.315)	(0.345)	(1.222)	(1.280)
_cons	4.767	5.893*	43.47***	24.51*
	(2.998)	(3.405)	(11.66)	(12.67)
N	87	87	86	86
R^2	0.102	0.107	0.018	0.121
Standard errors in parentheses				
*** p<0.1**	** p<0.05	*** p<0.01		

Table 3: Regressions on total natural resources rents (% of GDP), 1999-2011 country averages

The regressions presented in table 3 show the correlation between total natural resources rents as a percentage of GDP and the compensation of government employees using country averages for the period from 1999 until 2011.

A percentage point increase in total natural resources rents as a percentage of GDP is associated with a 0.0643 percentage point decrease in the compensation of government employees as a percentage of GDP. This means that a standard deviation increase in total natural resources rents leads to a 0.27 standard deviation decrease in the government wage bill.[1] This is highly economically significant. The coefficient is statistically significant on the 5% level. As the R^2 suggests, the model explains 10.7% of the variation in the compensation of government employees. Variation in GDP per capita alone explains only 4.08% of the variation in the government wage bills. The results do not change when the additional robustness checks – including the exclusion of the outliers mentioned in the previous section – are employed.

The government wage measured as a percentage of general government final consumption expenditure (GGFCE) increases in total natural resources rents as a percentage of GDP at a decreasing rate. The coefficients are statistically significant on the 1% level. The model explains 12.1% of the variation in the government wage bill, which compares to just 1.74% when only GDP per capita is included as an independent variable. The results are robust to the additional checks.

[1] The calculation goes as follows. The standard deviation of countries' total natural resources rents as a percentage of GDP is 15.25999 percentage points. If total natural resources rents increase by this much, the compensation of government employees increases by 15.25999 times -0.0643 (the estimated coefficient) equals 0,98121157 percentage points. The standard deviation of countries' government wage bills as percentages of GDP is 3.580631. Therefore, a 0.98121157 percentage point change in the compensation of government employees equals a change of 0.98121157 divided by 3.580631 equals approximately 0.27 standard deviation change.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Oil rents (% of GDP)	-0.0438*	-0.146	-0.0937	0.958*
	(0.0262)	(0.118)	(0.126)	(0.552)
Oil rents (% of GDP)^2		0.00213		-0.0236**
		(0.00238)		(0.0112)
Natural gas rents (% of GDP)	-0.0677	0.0822	0.403	0.192
	(0.0659)	(0.227)	(0.317)	(1.068)
Natural gas rents (% of GDP)^2		-0.00438		-0.0104
		(0.00765)		(0.0359)
Mineral rents (% of GDP)	-0.0803	0.758	0.563	0.0934
	(0.161)	(0.576)	(0.776)	(2.706)
Mineral rents (% of GDP)^2		-0.0783		0.0212
		(0.0485)		(0.228)
Coal rents (% of GDP)	-0.191	-1.456	-2.320	-5.933
	(0.485)	(1.201)	(2.333)	(5.643)
Coal rents (% of GDP)^2		0.428		0.830
		(0.331)		(1.553)
Forest rents (% of GDP)	0.0806	0.475	0.296	1.714
	(0.294)	(0.614)	(1.417)	(2.883)
Forest rents (% of GDP)^2		-0.0411		-0.216
		(0.0821)		(0.386)
GDP per capita, PPP (constant 2011 international $, log)	0.874**	1.177***	-1.420	-1.326
	(0.366)	(0.433)	(1.762)	(2.033)
_cons	2.094	-1.186	72.15***	70.14***
	(3.696)	(4.490)	(17.79)	(21.09)
N	80	80	80	80
R^2	0.169	0.210	0.055	0.145
Standard errors in parentheses				
*** p<0.1**	** p<0.05	*** p<0.01		

Table 4: Regressions on oil, natural gas, mineral, coal, and forest rents (% of GDP), 1999-2011 country averages

The regressions presented in table 4 are similar to the previous ones, except total natural resources rents are disaggregated into oil, natural gas, mineral, coal, and forest rents. They

suggest that the results of the previous regressions are driven solely by oil. This would be consistent with Ross (2012).

A percentage point increase in oil rents as a percentage of GDP is associated with a 0.0438 percentage point decrease in the compensation of government employees as a percentage of GDP. That is, the effect of a standard deviation increase in oil rents is a 0.18 standard deviation decrease in the wage bill, which is highly economically significant. The coefficient is statistically significant on the 10% level. The model explains 16.9% of the variation in the compensation. When the additional robustness checks are employed, the coefficient loses significance.

The compensation of government employees as a percentage of general government final consumption expenditure (GGFCE) increases in oil rents at a decreasing rate. The coefficients are statistically significant on the 10 and 5% levels. The coefficient on the 1^{st}-order term marginally loses significance when heteroskedastic robust standard errors are calculated: it is statistically significant only on the 10.4% level. The model explains 10.1% of the variation in the government wage bill. The coefficients lose significance when the additional robustness checks ae employed.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Fuel exports (% of merchandise exports)	-0.0248**	-0.0572	0.0373	0.283
	(0.0118)	(0.0498)	(0.0562)	(0.234)
Fuel exports (% of merchandise exports)^2		0.000422		-0.00292
		(0.000603)		(0.00283)
Ores and metals exports (% of merchandise exports)	-0.0254	0.141*	0.0115	0.744**
	(0.0252)	(0.0742)	(0.120)	(0.349)
Ores and metals exports (% of merchandise exports)		-0.00314**		-0.0137**
		(0.00132)		(0.00622)
Agricultural raw materials exports (% of merchandise exports)	0.0184	0.0260	-0.0457	-0.0291
	(0.0430)	(0.118)	(0.204)	(0.553)
Agricultural raw materials exports (% of merchandise exports)^2		-0.0000137		0.0000744
		(0.00197)		(0.00928)
GDP per capita, PPP (constant 2011 international $, log)	0.886***	0.813***	1.268	1.335
	(0.296)	(0.296)	(1.407)	(1.392)
_cons	2.160	2.382	44.81***	39.97***
	(2.924)	(2.971)	(13.91)	(13.97)
N	86	86	86	86
R^2	0.164	0.221	0.024	0.111
Standard errors in parentheses				
*** p<0.1**	** p<0.05	*** p<0.01		

Table 5: Regressions on fuel, ores and metals, and agricultural raw materials exports (% of merchandise exports) 1999-2011 country averages

Table 5 presents results of regressions ran on a different set of independent variables: fuel, ores and metals, and agricultural raw materials exports as percentages of merchandise exports.

Fuel exports have a linear negative effect on the compensation of government employees as a percentage of GDP. A percentage point increase in fuel exports is associated with a 0.0248 percentage point decrease in the government wage bill. So, when fuel exports increase

by a standard deviation, the government wage bills decreases by 0.19 standard deviation. This is highly economically significant. The coefficient is statistically significant on the 5% level. The model explains 16.4% of the variation in the compensation of government employees. When the additional robustness checks are employed, the coefficient loses significance.

At the same time, the compensation of government employees as a percentage of GDP increases in ores and metals exports at a decreasing rate. The coefficients are statistically significant on the 5 and 10% levels. The model explains 22.1% of the variation in the compensation. The coefficient on the first-order term loses significance when the additional robustness checks are employed.

The compensation of government employees as a percentage of general government final consumption (GGFCE) expenditure also increases in ores and metals exports at a decreasing rate. The coefficients are statistically significant on the 5% level. The model explains 11.1% of the variation in the government wage bills. The coefficient on the first-order term loses significance when the additional robustness checks are employed. However, the one on agricultural raw materials exports in model (3) gains significance.

Regressing the compensation of government employees data on Ross (2013)'s net oil and gas exports values per capita in constant 2000 dollars data produces no statistically significant result, so the regression table is not shown.

4.2.1 Summary

Table 6 below summarizes the results of the OLS regressions on country averages for the period from 1999 until 2011 presented in tables 3-5.

Table	Independent variable	Effect on compensation of government employees (% of GDP)	Effect on compensation of government employees (% of GGFCE)
3	Total natural resources rents (% of GDP)	Linear negative	Increasing at a decreasing rate
4	Oil rents (% of GDP)	Linear negative	Increasing at a decreasing rate
4	Natural gas rents (% of GDP)	-	-
4	Mineral rents (% of GDP)	-	-
4	Coal rents (% of GDP)	-	-
4	Forest rents (% of GDP)	-	-
5	Fuel exports (% of merchandise exports)	Linear negative	-
5	Ores and metals exports (% of merchandise exports)	Increasing at a decreasing rate	Increasing at a decreasing rate
5	Agricultural raw materials exports (% of merchandise exports)	-	-
-	Net oil exports value per capita, constant 2000 $	-	-
-	Net gas exports value per capita, constant 2000 $	-	-

Table 6: Summary of regressions on 1999-2011 country averages

Total natural resources and oil rents as percentages of GDP have a linear negative effect on the compensation of government employees as a percentage of GDP, and a U-shaped effect on the government wage bill measured as a percentage of general government final consumption expenditure (GGFCE). Even the effect of total natural resources and oil rents as percentages of GDP on the compensation of government employees as a percentage of GGFCE are on average negative, as indicated by the models that do not calculate nonlinear relationships. Fuel exports as a percentage of merchandise exports have a linear negative effect on the compensation of government employees as a percentage of GDP. At the same time, mineral rents seem to have a U-shaped effect on the government wage bill measured either as a percentage of GDP or as a percentage of GGFCE.

These results question the claim that natural resource rents lead to excess public employment. The most surprising results suggest that oil rents may actually have a negative effect on government wage bills.

4.2.2 Dependence and Abundance

To distinguish between the effects of natural resource dependence and abundance, following Basedau and Lay (2009), in table 7 below I include in the same model oil and natural gas rents as percentages of GDP and net oil and gas exports values per capita in constant 2000 dollars.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Oil rents (% of GDP)	-0.0809**	-0.185*	-0.266	0.862
	(0.0337)	(0.111)	(0.164)	(0.518)
Oil rents (% of GDP)^2		0.00204		-0.0269**
		(0.00230)		(0.0107)
Natural gas rents (% of GDP)	0.0141	0.169	0.745*	0.160
	(0.0896)	(0.220)	(0.435)	(1.027)
Natural gas rents (% of GDP)^2		-0.00759		0.00190
		(0.00745)		(0.0348)
Net oil exports value per capita, constant 2000 $	0.000467	0.000348	0.00201	0.000600
	(0.000282)	(0.000372)	(0.00137)	(0.00174)
Net oil exports value per capita, constant 2000 $^2		2.21e-08		0.000000421*
		(4.81e-08)		(0.000000225)
Net gas exports value per capita, constant 2000 $	-0.00113	0.00195	-0.00490	0.00129
	(0.000789)	(0.00148)	(0.00383)	(0.00693)
Net gas exports value per capita, constant 2000 $^2		-0.000000606**		-0.00000266*
		(0.000000286)		(0.00000134)
GDP per capita, PPP (constant 2011 international $, log)	0.873***	0.891***	-1.615	-2.017
	(0.289)	(0.301)	(1.406)	(1.405)
_cons	2.050	2.024	74.28***	77.21***
	(2.792)	(2.905)	(13.57)	(13.56)
N	79	79	79	79
R^2	0.188	0.255	0.068	0.211
Standard errors in parentheses				
*** p<0.1**	** p<0.05	*** p<0.01		

Table 7: Regressions on oil and natural gas rents (% of GDP) and net oil and gas exports values, constant 2000 $, 1999-2011 country averages

A percentage point increase in oil rents as a percentage of GDP is associated with a 0.0809 percentage point decrease in the compensation of government employees as a percentage of GDP. This means that when oil rents increase by a standard deviation, the

government wage bill decreases by 0.33 standard deviation, which is highly economically significant. The coefficient is statistically significant on the 5% level. The model explains 18.8% of the variation in the compensation of government employees. When the additional robustness checks are employed, the coefficient on net oil exports per capita in constant 2000 dollars also gains significance.

When the compensation of government employees is measured as a percentage of general government final consumption expenditure, a percentage point increase in natural gas rents as a percentage of GDP leads to a 0.745 percentage point increase in the government wage bill. That is, when gas rents increase by a standard deviation, the compensation of government employees increases by 0.33 standard deviation, which is highly economically significant. The coefficient is statistically significant on the 10% level, but loses significance when the additional robustness checks are employed. The model explains 6.8% of the variation in the government wage bills.

The results indicate that oil dependence, rather than abundance, has a negative effect on the compensation of government employees. This contradicts Basedau and Lay (2009), who claimed that natural resource abundance causes excess public employment.

4.3 REGRESSIONS ON CROSS-COUNTRY YEARLY DATA

This section investigates the same relationships as the previous one did, but instead of country averages it uses cross-country yearly data. The results presented here are arguably my most compelling evidence. First, the models capture within-country variation over the years. Second, the numbers of observations increase drastically compared to regressions ran on the cross-sectional data. Third, using panel data allows me to control for country and year fixed effects, ensuring that no time- or space-invariant variables are omitted.

Fixed-effects models are used in all cases. Year dummies are also always included as controls. The regressions exclude countries with less than five yearly compensation of government employees observations.. To demonstrate economic significance, I show by how many average county standard deviations the dependent variable changes when the independent variable increases by an average country standard deviation. I calculate average country standard deviations by determining the standard deviations of each country's yearly data, then taking their averages.

When I mention employing additional robustness checks, I mean running a fixed effects regression that controls for year dummies and the log of GDP per capita and the value added by manufacturing as a percentage of GDP lagged by a year, includes only countries with at least yearly five compensation of government employees observations, and calculates robust standard errors clustered on the country level.

The section is organized similarly to the previous one. Table 8 summarizes the results of regressions on total natural resources rents as a percentage of GDP; table 9 on oil, natural gas, mineral, coal, and forest rents as percentages of GDP separately; table 10 on fuel, ores and metals, and agricultural raw materials exports as a percentage of merchandise exports; and table 11 on net oil and gas export values per capita. The first two model of each table estimates relationships with the compensation of government employees as a percentage of GDP, and the second two with the compensation of government employees as a percentage of general government final consumption expenditure (GGFCE).

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Total natural resources rents (% of GDP)	-0.0527***	0.0233	-0.134***	0.0203
	(0.00897)	(0.0211)	(0.0339)	(0.0803)
Total natural resources rents (% of GDP)^2		-0.00125***		-0.00253**
		(0.000314)		(0.00119)
GDP per capita, PPP (constant 2011 international $, log)	-0.363	-0.211	9.431***	9.748***
	(0.270)	(0.271)	(1.026)	(1.035)
_cons	14.55***	12.89***	-25.50***	-28.97***
	(2.510)	(2.531)	(9.553)	(9.678)
N	1467	1467	1449	1449
Within-R^2	0.074	0.084	0.111	0.113
Standard errors in parentheses				
*** p<0.1, ** p<0.05, *** p<0.01**				

Table 8: Regressions on total natural resources rents (% of GDP)

Table 8 presents regressions on total natural resources rents as percentages of GDP. A percentage point increase in total natural resources rents is associated with a 0.0527 percentage point decrease in the compensation of government employees as a percentage of GDP. That is, the effect of an increase in total natural resources rents by an average country standard deviation is a 0.14 average country standard deviation decrease in the government wage bill.[2] This is highly economically significant. The coefficient is statistically significant on the 1% level. The within-R^2 shows that the model explains 7.4% of the variation in the compensation of government employees as a percentage of GDP, which compares to 5% when only fixed effects and GDP per capita are included as independent variables. The results do not change when the additional robustness checks are employed.

[2] The calculation goes as follows. I calculate the standard deviations of the total natural resources rents as a percentage of GDP data on the level of each country. I take the average of these standard deviations, which is 3.11343 percentage points. An increase in total natural resource rents by this much is associated with a 3.11343 times -0.0527 (coefficient estimate) equals -0.164077761 percentage point increase in the compensation of government employees as a percentage of GDP. I calculate the standard deviations of the compensation of government employees data on the level of each country. I take the average of these standard deviations, which is 1.172859 percentage point. I divide -0.164077761 by 1.172859, which equals approximately 0.14.

If total natural resources rents increase by a percentage point, the compensation of government employees as a percentage of general government final consumption expenditure (GGFCE) decrease by 0.14 percentage point. So, an increase in total natural resources rents by an average country standard deviation is associated with a 0.09 average country standard deviation decrease in the government wage bill, which is highly economically significant. The coefficient is statistically significant on the 1% level. The model explains 11.1% of the variation in the government wage bill. This is 1.04 percentage points higher than if only fixed effects and GDP per capita are included as independent variables. The coefficient is not robust to the additional checks.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Oil rents (% of GDP)	-0.0992***	-0.0351	-0.257***	-0.787***
	(0.0125)	(0.0361)	(0.0503)	(0.144)
Oil rents (% of GDP)^2		-0.00101**		0.00791***
		(0.000511)		(0.00204)
Natural gas rents (% of GDP)	-0.0157	-0.00697	-0.184**	0.0840
	(0.0186)	(0.0406)	(0.0747)	(0.162)
Natural gas rents (% of GDP)^2		-0.000683		-0.00517
		(0.00100)		(0.00401)
Mineral rents (% of GDP)	0.0266	0.0688	0.525***	1.003***
	(0.0243)	(0.0543)	(0.0976)	(0.217)
Mineral rents (% of GDP)^2		-0.00219		-0.0190**
		(0.00201)		(0.00802)
Coal rents (% of GDP)	0.0411	0.170*	-0.0161	-0.0895
	(0.0378)	(0.0955)	(0.151)	(0.382)
Coal rents (% of GDP)^2		-0.00713		0.00537
		(0.00447)		(0.0179)
Forest rents (% of GDP)	-0.0928	-0.144	-0.870***	-1.461**
	(0.0781)	(0.154)	(0.313)	(0.615)
Forest rents (% of GDP)^2		0.00682		0.0783
		(0.0195)		(0.0779)
GDP per capita, PPP (constant 2011 international $, log)	-0.386	-0.407	9.715***	9.532***
	(0.253)	(0.260)	(1.014)	(1.037)
_cons	14.71***	14.78***	-28.75***	-26.15***
	(2.398)	(2.473)	(9.620)	(9.875)
N	1379	1379	1379	1379
Within-R^2	0.131	0.138	0.168	0.182
Standard errors in parentheses				
*** p<0.1, ** p<0.05, *** p<0.01**				

Table 9: Regressions on oil, natural gas, mineral, coal, and forest rents (% of GDP)

The regressions summarized in table 9 disaggregate total natural resources rents into oil, natural gas, mineral, coal, and forest rents. When the government wage bills is measured as a percentage of GDP, only oil rents have a statistically significant effect. In particular, a percentage point increase in oil rents as a percentage of GDP is associated with a 0.0992

percentage point decrease in the compensation of government employees. This means that an average country standard deviation increase in oil rents leads to a 0.16 average country standard deviation decrease in the government wage bill. This is highly economically significant. The coefficient is statistically significant on the 1% level. The model explains 13.1% of the variation in the compensation of government employees. When the additional robustness checks are employed, the government wage bill seems to increase in natural gas rents at a decreasing rate. Even based on the results of this very robust specification it can be estimated that the wage bill of the most oil-dependent country's government is as many as 5 percentage points lower than that of countries with no oil rents.

Oil, natural gas, mineral, and forest rents are all statistically significantly correlated with the compensation of government employees as a percentage of general government final consumption expenditure (GGFCE). The government wage bill decreases in oil rents as a percentage of GDP at a decreasing rate. Both coefficients are statistically significant on the 1% level. They are robust to the additional checks.

At the same time, each percentage point increase in natural gas rents as a percentage of GDP is associated with a 0.184 percentage point decrease in the compensation of government employees as a percentage of general government final consumption expenditure (GGFCE). That is, the effect of an average country standard deviation increase in natural gas rents is a 0.03 average country standard deviation decrease in the government wage bill, which is much less economically significant than the effect of oil rents. The coefficient is statistically significant on the 5% level. When the additional robustness checks are employed, the results suggest that the compensation of government employees increases at a decreasing rate.

The compensation of government employees as a percentage of general government final consumption expenditure (GGFCE) increases in mineral rents at a decreasing rate. The coefficients are statistically significant on the 1 and 5% levels. When the additional

robustness checks are employed, mineral rents seem to have a liner positive effect of the government wage bill.

Each percentage point increase in forest rents leads to a 0.870 percentage point decrease in the compensation of government employees as a percentage of general government final consumption expenditure (GGFCE). So, an average country standard deviation increase in forest rents is associated with a 0.11 average country standard deviation decrease in the compensation of employees. The coefficient is statistically significant on the 1% level. The results are robust to additional checks.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Fuel exports (% of merchandise exports)	-0.0132**	-0.0103	-0.103***	0.00580
	(0.00593)	(0.0110)	(0.0253)	(0.0465)
Fuel exports (% of merchandise exports)^2		-0.0000432		-0.00168***
		(0.000128)		(0.000544)
Ores and metals exports (% of merchandise exports)	0.0107	0.0294*	-0.0384	-0.239***
	(0.00728)	(0.0171)	(0.0310)	(0.0723)
Ores and metals exports (% of merchandise exports)^2		-0.000269		0.00275***
		(0.000219)		(0.000925)
Agricultural raw materials exports (% of merchandise exports)	0.0202	-0.00243	-0.0766	-0.148
	(0.0151)	(0.0239)	(0.0644)	(0.101)
Agricultural raw materials exports (% of merchandise exports)		0.000405		0.00240
		(0.000385)		(0.00163)
GDP per capita, PPP (constant 2011 international $, log)	-0.260	-0.253	9.629***	9.954***
	(0.241)	(0.253)	(1.027)	(1.072)
_cons	13.10***	13.02***	-27.41***	-29.77***
	(2.282)	(2.421)	(9.729)	(10.25)
N	1333	1333	1333	1333
Within-R^2	0.089	0.091	0.133	0.147
Standard errors in parentheses				
*** p<0.1, ** p<0.05, *** p<0.01**				

Table 10: Regressions on fuel, ores and metals, and agricultural raw materials exports (% of merchandise exports)

Table 10 presents the results of regressions on fuel, ores and metals, and agricultural raw materials exports as percentages of merchandise exports. When the compensation of government employees is measured as a percentage of GDP, only the coefficient on fuel exports is statistically significant. This suggests that a percentage point increase in fuel exports is associated with a 0.0132 percentage point decrease in the government wage bill. That is, an average country standard deviation increase in fuel exports leads to a 0.06 average

country standard deviation decrease in the compensation of government employees. The coefficient is statistically significant on the 5% level. The model explains 8.9% of the variation in government wage bills. The results do not change when the additional robustness checks are employed.

Fuel exports as a percentage of merchandise exports have a similar effect on the compensation of government employees as a percentage of general government final consumption expenditure (GGFCE). A percentage point increase in fuel exports leads to a 0.103 percentage point decrease in the government wage bill. That is, the effect of an average country standard deviation increase in fuel exports is a decrease in the compensation of government employees by 0.13 average country standard deviation. This is highly economically significant. The coefficient is statistically significant on the 1% level. The model explains 13.3% of the variation in government wage bills. The coefficient loses significance when the additional robustness checks are employed.

The compensation of government employees as a percentage of general government final consumption expenditure (GGFCE) decreases in ores and metals exports as a percentage of merchandise exports at a decreasing rate. The coefficients are statistically significant on the 1% level. However, higher-order terms are also highly statistically significant, suggesting that the correlation may actually not exist. The model explains 14.7% of the variation in government wage bills. The results are robust to the additional checks.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Net oil exports value per capita, constant 2000 $	-0.000460***	-0.000481***	-0.0000934	-0.000423
	(0.0000769)	(0.000156)	(0.000293)	(0.000594)
Net oil exports value per capita, constant 2000 $^2		1.07e-09		2.11e-08
		(8.47e-09)		(3.23e-08)
Net gas exports value per capita, constant 2000 $	0.0000397	-0.0000718	-0.000861	-0.000316
	(0.000141)	(0.000259)	(0.000540)	(0.000986)
Net gas exports value per capita, constant 2000 $^2		1.18e-08		-6.85e-08
		(2.58e-08)		(9.85e-08)
GDP per capita, PPP (constant 2011 international $, log)	-0.466	-0.462	9.223***	9.366***
	(0.294)	(0.300)	(1.123)	(1.144)
_cons	15.03***	14.99***	-24.42**	-25.73**
	(2.742)	(2.790)	(10.46)	(10.64)
N	1318	1318	1318	1318
Within-R^2	0.102	0.102	0.107	0.107
Standard errors in parentheses				
*** p<0.1, ** p<0.05, *** p<0.01**				

Table 11: Regressions on net oil and gas exports value per capita, constant 2010 $

The regressions presented in table 11 investigate the relationship between the compensation of government employees and net oil and gas exports values per capita. A dollar increase in net oil exports value per capita in constant 2010 dollars is associated with a 0.000460 percentage point decrease in the government wage bill as a percentage of GDP. This means that an average country standard deviation increase in net oil exports value per capita leads to a decrease in the compensation of government employees by 0.11 average standard deviation, which is highly economically significant. The coefficient is statistically significant on the 1% level. The model explains 10.2% of the variation in government wage bills. The coefficient loses significance when the additional robustness checks are employed.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Constant price of oil in 2000 $/brl	0.00629	0.0553***	-0.0796***	-0.138**
	(0.00423)	(0.0168)	(0.0160)	(0.0637)
Constant price of oil in 2000 $/brl^2		-0.000538***		0.000938
		(0.000169)		(0.000638)
Constant price of gas in 2000 $/mboe	-5.19e-09	3.07e-08	-6.15e-08***	-0.000000106
	(5.66e-09)	(3.28e-08)	(2.14e-08)	(0.000000124)
Constant price of gas in 2000 $/mboe^2		-9.02e-16*		1.74e-15
		(5.18e-16)		(1.96e-15)
GDP per capita, PPP (constant 2011 international $, log)	-0.619**	-0.619**	9.030***	9.030***
	(0.281)	(0.281)	(1.062)	(1.062)
_cons	15.93***	15.21***	-22.41**	-23.72**
	(2.565)	(2.600)	(9.711)	(9.843)
N	1389	1389	1389	1389
Within-R^2	0.057	0.057	0.100	0.100
Standard errors in parentheses				
*** p<0.1, ** p<0.05, *** p<0.01**				

Table 12: Regressions on constant price of oil in 2000$/barrel and constant price of gas in 2000$/million barrels of oil equivalent

Table 12 presents the results of regressions on constant price of oil in 2000 dollars/barrel and constant price of gas in 2000 dollars/million barrels of oil equivalent. Because these are largely determined by world markets, endogeneity can almost certainly be ruled out.

The compensation of government employees as a percentage of GDP increases in the oil price at a decreasing rate. The coefficients are statistically significant on the 1% level. However, higher-order terms are also highly statistically significant, suggesting that the correlation may actually not exist. The model explains 5.7% of the variation in the government wage bills. The coefficients lose significance when the additional robustness checks are employed.

When the compensation of government employees is measured as a percentage of general government final consumption expenditure (GGFCE), both oil and natural gas prices have a linear negative effect. A percentage point increase in the oil price is associated with a 0.0796 percentage point decrease in the government wage bill. So, an average country standard deviation increase in the oil price leads to a 0.36 average country standard deviation decrease in the compensation, which is highly economically significant. Similarly, when the gas price increases by a dollar, the compensation of employees decreases by $6.15*10^{-8}$ percentage points. This means that an average country standard deviation increase in the oil price is associated with a 0.12 average country standard deviation decrease in the government wage bill. This is also economically highly significant. The coefficients are statistically significant on the 1% level. The model explains 15.4% of the variation in the compensation of government employees. When the additional robustness checks are employed, the results suggest that the government wage bill decreases in the oil price at a decreasing rate.

4.3.1 Summary

Table 14 below summarizes the results of the fixed effects regressions presented in tables 8-13, that is, my most robust evidence for a relationship between natural resource rents and the compensation of government employees.

Table	Independent variable	Effect on compensation of government employees (% of GDP)	Effect on compensation of government employees (% of GGFCE)
5	Total natural resources rents (% of GDP)	linear negative	linear negative
6	Oil rents (% of GDP)	linear negative	decreasing at a decreasing rate
6	Natural gas rents (% of GDP)	-	linear negative
6	Mineral rents (% of GDP)	-	increasing at a decreasing rate
6	Coal rents (% of GDP)	-	-
6	Forest rents (% of GDP)	-	linear negative
7	Fuel exports (% of merchandise exports)	linear negative	linear negative
7	Ores and metals exports (% of merchandise exports)	-	decreasing at a decreasing rate
7	Agricultural raw materials exports (% of merchandise exports)	-	-
8	Net oil exports value per capita, constant 2000 $	linear negative	-
8	Net gas exports value per capita, constant 2000 $	-	-
9	Constant price of oil in 2000 $/brl	increasing at a decreasing rate	linear negative
9	Constant price of gas in 2000 $/mboe	-	linear negative

Table 13: Summary of results

As table 14 shows, whether the compensation of government is measured as a percentage of GDP or of general government final consumption expenditure (GGFCE), the effect of total natural resources rents as a percentage of GDP is linear and negative. Like the effects summarized in the following, it is economically significant. In 7 out of the 8 regressions, the variables related to oil are statistically significantly correlated with the government wage bill. 5 out of 7 models suggest a linear negative relationship. Variables related to other natural resources fail to produce statistically significant results in more than half of the regressions in which they are included. Thus, it is quite safe to conclude natural resource rents have a

negative effect on the compensation of government employees, and this effect is driven solely by oil.

4.3.2 Dependence and Abundance

Similarly to those in table 7, the regressions presented in table 13 include as independent variables both oil and gas rents as percentages of GDP and net oil and gas exports values per capita in constant 2010 dollars to distinguish between the effects of natural resource dependence and abundance.

	(1)	(2)	(3)	(4)
	Compensation of government employees (% of GDP)		Compensation of government employees (% of GGFCE)	
Oil rents (% of GDP)	-0.0798***	-0.0408	-0.342***	-0.735***
	(0.0141)	(0.0392)	(0.0570)	(0.158)
Oil rents (% of GDP)^2		-0.000742		0.00562**
		(0.000560)		(0.00226)
Natural gas rents (% of GDP)	0.00110	0.0211	-0.0861	0.146
	(0.0204)	(0.0422)	(0.0823)	(0.170)
Natural gas rents (% of GDP)^2		-0.000737		-0.00505
		(0.00103)		(0.00417)
Net oil exports value per capita, constant 2000 $	-0.000278***	-0.0000966	0.000646**	0.00118*
	(0.0000755)	(0.000157)	(0.000305)	(0.000634)
Net oil exports value per capita, constant 2000 $^2		-8.83e-09		-4.35e-08
		(7.91e-09)		(3.19e-08)
Net gas exports value per capita, constant 2000 $	-0.000127	-0.000318	-0.00138**	-0.000672
	(0.000137)	(0.000251)	(0.000554)	(0.00101)
Net gas exports value per capita, constant 2000 $^2		1.95e-08		-2.47e-08
		(2.31e-08)		(9.32e-08)
GDP per capita, PPP (constant 2011 international $, log)	-0.0732	-0.0551	11.18***	11.00***
	(0.262)	(0.269)	(1.058)	(1.084)
_cons	11.65***	11.40***	-42.89***	-40.65***
	(2.465)	(2.539)	(9.962)	(10.24)
N	1255	1255	1255	1255
Within-R^2	0.166	0.170	0.154	0.161
Standard errors in parentheses				
*** p<0.1, ** p<0.05, *** p<0.01**				

Table 14: Regressions on oil and natural gas rents (% of GDP) and net oil and gas exports values, constant 2000 $, 1999-2011 country averages

When the compensation of government employees is measured as a percentage of GDP, both oil rents and exports have a linear negative effect. A percentage point increase in oil rents as a percentage of GDP is associated with a 0.0798 percentage point decrease in the

government wage bill. That is, an average country standard deviation increase in oil rents leads to a 0.13 average country standard deviation decrease in the compensation of government employees, which is highly economically significant. The coefficient is statistically significant on the 1% level. A dollar increase in oil exports is associated with a 0.000127 percentage point decrease in the government wage bill. In other words, an average country standard deviation increase in oil exports leads to a 0.1 average country standard deviation decrease in the compensation of government employees. This is also economically highly significant. The coefficient is statistically significant on the 1% level. The model explains 16.6% of the variation in the government wage bill. When the additional robustness checks are employed, the coefficient on oil exports loses, while that on gas exports gains significance. The coefficients on gas rents in model (2) also gain significance.

The compensation of government employees as a percentage of general government final consumption expenditure (GGFCE) decreases in oil rents at a decreasing rate. The coefficients are statistically significant on the 1 and 5% levels. Model (4) explains 16.1% of the variation in the government wage bill. At the same time, each dollar increase in oil exports is associated with a 0.000646 percentage points decrease in the compensation of government employees. So, when oil exports increase by an average country standard deviation, the government wage bill increases by 0.04 average country standard deviation. The coefficient is statistically significant on the 5% level. Similarly, a dollar increase in gas exports is associated with a 0.00138 percentage points decrease in the compensation of government employees. This means that an average country standard deviation increase in gas exports leads to a 0.04 average country standard deviation increase in the government wage bill. The coefficient is statistically significant on the 5% level. Model (3) explains 15.4% of the variation in the compensation of government employees. When the additional robustness checks are employed, the coefficients on gas rents in model (4) gain significance.

The positive coefficient on net oil exports value per capita in constant 2010 dollars in model (3) provides some evidence that the negative effect of oil richness on the compensation of government employees is driven by dependence rather than abundance. This suggests that oil dependence leads to lower public employment, but governments indeed spend additional oil revenues on excess employee compensation. However, this evidence is relatively weak considering that the coefficient on oil exports in model (1) is negative.

5 DISCUSSION

Chapter 4 concluded that on average oil rents have a negative effect on government wage bills. This finding goes against the suggestion of existing theories (see Auty and Gelb 2000; and Robinson, Torvik and Verdier 2006) about the relationship between natural resource – in particular, oil – rents and public employment that overemployment and/or above-market wages in public sectors are ways for elites to redistribute resource rents. This chapter gives potential explanations for the result.

First, the negative effect of oil rents on public employment may reflect their negative effect on state capacity to tax and regulate. Chaudhry (1997) researches the effects of the 1973-83 oil boom and the bust of 1984-90 on the Saudi Arabian state. She argues that during the boom years, the function of the state became rent redistribution. By the time the bust hit, the state lacked tax collection and regulatory capacities. The results of Besley and Persson (2010)'s model illustrate that high resource dependence may jointly trigger a high propensity towards low income and low investments in state capacity to raise taxes and to support markets through regulation. Because in countries awash with oil money there is no need for these functions, arguably there is no need for civil servants performing them either. However, taxation and regulation are only two of the state's numerous functions, so bureaucrats exercising these are only part of the civil service. Oil riches may actually allow states to extend other functions such as public service provision and the maintenance of a welfare system.

The second potential explanation building on the reviewed literature takes arguments of Alesina, Baqir and Easterly (2000) and Robinson, Torvik and Verdier (2006) as its points of departure. According to Alesina, Baqir and Easterly (2000), governments redistribute through public employment to hide from upper- and middle-class voters that redistribution happened.

While that is a sensible strategy in the country the authors focus on, the United States, with its high-income and diversified economy, it probably is not in poor and oil-dependent countries. In such contexts, the redistribution of anyway highly visible oil rents for governments can easily be something to showcase rather than to hide.

Possibly Robinson, Torvik and Verdier (2006) draw the wrong conclusion from their observation that public employment is politically costly to reverse. Having learned from the experiences of the past, in particular of oil busts, governments may want to avoid creating civil service jobs to credibly commit to redistributing oil rents. This is what happened in Saudi Arabia. Oil money was used to employ people in the public sector in the 1970s and 80s. Sustaining the system became too expensive in the mid-1990s, so the country had to economize. This was painful enough so that the policy was never restarted (Sadowski 2015).

Thus, it is possible that the politics of redistribution explains the effect of oil money on public employment, but not the way the literature argues it does. Based on Alesina, Danninger and Rostagno (1999) and Alesina, Baqir and Easterly (2000), redistributive public employment can be expected in most countries. Oil rent may decrease government wage bills because they cause a lack of redistribution through public employment, as the elites of oil-rich countries prefer to redistribute through more visible and easier-to-reverse mechanisms.

Third, it can be argued that many oil-dependent countries have lower government employment because part of the functions and thus the personnel of their public administrations are outsourced to state-owned oil companies often lacking transparency and accountability. These may also take over the role of oil rent redistribution through public employment.

The fourth theory supposes that in this case as well the devil is in the details, namely, in the salary profiles of public administrations that are masked by the aggregate government

wage bill data. This is because it may be that governments redistribute oil rents through public employment, but they do it by employing a relatively large number of relatively low-level and thus low-paid bureaucrats. The result may be a lower wage bill.

The theories, especially the first, third, and the fourth ones, suggest that the effect of oil rents on government wage bills is indeed a link in the causal chain leading to the resource curse. However, contrary to what the existing literature argues, this effect probably does not result in overemployment and above-market wages, which crowd out more productive private employment and entrench political clientelism. Rather, oil rents seem to induce a lack of state capacity, in particular a decline in the number of skilled civil servants and those working on taxation and regulation.

6 CONCLUSION

My thesis sought to answer the questions whether, how, and why natural resource rents affect public employment. Previous studies on the topic, in particular Auty and Gelb (2000) and Robinson, Torvik and Verdier (2006) theorized that the public sectors of resource-rich countries are characterized by overemployment and/or above-market wages because elites redistribute resource rents partly through these mechanisms. Empirical evidence for such claims, however, has so far been only anecdotal.

I attempted to remedy this situation by collecting data on government wage bills in more than 80 countries, mostly in the period from 1999 until 2011, from the National Accounts Official Country Data dataset of the United Nations Statistics Division. I used quantitative methods to analyze the relationships between these statistics and measures of dependence on and abundance in different kinds of natural resources. My most robust and important finding was that oil rents actually have a negative effect on government wage bills, which is both statistically and economically significant.

Two caveats are worth reiterating. First, I had government wage bill data on only about 80 countries. I tried to show that this sample represents reasonably well the population of all countries of the world in terms of natural resource richness. However, the limited geographic coverage may lead to biased estimates. Second, the government wage bill statistics exclude expenditure on compensating the employees of state-owned enterprises, a major part of public employment. Nevertheless, my analysis is useful for evaluating claims about overextended civil services.

I also discussed potential explanations for why richness in oil may lead to overemployment and/or above-market wages in governments. The empirical testing of these theories was outside the scope of this thesis, but I hereby propose ways to go about it.

The first theory argued that the negative and economically significant effect of oil rents on government wage bills can be explained by a decreased need for civil servants performing the functions of taxation and regulation. Probably the most feasible way to test this hypothesis is to conduct a case study based on data disaggregated by government units before and after a positive oil shock. Empirically researching the effect of oil rents on tax revenues would also help evaluate the validity of such a theory.

Regarding the second explanation by the lack of redistributive public employment, future research could model the decision-making process of a government choosing between redistributing oil rents through creating civil service jobs, other recurrent spending (for example subsidizing industries or providing generous unemployment benefits), and unproductive and productive investment. The best way to empirically test the "learning from mistake" part of this theory seems to be conducting a rigorous case study, maybe on Saudi Arabia, as the lack of available cross-country data about government wage bills from before 1991 makes statistical analysis implausible.

The empirical testing of the third theory, positing that lower government employment results from outsourcing to state-owned oil companies, would probably be relatively easy. It could be done by including in the presented regression models a control for ownership structure. Gathering data on the relative importance of state-owned and private oil companies in each country would also allow for seeing the effects of its interactions with measures of oil dependence and abundance.

A foray into empirically testing the fourth explanation, arguing that lower government wage bills may result from employing low-level and thus low-paid bureaucrats, could be a statistical analysis of International Labour Organization (n.d.) data, which provides information on public employment rates and public sector wages separately. This may be

worth pursuing even though, as mentioned in chapter 3, lots of statistics are missing and even the ones that are there are hardly comparable, especially across countries.

Finally, I argued that these theories suggest causal mechanisms through which the resource curse manifests. Rather than leading to overextended civil services, which would crowd out more productive public employment and entrench political clientelism, oil rents seem to deconstruct or inhibit the development of state capacity to tax and regulate and/or encourage outsourcing to less transparent and accountable state-owned oil companies. This would be consistent with arguments that the resource curse manifests through the erosion of institutional quality.

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