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The Politics of Oil Nationalizations

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Paasha Mahdavi

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Abstract of the Dissertation

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Professor Michael L. Ross, Chair

This dissertation is about the institutional choices governments make to manage their petroleum wealth. It is about the determinants of these choices, but more importantly, their consequences for effective governance and how they explain variations in political outcomes in oil-producing countries. I begin by describing several different institutional pathways – involving national oil companies (NOCs) and their varying characteristics – that governments can take in extracting petroleum and regulating its production. My goal, then, is to show how these seemingly technical institutional choices can have profound impacts on governance, ranging from effects on state revenue collection to incentives for corruption to ultimately the survival of the regime itself.

To this aim, I collected original longitudinal data on the formation of NOCs in 62 countries since 1900; data from U.S. Department of Justice transcripts on the prosecution of corrupt practices in the energy sectors of 80 countries in the 2006-12 period; and existing cross-national data on government revenue capture from the sale of oil and natural resources. I analyze the determinants of NOC formation in the first empirical chapter, where I use Bayesian analysis informed with interview-based data from oil consultants to test and confirm leading theories of state revenue-maximization as the primary determinant of expropriation. In the following chapter, I analyze the process of extortion in the oil sector where

I show cross-nationally how NOC institutional design influences bribery to high-level government officials. In the penultimate chapter, I expand on the governance consequences of NOCs by showing that nationalization ultimately increases state resource revenues, creating pathways for regime stability and duration. In the last chapter, I discuss the theoretical implications of my argument and findings.

I make two broad claims in this dissertation. First, while there is much agreement that oil is not always and everywhere a curse for political development, there is little consensus about the specific conditions or institutions that do and do not matter. I help turn the "institutions matter" phrase from a vague stylized fact into a well-measured, clearly-specified phenomenon. Second, when it comes to the production of natural resources, classical economics theories would suggest that state intervention will lead to inefficiency, lower outputs and therefore lower revenues. In contrast, I argue and show evidence that some forms of state intervention – that is, certain types of NOCs – actually increase both production levels and revenues when compared to periods of no state intervention. Taken together, my dissertation applies novel ways to measure and test theories about oil's conditional effects on politics that are widely circulated but often assumed rather than tested.

The dissertation of Paasha Mahdavi is approved.

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To Megan

Table of Contents

List of Figures

List of Tables

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Publications

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CHAPTER 1

Petroleum, national oil companies, and governance

1.1 Introduction

This dissertation is about the institutional choices governments make to manage their petroleum wealth. It is about the determinants of these choices, but more importantly, their consequences for effective governance and how they explain variations in political outcomes in oil-producing countries. I begin by describing several different institutional pathways – most of which involve national oil companies (NOCs) and their varying characteristics – that governments can take in extracting petroleum and regulating its production. My goal, then, is to show how these seemingly technical institutional choices can have profound impacts on governance, ranging from effects on state revenue collection to incentives for corruption to ultimately the survival of the regime itself. In doing so, I make two broad claims in this dissertation:

1. While there is much agreement that oil is not always and everywhere a curse for political development, there is little consensus about the specific conditions or institutions that do and do not matter. I help turn the "institutions matter" phrase from a vague stylized fact into a well-measured, clearly-specified phenomenon.

2. When it comes to the production of natural resources, classical economics

theories would suggest that state intervention will lead to inefficiency, lower outputs and therefore lower revenues. In contrast, I argue and show evidence that some forms of state intervention – that is, certain types of NOCs – actually increase both production levels and revenues when compared to periods of no state intervention.

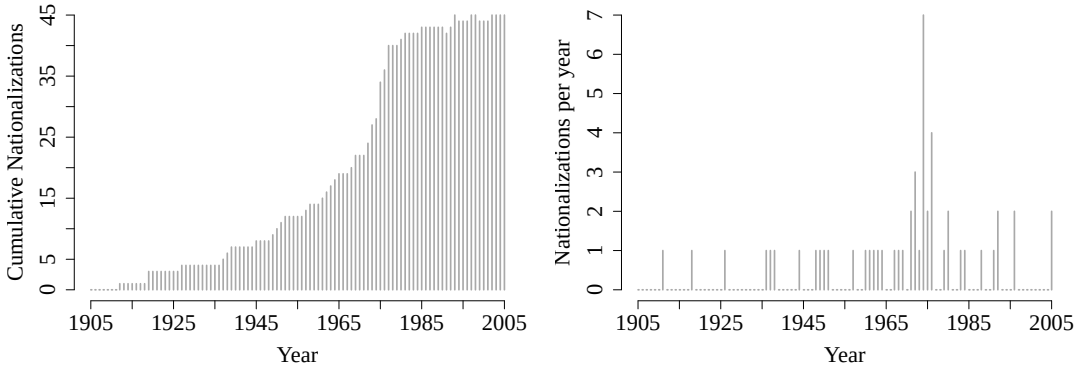
I provide support for these claims by incorporating new, precise measures of three development factors – oil-related institutions, corruption, and oil revenues – that will aid in shifting the existing scholarly work on natural resource politics from using fuzzy and sometimes subjective proxies to employing specific and objective measures that directly capture these concepts. In doing so, I provide a much deeper understanding of the institutions that dominate economic and often political life in many oil-producing countries.

This dissertation thus takes on two questions within the debates in natural resource politics. What are the consequences of natural resource state intervention in its many forms and varieties? Why do states intervene in these industries in the first place?

I aim to answer both of these questions with particular attention to state involvement in the petroleum industry.[1] Why do I only focus on one industry? In the modern era, there is perhaps no commodity of greater importance than petroleum. It has revolutionized industry, transportation, urban planning, and interstate warfare. Because of petroleum's immense geopolitical importance, governments across the oil-producing world have striven at one point or another to seize control of the industry in the hands of the state: in 2008, for example, 73% of global oil reserves and 61% of production were controlled by state-owned petroleum enterprises, better known as national oil companies or NOCs (Victor, Hults and Thurber, 2012). This increasing trend in NOCs over time can be seen

[1]Throughout this dissertation, I use the terms petroleum, oil, and gas interchangeably. See Hyne (2001).

Figure 1.1: National oil companies (NOCs) across the world, 1905–2005.



Number of states establishing NOCs cumulatively over time (left panel) and number of states establishing NOCs each year (right panel).

in Figure 1.1. That nearly 75% of current oil-producing countries[2] have national oil companies illustrates how popular state ownership continues to be even in the twenty-first century. It is against this backdrop that I wish to address how states achieved this position and how these oil-related institutions have affected politics.

In this initial chapter of the dissertation, I begin by expanding on the study's motivations with a review of existing scholarly explanations of petroleum's effects on governance. I then present a brief version of my argument of how the institutional pathways states take in managing petroleum can affect their political outcomes. I follow this with a discussion of how I measure these institutional choices through the lens of NOCs and their varieties. I conclude with an outline of the four subsequent chapters of the dissertation.

[2]This list includes 45 countries out of 60 oil-producing states.

1.2 Explaining petroleum's effects on governance

1.2.1 The oil "curse"

Petroleum wealth presents a development paradox. On the one hand, it can bring a country out of poverty with the dramatic amount of money that oil creates for governments lucky enough to reside above its reserves. On the other hand, it can wreak havoc on a country's other economic sectors, gender equity, governance, and the propensity for violent conflict. In this section, I focus on the prevailing theories and arguments about oil's effects on governance in particular, leaving out discussions of how petroleum has influenced economic growth, patriarchy, and wars.

1.2.1.1 Democratization and regime instability

The pioneers of the political resource curse theory, Terry Lynn Karl and Michael Ross, began with the assertion that oil is bad for governance, with Ross focusing the field on the distinction between democracy and non-democracy (Karl, 1997; Ross, 2001; Jensen and Wantchekon, 2004). While the causal pathways for why "oil hinders democracy" remain disputed (Dunning, 2008; Haber and Menaldo, 2011; Herb, 2005), the typical explanation rests on fiscal channels for oil's deleterious effects on democracy.

The most recognized of these explanations is based on a simple idea: "No representation without taxation" (Ross, 2004). This clever play on the American Revolution's byword is the mantra of the *rentier* state theorist. Where other governments must tax their citizens to support the state's role as public goods provider, a "*rentier* state" – that is, a state that generates income by collecting an external rent, whether it be foreign aid or revenue generated by natural resource sales – has no need for taxing its citizens (Mahdavy, 1970). *Rentier* states,

therefore, do not depend on the complicity of their citizens when making fiscal decisions. Instead, according to *rentier* state theory, this type of state plays the role of *l'état providence*: political leaders buy support using these "rents" by spending it on public goods and patronage, buying off more people with larger packages of money than their non-*rentier* state counterparts (Beblawi and Luciani, 1987). Thus the existence of an external fiscal revenue source, such as oil sales or foreign aid, widens the gap between citizens and their government. In the words of the father of *rentier* state theory, Hussein Mahdavy, "a government that can expand its services without resorting to heavy taxation acquires an independence from the people seldom found in other countries" (Mahdavy, 1970, 466). It was not until thirty years later that Michael Ross (2001) recognized this causal mechanism as the reason for why so many of the world's oil-producing states have remained authoritarian despite the wave of democratization that hit autocrats from 1974 to 1990 (Huntington, 1993).

Scholars then began investigating not just oil's authoritarian tendencies but also its stabilizing effects for those in power. That is, not only does oil hinder democratization, it also reduces the likelihood of transitioning to another dictatorship (Wright, Frantz and Geddes, 2015). Along similar lines as *rentier* state theory, the updated argument that "oil hinders regime instability" has its roots in fiscal and economic explanations. Here, Ross (2012), Smith (2004), and Ulfelder (2007) argue that natural resource wealth prolongs regimes in part due to an "allocative strategy" of increased government spending allowed by the collection of resource rents (Luciani, 1990). Robinson, Torvik and Verdier (2006), for instance, suggest that in democracies government revenue from natural resources is spent on providing jobs, thereby persuading voters to reelect the incumbent government. The same is true in dictatorships: Wright, Frantz and Geddes (2015) argue that oil wealth increases the survival of autocracies by reducing pressures to democratize and by decreasing the probability of coups through military spending. Similarly,

Cuaresma, Oberhofer and Raschky (2011) show theoretically and empirically how revenue from oil production increases the duration of autocratic leaders through increasing payments to elites and "kingmakers."

Generally speaking, any increase in government revenues should positively affect a regime's chances of survival, whether that regime is democratic or otherwise. Importantly in the context of natural resource wealth, this increase in revenues (and expenditures) occurs without having to resort to increasing taxation on citizens' incomes.

1.2.1.2 Corruption

Beyond their tax-displacing effects, oil revenues disrupt good governance through two of what Michael Ross calls their "four distinctive qualities" of scale, source, stability, and secrecy (Ross, 2012, 5). Source and scale refer to the *rentier* state and spending arguments above; stability and secrecy respectively refer to the volatility of oil prices – and thus the volatility of state expenditures – and the ability to conceal the true amounts of oil revenues. This latter mechanism explains why many resource-rich dictators are able to spend oil wealth on "bads" like repression and ineffective government projects without fearing the backlash of their citizens or the international community.

The secrecy of petroleum revenues also explains why scholars expect corruption somewhere in the fiscal pathway of oil revenues from the well-head to the treasury. Not only is there so much wealth generated from the sale of oil, but government officials can be easily tempted to divert some of this wealth into their own pockets or towards illicit activities. This can happen both at the low levels of government – for example, city officials siphoning money from municipal resource revenues (Ferraz and Finan, 2008) – and at the highest levels of government in the form of "grand corruption" involving heads of state (Rose-Ackerman, 1975).

Consistent with this logic, Leite and Weidmann (2001, 3) provide evidence that oil wealth causes corruption because of its high but easily concealable rents that are "likely to foster rent-seeking behavior." Others find a similar pattern between natural resource rents and *perceptions* of corruption (Bhattacharyya and Hodler, 2010; Vicente, 2010; Anthonsen et al., 2012; Brollo et al., 2013). Arezki and Brückner (2012) extend this relationship by analyzing within-country variance in oil rents and their effects on corruption as well as state stability.

1.2.2 Always and everywhere a curse?

For all of oil's pernicious effects on politics, there come to mind several examples of oil-producing countries that experience relatively better governance, such as Brazil, Canada, Great Britain, Malaysia, and the United States (Mitchell, 2011). This has given rise to a new branch of scholarly work questioning the scale and reach of the resource curse. Much of this began with Benjamin Smith's work on understanding why regimes like Indonesia were able to survive the boom-and-bust cycle of the 1970s and 1980s, while others like Iran collapsed. Smith (2007) came to the conclusion that the conditions under which oil is discovered matter for oil's regime-enhancing effects. Where oil shaped the very nature of the state, it leads to the negative outcomes commonly associated with resource wealth; but where the state had already reached "late development" – as in Canada and the United States – oil's effects on governance were not as pronounced.

Dunning (2008) continued this line of reasoning to show that the resource curse is conditional on institutional factors that can mediate oil's specific effect on democracy. This accounts for why oil hinders democracy in places like Angola or Algeria but not in Brazil or Venezuela. Indeed, Victor Menaldo (2012) argues that this is why the Middle East has largely avoided the wave of democratization that hit Latin America. Similarly, Lederman and Maloney (2008, 32) suggest that these conditions depend on whether or not "good institutional characteristics emerged

prior to the discovery of natural resources." In this way, the debate has been somewhat re-framed to an analysis of the factors involved in the "conditional resource curse," whereby some countries seem cursed by oil while others seem blessed by it.

My argument that nationalization matters, which I analyze with more empirical rigor in the coming sections and chapters, lends support to one causal explanation for the existence of a resource curse in some petroleum producing countries but not in others. Beyond this spatial variation, scholars have also pointed to a temporal dimension of the resource curse, finding that authoritarianism endures in petro-states primarily after the 1970s (see Aslaksen, 2010, for a review). Not coincidentally, this is a period "marked by widespread state ownership of resource wealth, which contrasts with ownership patterns earlier in history" (Goldberg, Wibbels and Mvukiyehe, 2008, 438). Results from Ross (2012) and Andersen and Ross (2013) point to the strongest evidence of a resource curse in the post-1979 era, while the weakest results for the Haber and Menaldo (2011) argument against a resource curse appear in the post-1973 period. Results from both studies are presented in Table 1.1. What is notable is that the two results from analysis using all years are directly in contrast with each other: Ross's negative and significant coefficient supports the claim that oil hinders democratic transitions, while Haber and Menaldo's positive and significant coefficient supports the exact opposite; if anything, they argue, oil is a blessing.[3] In contrast, the post-1970s findings illustrate a resource curse for Ross (negative and significant) but no clear result for Haber and Menaldo (positive but not significant). While these two studies, among others, point out the post-1970s period is markedly different than prior periods, the explanation as to why this is the case has yet to be tested. My own

[3]Part of the reason for such stark differences (despite using similar data) is that Haber and Menaldo include country fixed effects in a dynamic model of democratic transition, while Ross employs country fixed effects in a static logistic model. Further, the interpretation of a treatment effect (oil wealth as the treatment) in Haber and Menaldo's analysis is not appropriate given the lack of a credible control group. See Andersen and Ross (2013) for more detail on these points.

suggestion that nationalization is the key mechanism is not a novel one – indeed, Ross (2012) and Andersen and Ross (2013) speculate but do not demonstrate that nationalization matters, and Luong and Weinthal (2010) point to the wave of expropriation in the 1970s as a structural shift in the capture of oil rents – but I show why more work is needed to illustrate the validity of this argument.

Table 1.1: Curse or no curse? Oil's effects on democracy over time

	Ross (2012)	Haber & Menaldo (2011)
All years	−0.179*	1.326*
	(0.079)	(0.647)
Pre-1970s	−0.078	–
	(0.114)	
Post-1970s	−0.129*	2.396
	(0.059)	(1.426)

Logistic regression coefficient estimates with standard errors of the effect of logged oil income per capita on democratic transition. Three coefficients are shown for each study: all years, pre-threshold years, post-threshold years. The threshold year for Ross is 1979, while the threshold year for Haber and Menaldo is 1973. Results collected from: Table 3.7, p. 97 (Ross 2012); Appendix 3, Table 1, p.190 (Haber Menaldo 2011).

In their book-length treatise on the politics of resource ownership, *Oil is Not a Curse*, Luong and Weinthal (2010) develop a theoretical model to show that ownership structure plays an intervening role in the relationship between oil wealth and weak fiscal regimes, which in turn are "linked directly to poor economic growth, enfeebled states, and authoritarian regimes" (Luong and Weinthal, 2010, 27). Employing a case study approach based on evidence from the former Soviet states, Luong and Weinthal provide empirical support for their theoretical finding that state ownership of the oil sector fosters weak fiscal regimes while private domestic ownership fosters strong fiscal regimes.[4] And as the general resource

[4]There is a burgeoning literature on why states expropriated in the first place but scholars writing about resource ownership have been able to show why leaders nationalize resource sectors but have not yet reached a consensus on the factors. Chang, Hevia and Loayza (2010) and Manzano and Monaldi (2009) find that expropriations in the oil sector are determined by high

curse literature posits, the fiscal link – how the government collects revenue and how that revenue is distributed – is the primary linkage between natural resources and negative political and economic outcomes.

What is missing in their analysis, however, is this connection between ownership structure and fiscal regime. That is, there is no *a priori* link between state ownership and weak fiscal regimes. Luong and Weinthal summarize their causal argument in the following excerpt:

> S_1 (state ownership with control) fosters weak fiscal regimes – that is, fiscal regimes that are neither constraining nor enabling – because it creates low transactions costs and societal expectations for an enlarged state role in generating and allocating revenue such that neither direct claimants (governing elites) nor the indirect claimants (the population) have an incentive to supply or demand institutions that set effective limits on the state's ability to extract and spend the proceeds from mineral wealth. (pp. 48-49)

But why would the population and the elite not have incentives to access or at the very least control the revenue stream that natural resources supply? This argument – that the population will not demand access to resource revenues – is often overstated: citizens in resource-rich states certainly know that their government is profiting off the sale of natural resources. They may not know how much, but citizens know a revenue stream exists and will demand distribution

commodity prices and weak tax collection mechanisms; work by Duncan (2006) finds similar results for expropriation of non-oil minerals (bauxite, cooper, lead, nickel, silver, tin and zinc). Berrios, Marak and Morgenstern (2011) argue that political ideology is not a motivating factor in resource nationalization, especially in the Latin American context. Work by Guriev, Kolotilin and Sonin (2011) shows that oil prices and executive constraints are determinants of oil nationalizations. Albertus and Menaldo (2012) expand the argument to include land and non-resource nationalizations, presenting results that indicate ideology does not determine nationalization. In terms of the consequences of nationalizations, their main findings point to a connection between leadership durability and land expropriations, but do not find any statistical relationship between durability and oil expropriations.

of resource revenues, particularly when the mechanism for generating revenue is in the hands of the state via a NOC as opposed to being in the hands of foreign multi-nationals. Consider the case of Saudi Arabia, where the volume of oil wealth is highly secretive and the state-owned Aramco rarely publishes annual reports on production or oil revenues. Yet public and elite demands for oil revenue distribution have fostered what Hertog has called "islands of institutional efficiency" which have allowed the Saudi monarchy to enrich its own coffers, to build institutions for long-term economic development, and, more importantly, to "build political coalitions through distribution of resources to political clients" (Hertog, 2012, 229). As such, the state-owned oil enterprise serves as a starting point for fostering political institutions to manage the distribution of both elite and mass patronage. In this light, state ownership will not necessarily affect fiscal institutions; instead I argue that state ownership increases state revenues to allow for such patronage or public goods distribution, regardless of the fiscal regime in place.

1.3 The argument in brief

So if oil wealth does not unconditionally affect political development outcomes, under what specific contexts do we find successes, failures, and in-between cases? Here I lay out my argument about which oil-related institutional pathways have led to better outcomes for the state and which pathways have led to weak states and worse outcomes. In brief, I argue that those institutions which maximize government capture of oil wealth – those that incentivize high efficiency and thus high take-home revenues – will lead to strong states: durable regimes with sustainable expenditures and low corruption. I offer more detail on each segment of my theory in the chapters ahead, but for now consider the following argument:

Imagine a country where oil has recently been discovered and production has

just commenced. Prior to oil discovery, the government of this country had some constitutional rule that sub-soil resources belong to the state but can be licensed out to firms that are then taxed on their earnings. In the early years of oil production, the regime in power maintains this institutional setup and taxes the companies operating its country's oil fields.

At a certain point in time – when precisely this occurs is the subject of chapter two – the regime is faced with an institutional choice. It can either maintain the status quo or decide to intervene in the sector in an attempt to collect higher revenues from oil production. If it intervenes, the regime must then choose the type of intervention it will pursue. This seemingly technical choice of institutions to manage the oil sector has broad-ranging consequences in the politics and economy of what is now an oil-producing state.

Institutions that capture more oil wealth with less leakage and corruption will (almost by definition) allow the regime to reap the full potential of its country's oil resources. The high pass-through of oil revenues to the state treasury will allow the regime to maintain high expenditures – on things like public goods and elite cooptation – without resorting to taxing the income of its citizens. This is the classic case of the *rentier* state I mentioned above (Mahdavy, 1970; Beblawi and Luciani, 1987) which typifies the strong and stable "petro-state."

Next, there are institutions which allow the state to capture high levels of oil revenues but also allow for leakage and inefficiency. These institutions tend to reflect the strongest state presence in all phases of the upstream sector, from exploration and production to regulation and contract management. This choice tends towards high graft because it incentivizes extortion by institutionally decreasing the cost of corruption (a topic I discuss in more detail in chapter three). So while the regime is able to capture revenues at a high rate, some of this money is either lost due to corruption or due to operational inefficiencies. At times, this context also represents that of a strong *rentier* state, while at other times this

institutional choice may lead to political instability if corruption and inefficiencies hinder the state's ability to use oil wealth to finance its expenditures.

Then there are institutions designed for state intervention, but in the wrong place, focusing the state's efforts on regulation instead of production. Here the choice is to intervene in the sector by setting up a state-owned entity that monitors the activities of operating firms despite not being involved in operations itself. This pathway similarly incentivizes graft, but without any of the growth. With no real opportunities for oil production and revenue generation, this type of institution ends up becoming a poster child for the corruption and ineffectiveness of the regime. These cases represent the typical "resource-cursed" countries with high corruption, low economic development, and high political instability.

Lastly there are those institutional pathways that are seemingly designed to maintain some balance between intervention and non-intervention by keeping the state's role minimal in everyday operations. Yet these are the institutions which typically end up with the most unsatisfying results from the perspective of the regime in power. Such is the case of the "hollow" state-owned enterprise which is established neither to produce oil nor to regulate those that do produce oil, but instead to collect tax revenues from operators and transfer them to the state treasury. One might perceive this institution as ideal since it maintains a very *laissez faire* role in the sector. But this ignores the fact that intervention of any kind may send a mixed signal to firms about their risks of expropriation, disincentivizing investment and thus resulting in lower tax revenues collected by the state. While there is arguably little corruption or leakage in this scenario, there is also little revenue to support state expenditures – in essence, as if oil had not been discovered at all.

Of course, the state can eschew intervention altogether and not go down the interventionist pathway. This choice in particular leads to the most variance in outcomes, with much depending on the surrounding political climate. In states

Table 1.2: Petroleum-related institutional pathways and their political outcomes.

Institutional path	*Development outcomes*	*Examples* (alphabetical order)
NOC as operator	Highest likelihood of regime stability; Lowest corruption; Highest revenues and efficiency	Norway, Russia (post-2000), Saudi Arabia, Venezuela (pre-2000)
NOC as everything	Mid-high likelihood of regime stability; High corruption; High revenues but low efficiency	Angola, Iran, Malaysia, Mexico, Soviet Union
NOC as regulator	Low-mid likelihood of regime stability; Highest corruption; Low revenues and lowest efficiency	Ecuador (pre-1990), Indonesia (late Suharto era), Nigeria, Yemen
NOC as nothing	Lowest likelihood of regime stability; Low-mid corruption; Lowest revenues and low efficiency	Congo Republic, Thailand, Tunisia
No NOC	*Outcomes vary*	Chad, Papua New Guinea, United States of America

Note: NOC refers to national oil company. NOC as everything refers to NOCs which both produce and regulate. NOC as nothing refers to NOCs which neither regulate nor produce; these entities formally serve as tax administrators though in practice are often nothing more than holding companies.

with otherwise strong institutions, such as fiscal capacity and the enforcement of the rule of law, the status quo of positive political outcomes, such as low corruption and high stability, is maintained by not intervening in the resources sector. But in the absence of functioning tax institutions and a strong legal system, the regime cannot realize its natural resource potential as operating firms will capture most of the country's resource wealth.

These five scenarios can be generalized into five institutional choices which I describe in more detail in the following section: (1) setting up a national oil company that is solely an oil-producing company, sometimes operating alongside other firms; (2) founding an all-encompassing NOC which produces and regulates the oil sector, in that it both operates the country's oil fields as well as manages

the license-awarding process for other operators and service companies; (3) establishing a NOC that does not produce oil but whose role is primarily to regulate operating firms and manage the license-awarding process; (4) setting up a NOC with minimal interference with existing operating companies – in essence a NOC that serves as holding company for revenues transferred from operating firms to the state treasury; and (5) maintaining the status quo of taxing private firms.

I present a stylization of these institutional pathways and their political consequences – namely corruption, state revenues, and regime stability – in Table 1.2 with a few examples of each scenario. As the table shows, my argument offers specific institutional factors for the variance in outcomes of the oil-producing states. And it does so beyond the typical explanation of a "conditional resource curse" whereby the only conditions that matter are those prior to oil discovery such as democratic governance or strong fiscal capacity. Yes, these institutions still matter – particularly for states not intervening in the oil sector – but there remains considerable variance even across democratic states and across those with strong tax-related institutions.

Nearly every argument involving an institutional explanation for political outcomes is subject to the thorny issue of selection and endogeneity. A skeptical view of this argument would be that only the least corrupt governments or only the most stable regimes choose the optimal producer NOC institutional framework, and this explains why states with producer NOCs tend to have better outcomes. In the chapters ahead I tackle this issue head-on with analyses and discussions of the origins of specific institutional designs. In chapter three, for instance, I test whether having a corrupt government prior to nationalization explains the choice of giving a NOC regulatory authority. Using data on pre-existing corruption levels, I show that there is no relationship between corruption before nationalization and setting up a regulatory NOC: both corrupt governments and non-corrupt governments opt for both the regulatory NOC framework and the non-regulatory

NOC framework. Further, using instrumental variables analysis, I find that the determinants of the "NOC as regulator" choice are based on geological conditions and have little to do with political motivations.

In chapter four, I similarly analyze the determinants of the producer NOC framework to test whether regime stability prior to nationalization influences institutional choice. There I suggest that while states with production that is relatively easy to extract are more likely to choose the producer NOC framework (whereas states with more initial difficulty in extraction choose the non-producing NOC framework), there is qualitative evidence that political stability does not play a role in NOC institutional design. Indeed, even when looking at the anecdotal evidence of nationalizations in the Middle East and North Africa, it is difficult to find any relationship between stability and establishing a producer NOC. The producer NOCs established in Iran (1951), Libya (1968), Iraq (1961), and Syria (1962), for instance, were preceded by periods of high regime and political instability, while the producer NOCs of Egypt (1976), Jordan (1995), Oman (1974), and Saudi Arabia (1974) were established during relatively stable eras in these countries' political histories. Similarly, the non-producer NOCs established in Algeria (1963) and Yemen (1974) followed periods of instability, whereas the non-producer NOC of Egypt (1965) was preceded by over a decade of regime stability.[5]

These are only brief descriptions of why the specific type of NOC established in a given country does not seem to be determined by factors related to the political outcomes I analyze in the dissertation. In the chapters ahead, I offer more detailed arguments and evidence against possible selection effects and endogeneity.

To illustrate further the implications of my argument, consider the institutional trajectory of Iran's oil industry over time. Now one of the biggest oil producers in

[5]I am defining stability here simply in terms of whether the country experienced any regime transitions within the five to ten years prior to establishing a producer or non-producer NOC. Regime transitions are measured using the Geddes, Wright and Frantz (2014) dataset on political regimes. Also note that Egypt switched from having a non-producer NOC to a producer NOC in 1976.

the world – with the fourth-largest reserves of conventional oil in 2011 (BP, 2013) – Iran has been producing oil since it was first discovered by William Knox D'Arcy and his crew in 1908 at the Masjed Soleiman fields in Khuzestan. Since then, the country has been through four of the five institutional pathways I describe above and six different regimes. While there are many reasons for Iran's history of moderate instability (for a review, see Binder (1962) and Keddie (1981)), this brief vignette shows how the fortunes of Iran's various regimes were intertwined with the institutional pathways in managing the country's vast oil wealth.

The ownership structure of the early oil production era would fall under the "no NOC" institutional design. Starting in 1908, the government began collecting taxes and royalties from D'Arcy's group, the Anglo-Persian Oil Company (and beginning in 1935, from the Anglo-Iranian Oil Company or AIOC). Coincidentally, this period also began with upheaval in Iran's governance, as the Constitutional Revolution of 1906 would later pave the way for the ouster of the Qajar dynasty, which had ruled Iran since 1785. The last Qajar king, Ahmad Shah, was deposed in a coup d'{'etat in 1921 by the military commander Reza Khan, who would later rename himself Reza Shah Pahlavi. It was not until 1925 that Reza Shah ended the Qajar monarchy when he pressured Iran's parliament to formally exile the Qajars from government.

Reza Shah maintained the ownership structure of tax-and-royalty concessions with AIOC, despite steady increases in both Iranian oil production and international prices (Mikdashi, 1966). As such, Reza Shah was unable to take advantage of the country's growing oil wealth. The majority of this wealth during the 1930s was collected by the British government through AIOC per the terms of what is now referred to as the 1933 Oil Agreement (Noori, 1965). Still, these oil revenues were able to sustain a modest army directly loyal to the king, as Reza Shah began a campaign in the late 1930s and early 1940s to solidify his hold both over separatists within the country and pressure from the Soviets to the north

(Rubin, 1980). Yet it was this campaign, and his purported alliance with Nazi Germany, that led to his ouster during the Anglo-Soviet Invasion of 1941 with the British-endorsed replacement by his son, Mohammad Reza Shah.

Mohammad Reza Shah would again continue the no NOC institutional structure of his father's era (in the chapters ahead I discuss the durability of these institutional choices as the status quo). Further, he would fail to heed the public's calls for nationalization due to the imbalance in shared revenues between the Iranian and British governments (this is a topic I consider in more detail in chapter two). The meteoric rise in 1951 of Mohammad Mossadegh to the premiership – and in many ways, to the head of government given the weak position of Mohammad Reza Shah in this period – was a reflection of public demands for expropriation of British assets (Noori, 1965).

On May 1, 1951, Mossadegh ushered in a new era in ownership structure of the Iranian oil industry with the founding of NIOC on the expropriated assets of AIOC. NIOC quickly became a majority producer due to its seizure of the entirety of AIOC's drilling and production assets but more importantly due to Iran's favorable geology (in the 1950s) which made it easy for NIOC to operate the high-pressure onshore oil fields with relatively low sulfur and high viscosity (Ford, 1954; United States Geological Survey, 1932-2010). There was no need for regulation as no other companies or firms operated in the marketplace. However, operations were constrained by the British and American response to Mossadegh's nationalization: a naval blockade of oil exports, sanctions at the nascent United Nations, and a successfully orchestrated coup d'{'etat in 1954 to reinstate Mohammad Reza Shah as ruler.

With his reinstatement, Mohammad Reza Shah reversed the nationalization while maintaining NIOC as a "NOC as nothing" institution. From 1954 until 1974, Iran's oil sector was operated by a consortium of Western oil firms, overseen directly by the Shah and his *viziers*. During this period, NIOC remained a national

oil company in name only, with no real oversight of the consortium companies nor any major role in operations and production aside from entering into production-sharing agreements (Karshenas, 1990).[6]

The consortium began to unravel when the Shah introduced the Petroleum Act of 1974, spurred in part by some of the highest oil prices the market had seen since the 19th century as well as changing international norms for state ownership. This law granted monopoly production rights to NIOC and called for the annulment of foreign operations (Karshenas, 1990). In practice, however, given the difficulties faced by aging oil fields and dropping reserve pressure – not to mention the challenges in transitioning to a monopoly producer after being on the sidelines for thirty years – NIOC played more of a regulatory role than a producing role (Takin, 2009).[7] As such, this period would fall under the category of "NOC as regulator," without major production capacity (though a case can be made to consider this a transition period).

After the 1979 revolution, which saw a theocratic Islamic republic replace the exiled Shah, the government led by Ayatollah Ruhollah Khomeini maintained NIOC as a state-owned enterprise. The oil industry was immediately crippled, however, during the eight-year war with Iraq (1980–88). But after the war, NIOC gained a stronger foothold on the sector as it became the *de facto* regulator and monopoly producer of Iran's oil in 1988 (Mahdavi, 2012). Since then, the oil sector has been managed by what I refer to above as a "NOC as everything" structure.

Reviewing Iran's political and oil histories, it is clear that the period with most upheaval was also a period of no nationalization. In the early era of oil production, the three regimes in power from 1908 until nationalization in 1951 – the Qajar monarchy, Reza Shah's personalist/military dictatorship, and Mohammad Reza

[6]Production was shared with NIOC in the sense that the consortium would sell a portion of produced oil on NIOC's behalf.

[7]At this time there was also no effective Ministry of Petroleum (the Shah had simply appointed people to his cabinet as oil ministers without establishing a formal ministry) but NIOC undertook the role of oversight of the outgoing consortium members (Karshenas, 1990).

Shah's first personalist dictatorship – could not capitalize on the country's oil wealth, allowing APOC/AIOC to take the majority share of total profits (see Figure 2.6 in chapter two for a full breakdown of revenues shared between the British and Iranian governments). While there are a host of factors for each regime's demise – notably a rising middle class, ill-fated international alliances, and periods of economic crisis – the lack of a NOC to capture a greater share of oil revenues meant less government revenue to spend on buying loyalty, repressing separatists, and fighting off overt international invasions.

Mossadegh's shift to nationalization and the establishment of a producing NOC, if my argument above is valid, should have led to a strong, lasting regime – one that by many accounts was proto-democratic (see Katouzian (1990) for a discussion of this debate). However, his administration was constrained by an international embargo of oil exports and ultimately cut short by the idiosyncratic events that led to his ouster. In a different era where nationalization was more commonplace (e.g. after 1960), perhaps, the response to this institutional change would not have been so drastic, and the producer NOC that Mossadegh established would have led to sustainable government expenditures and a long, lasting regime.

The hollow NOC institutional design that followed from 1954 to 1974 coincided with a period of increasing oil revenues for the Iranian state, and therefore, increasing state expenditures by the Shah. But it became clear to the Shah that his government could get a greater share of oil revenues by taking control of the sector away from the Western consortium and into the hands of NIOC. In doing so, these increased revenues allowed for an even higher level of expenditures on the inner elite and the Shah's repressive apparatus, the *SAVAK* secret police, to counter the rising tide of Shia and communist militant opposition groups (Keddie, 1981). This increase was apparently not enough, as the Shah's regime came crashing down in the winter of 1978–79.

After the war with Iraq and the subsequent establishment of NIOC as an

integrated NOC with monopoly production rights, the state has reached a ceiling in its ability to capture revenue from the sale of oil. In spite of heavy sanctions, NIOC was able to increase production – and therefore oil revenues – from 2.3 million barrels per day in 1988 to 4.4 million barrels per day in 2011 (BP, 2013). Again there are many reasons for the durability of the Iranian regime during this era, but the ability to fully capture oil wealth through NIOC has contributed to Iran's longest-lasting regime (35 years as of 2015) since the Qajar monarchy of 1785–1925.[8]

This "mini" case study of Iran's oil history and its institutional pathways over time is illustrative of the plausibility of my argument, but is by no means complete evidence to support my theoretical claims. To do that, in the chapters ahead I turn to a more systematic approach in cross-national statistical analysis of the different institutional pathways states take and their resulting outcomes, with particular attention to how states chose these pathways to begin with. But first I discuss the measure of institutional differences – oil nationalization and its varieties – that I employ throughout this dissertation.

1.4 Measuring nationalization

1.4.1 Timing and duration of nationalization: NOCs

Nationalization is the forced acquisition of privately-owned assets by the state, either with or without compensation (Wortley, 1956). In the context of the oil industry, nationalization is not just this forced acquisition, but also the establishment of a state-backed apparatus to manage and operate these expropriated assets (Victor, Hults and Thurber, 2012). This state-owned enterprise is com-

[8]This assumes that the Pahlavi dynasty was in practice two separate personalist dictatorships (Herb, 1999) of Reza Shah (1925–1941) and Mohammad Reza Shah (1941–1951; 1954–1979), the latter being punctuated by the Mossadegh-era of parliamentary democracy from 1951 to 1954.

monly referred to as a national oil company, or NOC for short. When measuring oil nationalizations, scholars have largely ignored state-owned enterprise establishments and instead have focused on individual acts of expropriation. Kobrin (1980) was the first to quantify nationalization cross-nationally, with the creation of a database that measured every act of oil-related expropriation in a given country and year. Since then, most cross-national quantitative studies on oil nationalization have used and updated this measure (Kobrin, 1984; Minor, 1994; Bohn and Deacon, 2000; Li, 2009; Guriev, Kolotilin and Sonin, 2011). The notable exception is the work discussed above by Luong and Weinthal (2010), who analyze domestic ownership structure as a measure of nationalization that is related to the idea of the establishment of NOCs. In addition, McPherson (2010) proposes a new dichotomous measure based on state participation, whereby sectors with greater than 30% state participation (either through ownership of a NOC or participatory contracts with IOCs) are considered "nationalized."

While the existing data on acts of expropriation are helpful in measuring the causes and effects of individual instances of expropriation, these measures do not capture institutional characteristics of nationalization as manifested in the differing frameworks of NOCs across oil-producing countries. In addition, these data may suffer from over-counting when conceptualizing nationalization as an institutional change in ownership structure of natural resources.[9]

I begin by considering an oil sector of a given country nationalized if a NOC exists in a given year. To this end, I created a new data-set based on the oil

[9]As an example of over-counting, the Kobrin (1980) data counts four acts of oil-related expropriation occurring in Qatar during the 1972-1977 period. In practice nationalization began in 1974 with the establishment of QPC as a state-owned oil company upon the expropriated assets of Shell Qatar. All subsequent expropriations are effectively less relevant since the international community had already recognized Qatar as operating a nationalized oil sector as of 1974 (Crystal, 1989). The same is true for Abu Dhabi: after the establishment of the Abu Dhabi National Oil Company (ADNOC) in 1971, any further expropriations by the king, Sheikh Zeyed, were state consolidations of private assets (Suleiman, 2008). In other words, the state had already begun its intervention and nationalized the oil sector in 1971, so any consequential expropriations are not salient to the discussion of the initial timing or onset of nationalization.

histories of every country since 1900. I extend the time period back to 1900 because the existing data on expropriations do not cover the period prior to 1962, when anecdotal evidence suggests some of the most important nationalizations occurred in the 1930s (Mexico, Bolivia, and Brazil) and 1950s (Iran and Indonesia). These data are coded from a comprehensive review of every oil nationalization using primary and secondary sources: 25 petroleum laws and executive decrees, 80 United States Geological Survey *Minerals Yearbooks* published annually since 1932 (United States Geological Survey, 1932-2010), and roughly 100 scholarly accounts of individual countries' oil histories including examples such as Philip (1982); de Oliveira (2012); Victor, Hults and Thurber (2012); Zahlan (1998) and Grayson (1981).[10] Importantly, operationalizing nationalization using NOC establishments relies on a process that is well-documented and objectively measurable, given there is precise information about when a NOC is established and the conditions under which a sector becomes nationalized.

This variable is named *NOC* in the data and is a dummy variable with the following rule used to code it 1 or 0: if there is a state-owned enterprise in the oil sector, with greater than 50% state ownership, then the NOC dummy is coded "1", and "0" otherwise. The unit of analysis is "country-year." The choice of calendar year, instead of budget year or fiscal year, is due to the availability of data for the independent variables in the analysis. (I use years instead of quarters, months, weeks, days, etc. for the same reason.) Furthermore, as budget and fiscal years vary widely across countries, using the Gregorian calendar year as the unit of time provides for a more comparable analysis. The trends shown in the left panel of Figure 1.1 are based on this method of coding nationalized sectors.

A similar measure can be constructed based not on majority ownership by the state, but rather state ownership of what is sometimes referred to as a "golden

[10]The full bibliography of sources, along with country-specific oil histories, will be available online at http://dataverse.harvard.edu/dataverse/paasham.

share" whereby the state may not control the majority of shares but retains the authority to outvote other shareholders on key company decisions. There are only three differences between these coding rules: France (1995–2003), Italy (1998–2014/present), and the UK (1983–1985). The dates refer to periods where the two coding decisions differ — for example, in France, starting in 1995 the state held a minority stake in Elf-Aquitaine (later Total) with a golden share until 2003, at which point the company became fully privatized (though the state continues to own a small proportion of shares). If coding under the majority-ownership rule, these years would be marked zero; if coding under the golden share rule, these years would be marked one. Nonetheless, I primarily use a 50% threshold for substantive reasons: the government must be the majority shareholder of the company to prevent private investors from influencing key decisions.

In terms of the timing of nationalization, a topic I consider in greater detail in chapter two, I construct another binary measure, *nationalization*, based on the *NOC* variable. The *nationalization* dummy variable is coded as follows: the first year that a NOC is established is measured as the year of nationalization for a given country, coded as "1" for that year, with all other years taking on a "0" value. By this measure, states may only nationalize more than once if a previous NOC was privatized, as was the case in Canada, France, and the UK (a topic I revisit in chapter two as well). A full listing of the timing of all oil nationalizations is presented in Table 1.3, sorted by year of NOC establishment.

Two examples will help to clarify how the *NOC* and *nationalization* measures are constructed. Consider Mexico, where Lazaro Cardenas' expropriation of Shell and Standard Oil in 1938 – an event that is still celebrated as a major national holiday (Fiesta Patria) – led to the establishment in that year of *Petróleos Mexicanos* (PEMEX), Mexico's national oil company with full state ownership of the company's shares (Philip, 1982). For the Mexican case, the *NOC* dummy is coded "0" from 1900 (the first year in the data) to 1937, and "1" thereafter; the *nation-*

Table 1.3: NOCs around the world, 1900–2013

Country	*Year*	*Country*	*Year*	*Country*	*Year*
Argentina*	1911	Algeria	1963	Angola	1976
Soviet Union/Russia	1916	Egypt	1964	United Kingdom*	1976
Italy*	1926	Iraq	1964	Vietnam	1976
Bolivia*	1936	South Africa	1965	Gabon*	1979
Mexico	1937	Japan	1967	Cameroon	1980
Brazil	1938	Libya	1968	Ghana	1983
France*	1941	Peru	1968	Denmark	1984
Poland	1944	Nigeria	1971	Thailand	1985
Colombia	1948	United Arab Emirates	1971	Turkmenistan	1991
Romania*	1948	Ecuador	1972	Azerbaijan	1992
China	1949	Norway	1972	Uzbekistan	1992
Chile	1950	Tunisia	1972	Jordan	1995
Iran	1951	Netherlands	1973	Kazakhstan	1996
Turkey	1954	Malaysia	1974	Sudan	1996
Austria*	1956	Oman	1974	Congo	1998
India	1956	Pakistan	1974	Congo, Dem. Rep.	1999
Indonesia	1957	Qatar	1974	Equatorial Guinea	2001
Venezuela	1960	Saudi Arabia	1974	Bolivia	2006
Kuwait	1961	Trinidad & Tobago	1974	Brunei	2007
Syria	1962	Bahrain	1975	Argentina	2012
Yemen	1962	Canada*	1975	Uganda	2013

*Note: * refers to states which later privatized their oil sectors. Two of these states re-nationalized after privatization (Argentina in 2012 and Bolivia in 2006). Sources: see footnote 10.*

alization dummy is coded "1" only for the year 1938, and is "0" for every other year. A more complex case is Canada, which established a NOC by the name of Petro-Canada in 1975, only to privatize the company in 1995.[11] For this case, the NOC dummy is coded "1" for 1975-1995 and "0" for all other years, and the nationalization dummy is "1" for 1975 and "0" otherwise. What separates these two cases is that for analysis of the timing of nationalization, Mexico is "removed" from the data after 1938 since it cannot technically re-nationalize its industry; Canada on the other hand re-enters the data-set following privatization in 1995 since the government can choose to nationalize the oil industry again.

[11]Privatization of state shares began in 1991, but the government sold its majority shares in 1995 (retaining 19% of the company), with complete privatization in 2004.

1.4.2 Institutional characteristics: not all NOCs are the same

Beyond the historical trajectory of their NOCs, the institutional pathways of Canada and Mexico are different in important ways. PEMEX is a perfect example of a fully-integrated NOC: not only is it involved in production and regulation of the sector, up until 2015 it was the monopoly operator of Mexico's oil industry and was fully owned by the Mexican government. The company engages in non-commercial activities such as social programs, fuel subsidies, and the required use of domestically-produced inputs like concrete, steel, and plastics. Petro-Canada on the other hand was just like any other oil company, with the only exception being that 57% of the company's shares were owned by the government (making it a Federal Crown Corporation of Canada). The company explored for oil and operated oil fields in Alberta alongside other companies like BP, Mobil, Shell, and Suncor; it was thus not a monopoly producer. It did not engage in non-commercial activities and it played no role in regulating other companies in the sector. Indeed, Petro-Canada had to compete with other companies for contracts which were awarded by the provincial governments and their ministries (for example, the Alberta Energy Regulator).

It is my goal in this dissertation to show that differences like these matter for governance outcomes. Following from my discussion of the argument in the previous section, two institutional differences in particular stand out and are the focus of chapters three and four, respectively. The first is whether or not regulation of the oil sector is under the aegis of the NOC. This refers to the authority to grant procurement contracts and licenses for oil exploration, or in short, the manager of the oil sector. The alternative institutional arrangement is to vest this authority in a state ministry or regulatory department. In states with no NOCs, this is the default arrangement. Such is the case in the United States, where firms wanting to explore and produce oil in the offshore Gulf of Mexico fields must bid for contracts awarded by the Department of Interior. This institutional difference

across oil-producing countries is the subject of chapter three.

The second institutional difference is whether or not the NOC produces oil in commercial quantities. This captures an important distinction between states whose NOCs are oil companies in the literal sense versus those who are "oil companies" in that they manage other oil companies actually involved in production. As I argue above and more extensively in chapter four, production capacity matters in a NOC because it translates to more oil revenues for the state than would be possible under private ownership or under NOCs who are merely tax and regulatory entities. Because time-series data on specific production percentages are not available – even at any point in time for nearly 20 of the roughly 60 oil producers – I use a producer vs. non-producer proxy. I am able, however, to differentiate between major- and minor-producing NOCs based on rough estimates of production activity from the United States Geological Survey (1932-2010), where the threshold between major and minor is 50%.[12] My discussion throughout the dissertation of "producing" or "producer" NOC refers to those with major production capacity versus those with either no production capacity or only minor capacity.

These two mutually exclusive characteristics lend themselves naturally to a typology of NOCs into four categories. These are presented in Table 1.4. The first category is what I refer to as "Hollow NOCs" whereby the company is not involved with regulation or contract-awarding authority, nor is it involved in the upstream sector beyond minor levels of oil production. These NOCs are either simply revenue collection agencies working alongside regulating ministries, such as the *Entreprise Tunisienne d'Activités Pétrolières* (ETAP) in Tunisia, or minor operators in small oil-producing countries, such as the Ghana National Petroleum Corporation. Some hollow NOCs are also remnants of what used to be NOCs

[12]The distribution of production share between NOCs and other companies within a given country is for the most part bi-modal – most NOCs either produce very little of a country's oil or are near-monopolists – such that moving the threshold by plus or minus 15% does not substantively alter the coding.

with high production capacity in previously petroleum-exporting states, such as *Energie Beheer Nederland* (EBN) in the Netherlands.[13]

Table 1.4: A typology of national oil companies

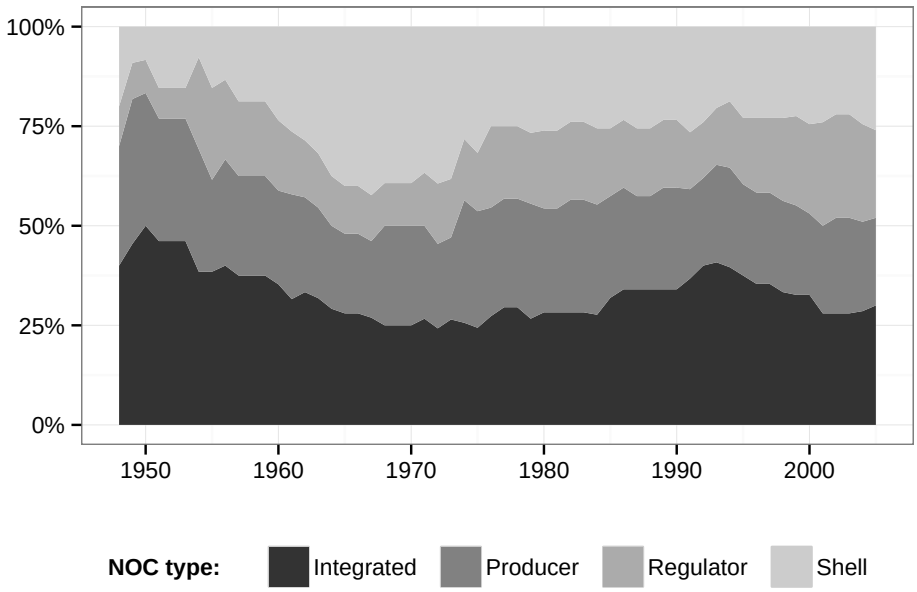
		Regulatory Authority	
		No	**Yes**
Production Capacity (major)	**No**	Hollow NOC	Regulator NOC
	Yes	Producer NOC	Integrated NOC

The second category is the regulator NOC without production. Here a NOC exists solely to manage the oil sector and award contracts, as well as to collect tax revenue from operating firms. Two classic examples are the Nigerian National Petroleum Corporation and Cameroon's *Société Nationale des Hydrocarbures* (SNH), both of which manage the bidding process for permits, licenses, concessions, and exploratory blocks, without actually producing or operating any fields (despite being listed in production-sharing agreements). Some regulator NOCs are also involved in production though are far from being major producers of the country's oil fields. Such is the case for PetroEcuador and Indonesia's Pertamina.

The third category is the producer NOC without regulatory powers. These are companies that are nearly identical to private oil companies such as ExxonMobil

[13]Throughout its oil history, the Dutch hydrocarbons economy has been "privatized", albeit with a twist. The state founded EBN, a fully-state-owned oil and gas company, in 1973 to manage the hydrocarbons sector through joint-ventures and production-sharing. However, EBN has no true production capacity nor does it have any oversight: it is purely a contracting shell whose existence is to manage the Dutch government's national claims to oil and gas production. This is in reference to the government's self-proclaimed right to 40-50% of all oil and gas produced within Dutch territories (mostly offshore). The fields themselves were and continue to be operated by IOCs such as Amoco, Conoco Philips, Unocal, and NAM (Royal Dutch Shell's investor-owned subsidiary), and EBN is just there to collect the government's share of revenues (after sale, not at the wellhead). See http://www.nam.nl/en/about-nam/facts-and-figures.html for more details on both EBN and NAM.

Figure 1.2: Institutions over time: Percentage of NOCs by type, 1947-2005



The starting point is 1947 for illustrative purposes only; prior to 1947 there were only eight NOCs, four of which were integrated while the other four were producers only.

and Chevron with the key exception of being owned by the state (as BP once was prior to 1979 and the Thatcher-era of British privatization). As such, they are typically regarded as among the most efficient NOCs given their sole focus on operations (Wolf, 2009; Victor, Hults and Thurber, 2012). Examples of producing NOCs without regulatory powers include Norway's Statoil, Brazil's Petrobras, Russia's Rosneft, Saudi Aramco, and PetroVietnam.

The fourth category is what I refer to as the "Integrated NOC" which is charged both with production and regulation of the oil sector. These companies tend to also be monopoly producers such as PEMEX, the National Iranian Oil Company, and Malaysia's Petronas, but also include major-but-not-monopoly producers such as Algeria's Sonatrach, China's combination of Sinopec and CNPC,

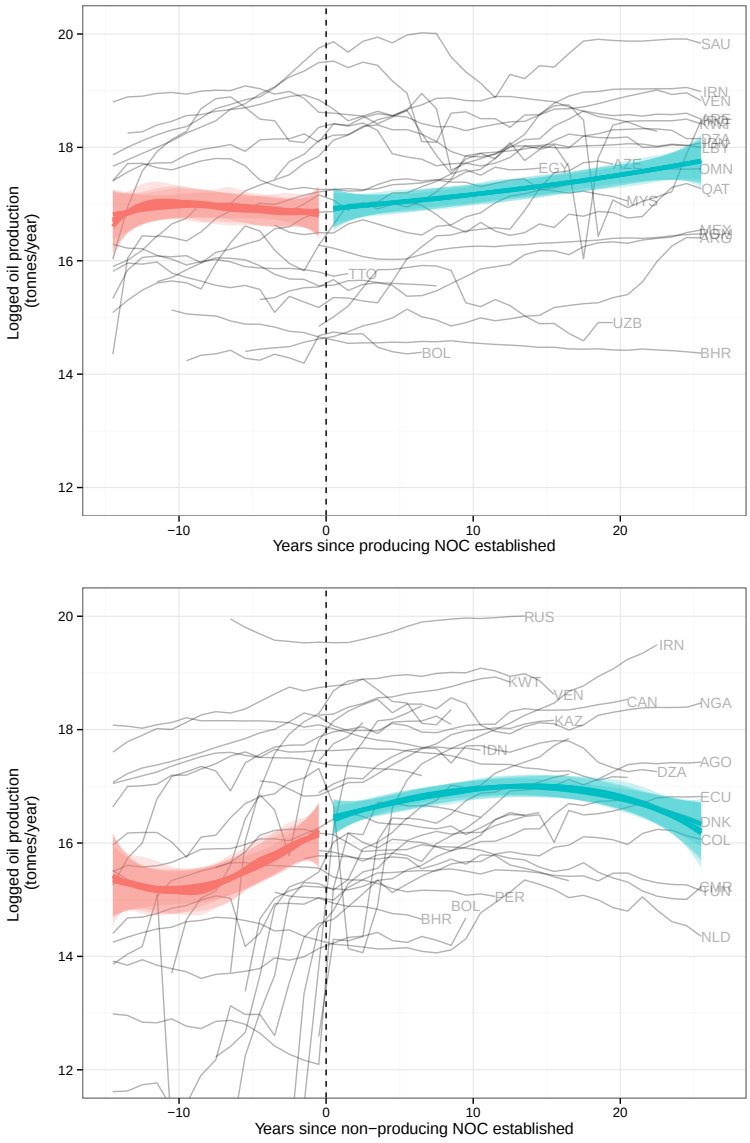
and many NOCs in the former Soviet states such as Azerbaijan's SOCAR, Turkmenneft, and Uzbekneftegaz. In chapter three I group this category with the regulator NOCs given the focus there on contract-awarding authority, while in chapter four I group this category with the producer NOCs given the focus there on production capacity.

States have chosen these four institutional pathways at varying rates over time, as shown in Figure 1.2. The first wave of NOCs in the 1940s and early 1950s all had production capacity with three out of every four either integrated NOCs or producer NOCs. This changed in the mid-1960s and 1970s, during the major wave of nationalizations, when over one-third of all NOCs were hollow NOCs and roughly half were producers or integrated NOCs (the remainder were regulator NOCs). By the 1990s there was again a surge of integrated and producer NOCs resulting from the collapse of the Soviet Union. But since 1995 an increasing number of regulator NOCs in sub-Saharan Africa has brought balance to the mix such that by 2000 and onward there is a roughly even split between all four types.

Other institutional differences are coded in the data but are not discussed in this dissertation. These include the following NOC characteristics: degree of state ownership (minority vs. majority vs. full ownership), obligation to perform non-commercial activities, ability to access state revenues for exploration and production reinvestment, and types of contracts entered into with other firms (participatory vs. joint ventures vs. production-sharing). The first two refer to the role played by the NOC in state activities, while the latter two refer to fiscal and operational characteristics which can affect the NOC's technical performance. All four institutional characteristics are the subject of future research, which I discuss at length in chapter five.

Let me for a moment return to the argument that revenues are higher under the institutional framework where NOCs have production capacity – the producer NOC and integrated NOC arrangements. Part of the reason for this is that there

Figure 1.3: Oil production, before and after establishing a producing NOC compared to before and after establishing a non-producing NOC



Annual oil production before and after a producing NOC is established (top panel) and before and after a non-producing NOC is established (bottom panel) are shown for each country by gray lines. I overlay four additional metrics to capture temporal changes in production and income, with 95% confidence bands: (1) loess smoother, (2) quadratic smoother, (3) cubic smoother, and (4) a fourth-order polynomial smoother. These are colored red before a producing NOC is established and blue afterwards. Total number of countries in the sample is 24 which established producing NOCs and 32 which established non-producing NOCs. "Producing NOC" refers here to a NOC which produces the majority of the country's oil and gas. Note: some countries appear in both graphs if they set up a non-producing NOC prior to a producer NOC (or vice versa).

is more investment in the oil sector after establishing a producing NOC and there is likely to be greater efficiency in operations. If this were true, the data should indicate that production levels are higher upon establishing a producing NOC. The data should also show that this increase is higher when compared to establishing a non-producing NOC. Indeed, a first glance of the data reveals an interesting pattern supportive of this line of argument. In Figure 1.3, I plot each country's oil production levels before and after a producing NOC (top panel) or a non-producing NOC (bottom panel) is established, along with overall trend lines with 95% confidence bands. Whereas production levels gradually increase over time after a producing NOC is established (compared to the period prior to setting up a producing NOC), production levels initially increase but then decrease over time after a non-producing NOC is established. Holding oil prices constant, this pattern illustrates one reason why overall revenues are higher under the producer NOC framework compared to alternative institutional designs. In chapter four, I apply more rigorous techniques to find that this pattern still holds once other factors are accounted for.

1.5 Plan of the Dissertation

Before I outline the structure of the dissertation, a brief discussion of methods and research design is warranted. The primary empirical methodology used in this dissertation is statistical analysis. Specifically I employ Bayesian methods for the cross-national analyses in chapters two through four. In chapters two and four I use longitudinal (also known as panel or time-series cross-sectional) models, while in chapter three I use cross-sectional models due to the lack of longitudinal data to analyze trends over time. The Bayesian approach offers several advantages over the classical, so-called "frequentist" approach, but also carries with it several disadvantages. Bayesian modeling allows the researcher to make probability state-

ments about the data, rather than "confidence" statements such as the p-value, or "the probability of observing a test statistic as extreme or more extreme assuming the null hypothesis is true" (Weiss, 2012). Second, the Bayesian approach forces the researcher to state the model assumptions explicitly and to derive assumptions based on defensible knowledge about the data and the problem. Third, modern Bayesian tools allow the researcher to adapt models to data with small sample sizes without relying on strong "asymptotic" assumptions (a common pitfall of "frequentist" statistics). These advantages come at a cost, one that is particularly challenging for political science. Bayesian methods require the researcher to specify priors, preferably informative priors based on scientific knowledge or expert elicitation. This can be problematic when the information collected for specifying a prior is not independent of the data being analyzed, a common drawback using observational data in political science. A full discussion of these advantages and disadvantages is outside the scope of this dissertation, but it is important to note that there is no one "best" model or "best" approach. As such, throughout the dissertation I will be analyzing the data using multiple approaches and models to show convincingly that the patterns we theoretically expect to find are robust to different specifications. Importantly, all of the substantive findings in the dissertation estimated using Bayesian methods are robust to the use of classical, "frequentist" methods such as maximum likelihood estimation.

I begin in chapter two by analyzing the determinants of nationalization. Here I look at the formation of the 61 NOCs around the world listed in Table 1.3. To preview the results, I find that three factors are influential in the timing of nationalization: oil prices, political institutions – namely institutional constraints on the executive office – and cross-country diffusion (Kobrin, 1985) predict nationalization. I also suggest that nationalization is more likely when revenue is perceived to be shared unfairly between the host government and the producing company and/or representative government. In these contexts either the public, the elite,

or both, pressure the government to reconsider the institutional arrangement of how its oil is extracted and managed. This "resource nationalism" (Stevens, 2008; Vivoda, 2009) leads either to contract re-negotiations or outright nationalization. The formation of NOCs is thus a product of domestic institutions, international politics, and global market forces, but importantly, resource nationalism plays a role.

To illustrate the argument, I use statistical analysis to determine the relevant factors for all oil nationalizations since 1900. To this end I employ Bayesian analysis informed with interview-based data from oil consultants to test and confirm leading theories of state revenue-maximization as the primary determinant of expropriation. In addition, I compare the cases of Saudi Arabia and Iran in the 1940s to show how resource nationalism led to Mohammad Mosadegh's ill-fated nationalization in Iran in 1951 but led only to contract re-negotiations with American-led Aramco in Saudi Arabia in 1950.

In chapter three, I turn to the consequences of nationalization and the different institutional pathways states take in managing their petroleum sectors. Here I analyze the role of NOCs in the process of extortion and corrupt behavior in the oil sector. I argue not only that institutions matter for corruption – a long-held view in political economy (Rose-Ackerman, 1975; Shleifer and Vishny, 1993) – but also why they matter: when procurement contracts are awarded by national oil companies instead of government ministries, there are greater opportunities and incentives for state officials to extort bribes from private firms. This chapter highlights the conditionality of the resource curse, that oil wealth does not necessarily lead to higher corruption, but only in cases where the institutional pathways incentivize corrupt behavior.

To support my argument, I again use evidence from statistical analysis of cross-national data. To quantify corruption in the oil sector, I develop a new measure using court transcripts from the US Department of Justice and Securities

and Exchange Commission in prosecutions of violations of the Foreign Corrupt Practices Act (FCPA). Using these data I identify 337 oil-related FCPA violations in 39 oil-producing countries to construct a country-level corruption measure that captures the incidence of extortion specific to the petroleum sector. I find that corruption is higher in countries that have NOCs with regulatory powers, which include the two categories of regulator NOC and integrated NOC described in the previous section.

In chapter four, I examine two further consequences of oil nationalizations: states that have NOCs with production capacity will have greater government revenues from the sale of oil, and therefore, greater regime stability than states without NOCs or with non-producing NOCs. While the second finding of this chapter will seem intuitive to the reader – higher government revenues translate to more stability (Levi, 1989) especially when these revenues come from non-tax sources (Morrison, 2015) – the first finding will seem paradoxical, particularly to readers familiar with the classical economics literature on the consequences of state intervention (Stigler, 1971; Buchanan, Tollison and Tullock, 1980; Hartley and Medlock, 2008). Any institutional design involving state intervention should lead to *lower* revenues, especially in the long run, given the operational inefficiencies of state-owned enterprises. The share of revenue captured by the state may increase upon nationalization, but the overall amount of revenues collected should gradually fall over time. Ultimately, I argue that by increasing state revenues from oil – and thereby providing pathways for elite cooptation and patronage without resorting to increased income taxation – the decision to go down the institutional pathway of NOCs with production capacity ultimately helps a regime to endure.

To illustrate the final empirical argument of the dissertation, I continue the methodological approach taken in the previous chapters by using evidence in the form of longitudinal statistical analysis of observational data. Here I apply the NOC categorization into producing (producer NOC and integrated NOC) vs. non-

producing (hollow NOC and regulator NOC). I combine this measure with new data on government collection of oil revenue that is assembled from data on government revenues (Prichard, Cobham and Goodall, 2014) and data on oil income per capita (Ross, 2012). To show that governments are more durable after nationalizing oil assets and after establishing producing NOCs, I then analyze data on regime stability from the Geddes, Wright and Frantz (2014) and Marshall, Jaggers and Gurr (2011) (Polity IV) databases on political regimes.

In chapter five, I conclude the dissertation with a summary of my findings, a discussion of the implications of these findings, and a host of avenues for further research. In the chapters that follow this introduction, I provide theoretical foundations and empirical evidence of why countries nationalize and how different characteristics of national oil company governance can lead to different political outcomes. Namely, I show that on average, regimes that have nationalized their hydrocarbon industries survive longer than those that maintain a tax-and-royalty system on private oil companies. In authoritarian systems in particular, this effect is quite pronounced – autocrats who nationalize the oil industry are less likely to democratize than leaders who do not nationalize. In the oil industry, the decision to expropriate is a complex combination of domestic political factors and international market forces. The consequences are no less complex in how nationalization affects governance. But one clear pattern emerges from my analysis: the institutional pathway a state chooses to manage its petroleum resources has profound implications for corruption, fiscal success, and ultimately, the stability of the regime in power.

One could argue that this dissertation is simply showing that leaders are revenue-maximizing agents who use their resources to stay in power as long as possible. That is, leaders choose the institutions that increase state revenues, and then use these revenues to stay in power. This would certainly not be a revolutionary finding in the field of comparative politics. Indeed, as Haber and

Menaldo (2011) reiterate, "the resource curse literature claims that the causal mechanism that links natural resources to regime types is the rents captured by governments from oil, gas, and mineral production, which allow them to become 'rentier states' that are financed without taxing citizens" (Haber and Menaldo, 2011, 4). Yet, it is a claim that heretofore has been difficult to prove within the context of resource-rich regimes, represented by the fact that the debate about the political components of the resource curse is ongoing and remains disputed (Dunning, 2008; Haber and Menaldo, 2011; Ross, 2012; Morrison, 2015). What this dissertation aims to accomplish – in addition to explaining the determinants and consequences of nationalization – is to provide convincing evidence that indeed natural resources can corrupt and prolong regimes, but primarily through different channels of nationalization and the abundance of state revenues such ownership structures provide.

CHAPTER 2

Why do leaders nationalize the oil industry?

[*An article-length version of this chapter has been published as Mahdavi (2014b).*]

2.1 Introduction

On April 14th, 2012, the president of Spanish private oil company Repsol awoke to the news that his company's 57% stake in Argentina's YPF-Repsol had been forcibly reduced to a mere 6% holding. Citing the Spanish company's failure to keep oil profits within the country, Argentinian president Cristina Fernandez de Kirchner had expropriated Repsol's share to establish a 51% state ownership in YPF. After 20 years of private ownership, Kirchner re-nationalized the country's oil industry and made YPF once again a national oil company (NOC).[1] In Russia, sometimes-premier, sometimes-president Vladimir Putin pressed for state control of the "commanding heights" of the economy as early as 1999, when he published an article in the St. Petersburg Mining Institute journal on "'Mineral Natural Resources." Putin's central premise was that "these resources," meaning oil and gas, "had to be under the aegis or direct control of the state" (quoted in Yergin (2012, 37)). The OPEC charter and indeed one of OPEC's founding philosophies stresses that its members "take assets from foreign occupiers." Though these kinds of nationalization are rare events – occurring only 55 times since the 1930s – the impacts of state expropriation are game-changing in both international markets

[1]The nationalization was announced in a bill titled "On Argentina's Hydrocarbon Sovereignty," accessed here:
http://www.presidencia.gov.ar/images/stories/proyecto3-12_4versionfinal.pdf

and the domestic political environment. In this chapter, I provide insight on the determinants of these events to answer the question, why do leaders nationalize the oil industry?

Oil nationalizations have occurred at some point in time in almost every major oil producer in the world and in the majority of minor oil producers. While some states nationalized early in the 20th century, some waited until the early period of the 21st century, but the vast majority of nationalizations occurred in the 1970s (Guriev, Kolotilin and Sonin, 2011; Victor, Hults and Thurber, 2012). What accounts for this pattern? Why did governments choose to nationalize their oil sectors, and why did so many nationalize in the 1970s?

Using both statistical analysis of historical nationalizations and a quantitative case comparison, I show in this chapter that the decision to nationalize is motivated by state revenue maximization, risk of international retaliation, and resource nationalism. While researchers have put forth a handful of theories on why leaders expropriate the oil industry (see Victor (2013) for a review), there exists no comprehensive assessment of political and economic factors of oil nationalization in the context of domestic perceptions and international risks. Some provide strong theoretical frameworks for the economic underpinnings of expropriation (Chang, Hevia and Loayza, 2010; Guriev, Kolotilin and Sonin, 2011), while others expound on domestic political factors in the formation of ownership structure in the oil sector (Luong and Weinthal, 2010; Warshaw, 2012). But current scholarly work has yet to incorporate a systematic discussion of the cost-benefit structure of nationalizations which takes into account resource nationalism and fears of foreign intervention.

In this chapter, I make three contributions to the extant literature. First, an often omitted factor in the empirical analysis of oil nationalization is the diffusion effect (Kobrin, 1985; Vernon, 1971). That is, the cost of nationalization in a given country is substantially reduced the more that other countries nationalize.

Stephen Kobrin termed this phenomenon "the domino effect" of nationalization. While the theoretical implications of Kobrin's work have not been subjected to statistical analysis except by Kobrin himself – who was able to provide support for a "cumulative" or wave effect in the 1970-1984 period – other scholars have discussed the contagion effect of nationalizations (Adelman, 1993; Guriev, Kolotilin and Sonin, 2011; Warshaw, 2012). Here, I extend this analysis to a broader timeframe to confirm that diffusion is a strong predictor of nationalization. Based on these findings, I conclude that nationalization is substantially more likely to occur after a first-mover has reduced the risk of international retaliation and paved the way for further nationalizations – a phenomenon that occurred both in the early 1970s and the early 1990s.

Second, I hypothesize that a state's perceptions of "unfairness" in how profits are shared between host and operating countries influences the likelihood of nationalization. When a leader perceives that her share of oil profits is lower than the share taken home by the foreign operating company's government, this prompts government and public sentiments of resource nationalism and provides motivation for nationalization to eliminate the profit-sharing gap. These perceptions of unfairness are difficult to test cross-nationally due to constraints in data availability, so I show this effect both by employing a proxy variable in the longitudinal analysis and by analyzing a case comparison of Iran and Saudi Arabia. Whereas the ratio of profits shared between Iran and the UK was consistently in favor of the UK in early years of production (1930-1950), the profit-sharing ratio between Saudi Arabia and the US was nearly equal in the same period. Not surprisingly, Iran nationalized the oil industry in 1951, while Saudi Arabia waited until 1974 to nationalize and until 1980 to fully expropriate its oil sector (and was the last OPEC member to nationalize[2]). This explanation, I argue, helps to understand cases where current models get the prediction of nationalization

[2]This excludes Gabon, which joined OPEC in 1975 and nationalized in 1979, and left OPEC in 1995.

wrong: Iran nationalized during a time of low oil prices and during an era with relatively (among non-democracies) high executive constraints, both of which are factors predicting a low probability of nationalization.

Third, this chapter also provides a methodological contribution to the existing literature on resource nationalization. Because the decision to nationalize is tested in the context of longitudinal data with a discrete outcome – a leader either nationalizes or not in a given country in a given year – researchers typically use either ordinary least squares or maximum likelihood regression techniques including unit fixed effects to account for country-specific potentially omitted factors. As I discuss in greater detail in the pages that follow, the application of these methods to these data is problematic and can give inconsistent and, in the case of maximum likelihood regression, biased estimates. As such, I operate within a Bayesian estimation framework to mitigate these concerns. As this method necessitates prior distributions for the parameters to be estimated, I combine expert interviews and previous scholarly findings to estimate informative priors for the analysis. To my knowledge, this is the first application of Bayesian methods to questions of resource nationalization.

The findings of this chapter speak to the complexity of a leader's decision to nationalize the oil sector. With many moving parts to this decision, it is difficult to pin down any one explanation for nationalization. The goal of this chapter is to augment our understanding of such events by providing two additional factors – resource nationalism and the diffusion effect – that help to improve the predictive accuracy of arguments for why leaders nationalize. In the sections that follow, I begin with a presentation of the puzzle in theoretical context. I then formulate hypotheses and discuss the methods and data I use to test them. The subsequent sections include empirical results from a statistical analysis first and a case comparison of Iran and Saudi Arabia second. Lastly, I conclude with a discussion of the contribution of this chapter along with implications for the later chapters of

this dissertation.

2.2 What factors determine oil nationalization?

A leader's decision to nationalize the oil industry is inherently based on a delicate cost-benefit analysis.[3] A leader must maximize his expected utility from nationalization while considering the potential benefits to state ownership and avoiding the potential costs of expropriation.

The primary benefit to nationalization is a short- to medium-term increase in the state's take of revenues from the sale of oil (Victor, Hults and Thurber, 2012; Victor, 2013; Wolf, 2009). This is a topic which I revisit in greater detail in chapter four where I show that oil revenues are higher after establishing a NOC, even after controlling for prices, production, and other country-specific factors. Other benefits include direct oversight of operations and production decisions, and control over lucrative state-owned enterprise management positions to use as tools of patronage (Nolan and Thurber, 2010).

By expropriating foreign assets, the state not only gains by controlling new hard assets (e.g. rigs, pipelines, and drilling equipment), but more importantly increases the share of profits collected by the treasury from the oil industry (Marcel, 2006; Stevens, 2007). Rather than having to split profits with a foreign company or government, the state *can* collect 100% of revenues – not just profits – from the sale of oil via the NOC and decide how best to reinvest this money back to the company, thus implicitly forcing the NOC to take a negative rate of return. More often than solely relying on the NOC, states such as Algeria, Brazil, and the UAE have chosen to employ operators for production alongside the NOC that are facilitated through profit-sharing agreements and joint ventures (McPherson,

[3]Though I use the term "leader" here referring to an individual political agent, the concept applies equally to consensus-based decisions to nationalize such as those by a parliament, junta, oligarchy, etc.

2010; Sarbu, 2014). In the realm of oil nationalizations, this framework is adopted by Guriev, Kolotilin and Sonin (2011) to show that leaders nationalize the oil industry when petroleum prices are high as this maximizes the short-term revenues from expropriation and outweighs the potential costs of nationalization.

An additional benefit to nationalization is satisfying domestic sentiments of "resource nationalism." This refers to the public's perceived "lost profits" from the perspective of the state vis-a-vis private oil operators (Bremmer and Johnston, 2009; Tordo, Tracy and Arfaa, 2011; Vivoda, 2009). More specifically, a leader may feel "cheated" by private operators of her fair share of oil profits if she sees private companies benefiting more from oil production than they are entitled to. In other words, if the state perceives its share of oil profits to be low relative to the operators' share, the state may see the difference in profits as the opportunity cost of maintaining a private ownership structure.

When private operators are foreign-owned in particular, xenophobic feelings arise that foreigners are "stealing" a country's oil, which leaders and the public feel is the sovereign right of an independent nation. Referring to the period prior to expropriation, scholars use nationalistic quotations from political leaders such as "it's our oil," "the oil belongs to the people," and "driving out the foreign devils" (Karl, 1997; Yergin, 1991). If there exists a noticeable gap between what the state treasury collects from oil profits and what foreign operators collect, this could influence the decision to nationalize. Though this is itself a form of revenue maximization, it is a combination of resource nationalism and maximizing state revenues. As Vlado Vivoda has noted, "it is natural that during a period of high prices the phenomenon of resource nationalism comes to the surface, as it is a by-product of high prices" (Vivoda, 2009, 518).

Research by Manzano and Monaldi (2009) similarly finds that high oil prices induce pressure to renegotiate fiscal contracts. Because of the lack of price contingencies in many existing contracts, high oil prices translate to disproportionately

higher operator-retained revenues compared to what is allocated to the state. This imbalance, the authors argue, can stoke grievances over revenue-sharing that result in contract renegotiation in the form of increasing taxes and royalties to outright nationalization of assets.

Though it has not been tested empirically, this notion of resource nationalism — specifically, public perceptions of unfairness in how resource revenues are divided between foreign operators and the host state — has been recognized by existing scholarly work in the context of oil nationalizations. Building off of Manzano and Monaldi (2009), Berrios, Marak and Morgenstern (2011) recognize resource nationalism as one of the mechanisms behind their explanation for the political Left's expropriation of oil and gas in Latin America. Solberg (1979) and Smith (2007) cite resource nationalism as potential factors in the nationalizations of Argentina and Iran, respectively. Singh (1989) and Stevens (2008) note the cyclical patterns of resource nationalism, not just in the oil and gas sector, but also in metals such as copper, iron and steel. Similarly, Kretzschmar, Kirchner and Sharifzyanova (2010) identify resource nationalism as the reason for limited foreign investment after a nationalization due to strong elements of xenophobia and mistrust.

The costs of nationalizing the oil sector are more complex. The most straightforward cost is the expected loss of efficiency when switching from a privately run oil company to a state-run firm (Hartley and Medlock, 2008), though this may be reduced in the long run by improving NOC efficiency (Victor, Hults and Thurber, 2012) or by establishing producer NOCs as I discuss in chapter four. A more dangerous cost is the loss of oil exports due to international retaliation, as foreign governments may enforce an oil embargo on the nationalizing country. Such was the case after Mexico's nationalization in 1938 and Iran's nationalization in 1951. Lesser sanctions may be enacted by the international community following nationalization, such as trade and financial sanctions, which were considered by

Spain and the EU after nationalization of Repsol in Argentina in 2012.

As I highlighted in the introduction section, work in the 1980s by Stephen Kobrin highlighted the so-called "diffusion effect" of nationalizations in other countries affecting the probability of nationalization in a given country (Kobrin, 1984, 1985). Consider that in December 1936, the Bolivian state nationalized Standard Oil's assets to form the national oil company Yacimientos Petroliferos Fiscales Bolivianos (YPFB). Two years later, Brazil's dictator Getulio Vargas proposed a new government agency with "extensive powers over all sections of the oil industry," an agency which was formally established in 1938 and early 1939 as the country's national oil company, the CNP (Philip, 1982, 230). These two events are not independent of one another: indeed, Vargas' energy commission directly cited the establishment of Bolivia's YPFB and Argentina's YPF (formed in 1911) as examples to be followed (Cohn, 1968). One explanation for this pattern is that the diffusion effect of nationalizations could simply be a "copycat" effect, whereby countries nationalize the industry to emulate the ownership structure of perceived "pioneer" countries, similar to patterns of "copycat entrepeneurship" among small to medium sized enterprises (Philip, 2002).

In minimizing the costs of nationalization, leaders must also take into account the constraints of expropriation given domestic politics and the institutional environment. Pioneering work by Luong and Weinthal (2010) considers institutional constraints on expropriation: countries with strong political institutions will find it harder to expropriate without incurring large and possibly disastrous political costs. On the other hand, countries with either weak institutions or institutional settings that favor state control will find it easier to nationalize.

Guriev, Kolotilin and Sonin (2011) similarly characterize strong institutions as impediments to expropriation, and suggest that executive constraints — checks and balances on the executive branch of government — increase the costs of nationalization. In non-democratic systems in particular, weak or non-existent par-

liaments or other veto points may allow a leader to nationalize the oil industry with little political opposition, though this might have long-term costs in the form of diminished foreign investment (Tsebelis, 2002; Henisz, 2004). Indeed, Wilson and Wright (Forthcoming) suggest that having a functioning legislative body in a non-personalist dictatorship may diminish the risk of expropriation and increase investor confidence, though this pattern does not seem to hold in personalist dictatorships. In general, elites may have the ability to influence dictators and monarchs to press for nationalizations in a way not possible in democracies (Gandhi, 2008).

Executive constraints may also reduce the probability of nationalization by decreasing the leader's share of rents resulting from expropriation (Warshaw, 2012). Compared to a personalist dictatorship or monarchical regime, a leader in a power-sharing position must divide these rents among other high-ranking elites, as in a single-party dominant autocracy such as the USSR or pre-1994 Mexico, or in the case of democracy, among other government branches and bureaucracies.

Before turning to a discussion of testable hypotheses, it is important to note exactly how rents from the sale of oil are allocated to the government. Even in states with nationalized sectors, there are a variety of rent allocation options. A government can collect rents directly from its NOC or from IOCs making payments via the NOC on royalties, license fees, acreage fees, dividends (from joint ventures), income taxes, bonus payments, or what are sometimes called "special profits taxes." A government can also collect rents indirectly either from its NOC or from IOCs through profit oil (typically from production-sharing contracts), infrastructure projects, or social/training funds (McPherson, 2010; Sarbu, 2014). Centralizing rent allocation through a government-owned entity is often stated as a justification for creating a NOC in the aims of narrowing the technical knowledge gap between state and operator (on this point, see Stevens (2008)). Similarly, Warshaw (2012) cites closing the information asymmetry gap as one

factor in why governments nationalize the oil sector. This is often referenced to the broader Principal-Agent Theory whereby state intervention is presumed to reduce the information asymmetries between governments and market operators.[4]

Taken together, these costs and benefits suggest specific factors at play in a leader's decision when and whether to nationalize the oil industry. I offer four testable hypotheses based on observable implications from the theoretical determinants discussed above. I begin by re-framing the question of why leaders nationalize the oil industry into statements that capture the likelihood of oil nationalization based on a given factor or set of factors.

If leaders are revenue maximizers, then the timing of nationalization should occur in or after moments when the financial return to doing so is at its peak. When global oil prices are high, then oil revenues are high (assuming constant or increasing production). Further, nationalizing when the short-term gains are at high levels outweighs the potential financial costs of nationalization – notably inefficiency and retaliation. If this is true, then I should observe the following from the data:

H_1 *Oil nationalization is more likely when oil prices are high than when prices are low.*

Vernon (1971) and Kobrin (1985) suggest that first-movers can defray the probability of retaliation for followers. Here the notion of first-movers is relaxed somewhat to refer to the sum of nationalizers occurring in a previous period with respect to a given country that has not yet nationalized. This probability decreases with the number of countries that nationalize in this prior period. For instance, if six countries nationalize in a given year (t), this reduces the retaliation probability

[4]For a review of principal-agency theory in the context of energy markets, see Nikogosian and Veith (2012). See also the discussion in chapter one and chapter four regarding NOCs and reducing information asymmetries.

in the following year $(t+1)$ more than if only two countries nationalize.[5] This leads to hypothesis two:

H_2 *Oil nationalization is more likely when others nationalize than when there are no nationalizations in the prior years or in neighboring states.*

A third factor is resource nationalism:

H_3 *Oil nationalization is more likely when there is perceived unfairness in revenue-sharing between host government and operating company.*

The resource nationalism hypothesis follows from the notion that nationalization is a function of the perception of fairness by the producing country with respect to the operating company's take-home share of resource revenues. Thus nationalization is more likely when there are perceptions of *unfairness* with regards to how oil revenues are shared between host and operator. Yet these perceptions are latent characteristics and by nature unobservable.[6] As such, an observable implication of this hypothesis is that nationalization is more likely as the gap between state and foreign/private revenue collection increases.

Absent data on how oil revenues are divided, a second observable implication is that states joining OPEC are more likely to nationalize. But why should OPEC membership matter? OPEC was founded in September 1960 on principles of revenue fairness as manifested through price control — its mission is "to unify petroleum policies among Member Countries in order to secure fair and stable prices for petroleum producers"[7] — and xenophobic ideologies with respect to

[5] In Tables 2.7 and 2.8 in the Appendix, I test lag times longer than one-year $(t+k > t+1)$, as well as test models with cumulative effects over the course of multiple years. See footnote 8 for further discussion of these results.

[6] In theory, survey methods could be applied to measure public perceptions of revenue-sharing fairness in the years preceding nationalization, though it still could be argued that elites are driving public opinion to believe in "perceived unfairness" when some other factor is at the core of the decision to nationalize.

[7] OPEC. (n.d.). "Brief History." Accessed 4 August, 2014, from http://www.opec.org/opec_web/en/about_us/24.htm.

operating companies backed by Western governments (Park, Abolfathi and Ward, 1976). Yes, the determinants of joining OPEC are likely endogeneous to other determinants of nationalization, namely autocratic government, a long history of oil production, and generally high levels of oil exports. However, these factors should be considered necessary but not sufficient determinants of OPEC membership given the absence of major autocratic producers in the 1960s and 1970s such as the Soviet Union, Mexico, and Malaysia. In the absence of data on revenue-sharing, OPEC membership is a proxy, albeit one with measurement error, for countries with resource nationalistic tendencies and revenue-maximization ideals.

Lastly, I revisit the claim that political institutions matter in the timing of nationalization:

***H*$_4$** *Oil nationalization is more likely when political institutional quality is weak than in states with strong political institutions.*

Luong and Weinthal (2010) and Guriev, Kolotilin and Sonin (2011) show that leaders with more executive constraints find it harder to expropriate private assets for fear of domestic backlash. With increasing numbers of institutional veto points a leader will find it difficult to push nationalization through the requisite legislative and judicial channels (Henisz, 2000; Wilson and Wright, Forthcoming). Alternatively, Warshaw (2012) contends that executive constraints can limit a leader's consumption of rents by virtue of having to share rents from expropriation with power-sharing elites. On the other hand, leaders with few constraints can nationalize without overcoming institutional roadblocks. Thus we should expect nationalization to be more likely in authoritarian states than in democratic states. However, the empirical tests conducted here do not discern between which mechanisms drive the resulting relationship between institutional quality and nationalization.

2.3 Data, methods, and research design

2.3.1 Data

The outcome of interest is the probability of nationalization in a given country in a given year. Following my discussion in chapter one, I measure nationalization as a binary variable according to whether or not a state establishes a majority-state-owned NOC of any kind – or to restate the typology described in chapter one, the NOC can be either a hollow NOC, regulator NOC, producer NOC, or integrated NOC. All years prior to NOC establishment are coded zero; the year of nationalization is coded one. For all years after nationalization, the country is removed from the data given that nationalization as defined here cannot occur twice in the same country, unless a state privatizes a previously nationalized oil industry.

Consider the example of Canada, which nationalized oil in 1975 upon the establishment of Petro-Canada based on existing assets held by the private companies Panarctic and Syncrude. In 1995, under the premiership of Brian Mulroney, Petro-Canada was privatized, with the government holding only a 19% share in the company (Grayson, 1981). Thus, Canada "exits" the data set after nationalization in 1975 but "re-enters" in 1996 upon privatization. After 1996, since it becomes logically possible for Canada to re-nationalize the oil industry, Canada remains in the data set with the nationalization measure set to zero.

In the statistical models that follow, I include covariates to capture the theoretical implications of different factors determining nationalization. The measure of oil price is a de-trended, residual price of oil, used to proxy for oil price shocks to observe long-term oil price cycles. A de-trended price is used for ease of interpretation and to reduce year-to-year noise in price changes. Calculated first by Pindyck (1999) and adapted by Guriev, Kolotilin and Sonin (2011), the formula for creating this residual is $\ln p_t = \alpha * \ln p_{t-1} + \beta_1 + \beta_2 * t + \beta_3 * t^2 + \epsilon_t$

where p_t is the price of oil at time t and p_{t-1} is the lagged price of oil, for each year $t \in [1945, 2005]$. The deviation from this price trend is the corresponding price shock, so we can estimate the shock by computing yearly residuals, ϵ_t. As a robustness check, the nominal oil price is used based on data from the British Petroleum *Statistical Review of Energy*.

To capture the diffusion effect, I use a count measure of nationalizations occurring in each year and then lag each by one year. For example, if in 1995 there were no nationalizations and in 1996 there were two nationalizations, the count measure in 1996 would simply be zero and in 1997 would be two.[8] I also include a variable for the count of previous nationalizations within the same region as a given country; for example, Iran's nationalization in 1951 would only be counted in the diffusion variable for other countries in the Middle East & North Africa for the year 1952.[9]

To test the resource nationalism hypothesis, I use two approaches. In the statistical analysis of nationalization, I use an OPEC dummy indicator for whether or not a country is a member of the cartel in a given year. In the two-country case comparison, I employ a more refined measure of the ratio of state oil revenues to foreign and/or private company oil revenues. Lastly, to measure political constraints and institutional strength, I employ the "Polity" index of democratic governance (Marshall, Jaggers and Gurr, 2011).

To control for geological factors in the decision to nationalize, two proxies for the oil production cycle are included in the empirical analysis. The first is a measure of a country's "oil history," or more specifically, a measure of how long a

[8]Results in Appendix Table 2.7 show that when using lags, there is little effect of diffusion beyond two years after a given nationalization. When looking at cumulative lags, presented in Appendix Table 2.8, the diffusion coefficient is positive and significant up to four years after a given nationalization (or set of nationalizations). The correlations decay over time, with the largest coefficient estimated with a one-year lag.

[9]Results from using this variable instead of the "global" diffusion variable are presented in Table 2.6, models 1–3. When including both the global and regional counts, I find a stronger correlation for regional diffusion, suggesting that the diffusion effect is largely driven by geographically proximate nationalizations.

country has been producing oil. This is measured simply as the number of years since first oil production. The second measure is one that captures growth in the production cycle. This is measured as the year-to-year growth in oil production, calculated using the reported oil production figures published cross-nationally by the United States Geological Survey. Nolan and Thurber (2010) argue that both measures should be positively correlated with increased probabilities of nationalization. Countries must deal with higher risks early in the production cycle and when production begins declining. Both reflect the inherent risks of exploration and risks associated with aging oil fields.[10]

To control for broad economic and political factors not covered in the theoretical discussion above, I add to the analysis a measure of economic development and political stability. The first is measured using the GDP per capita indicator, collected from the work of Maddison (2007) on global incomes. The second is measured using the Cheibub, Gandhi and Vreeland (2010) regime age indicator, which reflects the duration of the current governing regime.

The sample includes 62 oil-producing countries across the period 1945-2005.[11] Though the nationalization measure is coded beginning in 1900, the lack of data on covariates reduces the time frame of the multivariate analysis. However, this is not an egregious loss of data given there were so few nationalizations prior to 1945 (only eight occurred in the period 1900-1944). The selection of cases is determined by the universe of oil producers among all 175 sovereign states in the period with populations above 100,000. Defining "oil producer" as a state which

[10]In Appendix Table 2.6, I also include controls for an interactive effect between oil production levels and changes. Results from model 5 in particular suggest a positive correlation: there is a decline in nationalization probability when production is declining and overall levels of oil production are low. This scenario reflects two possibilities: (1) declining production in a typically small producer, such as the case in post-1980 Bahrain or post-1990 Austria, or (2) declining production in a once-major producer whose production levels have declined significantly over time, such as the case in post-1991 Indonesia or post-1995 Gabon (both were former members of OPEC).

[11]In future work, I will update the dataset to include the nationalizations occurring in 2006-2015. Refer to Table 1.3 in chapter one for a list of the timing and location of these NOCs.

at any point in time produces more than 1000 tonnes of oil per year (or about 20 barrels per day), 62 of these 175 states qualify as oil producers.[12] To put the figures into context, 1000 metric tonnes of production could supply the Maldives with enough oil for one day.[13]

2.3.2 Empirical methods

Hypotheses are tested using longitudinal statistical analysis of cross-sectional time-series data on oil nationalizations. The decision to nationalize in a given country in a given year is treated as a dichotomous variable which is a function of country-level and time-specific covariates. The first two hypotheses are temporal in nature; inference is made via within-country analysis over time. The second two hypotheses are both temporal and spatial in nature; inference is made via between-country and within-country analysis over time. Though I am unable to make strong causal inferences with this research design, the identification strategy for each hypothesis relies on capturing within-country variation over time augmented with techniques for statistical control.

It is unrealistic to control for all possible determinants of nationalization, particularly country-specific factors. The typical solution to this problem in political economy studies is to add country dummy variables or, as they are better known, country fixed effects. This paper takes a different approach to the MLE unit fixed effects problem.[14] Here, I employ Bayesian methods with Markov Chain

[12]For comparison, the median production level among producers is 1.2 *million* tonnes per year. Changing the threshold to any state producing more than 0 tonnes/year adds nine cases for a total of 71; changing the threshold to 10,000 tonnes/year drops ten cases for a total of 52.

[13]Based on EIA estimates of international oil consumption in 2012. The Maldives consumed 7,311 barrels per day, or equivalently 997 metric tonnes of oil per day.

[14]Adding country fixed effects to longitudinal analysis with a dichotomous variable is subject to inconsistent estimates due to poor convergence of maximum likelihood methods (Weiss, 2005). Further, Greene has shown that even the commonly-held belief that probit regression is robust to unit fixed effects is incorrect in finite samples. One solution to this problem is to apply linear ordinary least squares models to these fundamentally non-linear data given that the OLS estimator is unbiased and consistent in finite samples (Heckman and Jr., 1977). This is the approach taken by Guriev, Kolotilin and Sonin (2011) in analyzing the determinants of acts of

Monte Carlo estimation of a conventional logistic regression model. To account for country-specific factors, instead of adding country dummy variables I estimate country-specific intercepts in the form of a random variable with a standard normal distribution. I estimate a Bayesian hierarchical logistic regression model, though I also provide results from conventional logistic regression, hierarchical logistic regression, and the linear probability model with country fixed effects. The full model specification and information on Bayesian priors used for the analysis are presented in the Appendix.

2.4 Results

2.4.1 Statistical findings

Results from empirical analysis lend strong support for the revenue maximization, resource nationalism, and diffusion (international retaliation) hypotheses, and weak to modest support for the domestic constraints hypothesis. To aide in interpretation of model output, I present visual results in the form of added-variable plots and modeled probability plots. A full table of statistical results from the Bayesian analysis is presented in the Appendix in Table 2.4, along with Table 2.5 which shows results from non-Bayesian regressions.

Added-variable plots are shown in Figure 2.1 for the four variables of interest: oil price shock, regime index (Polity score), the OPEC dummy variable, and the number of nationalizations in the previous year (diffusion). Each plot shows the predictor of interest on the x-axis with the model-predicted probability of nationalization (conditional on the full set of controls) on the y-axis. The top

expropriation in the oil sector, and robustness checks using non-linear methods show similar substantive results. Yet the linear probability model, as the OLS estimator with a dichotomous outcome is known, suffers from improper bounding on the 0-1 interval of probabilities and implies heteroskedasticity of the residuals (Horrace and Oaxaca, 2006). Lastly, the Bayesian approach improves the interpretation of model results as compared to the OLS and maximum likelihood approaches (Gelman et al., 2013).

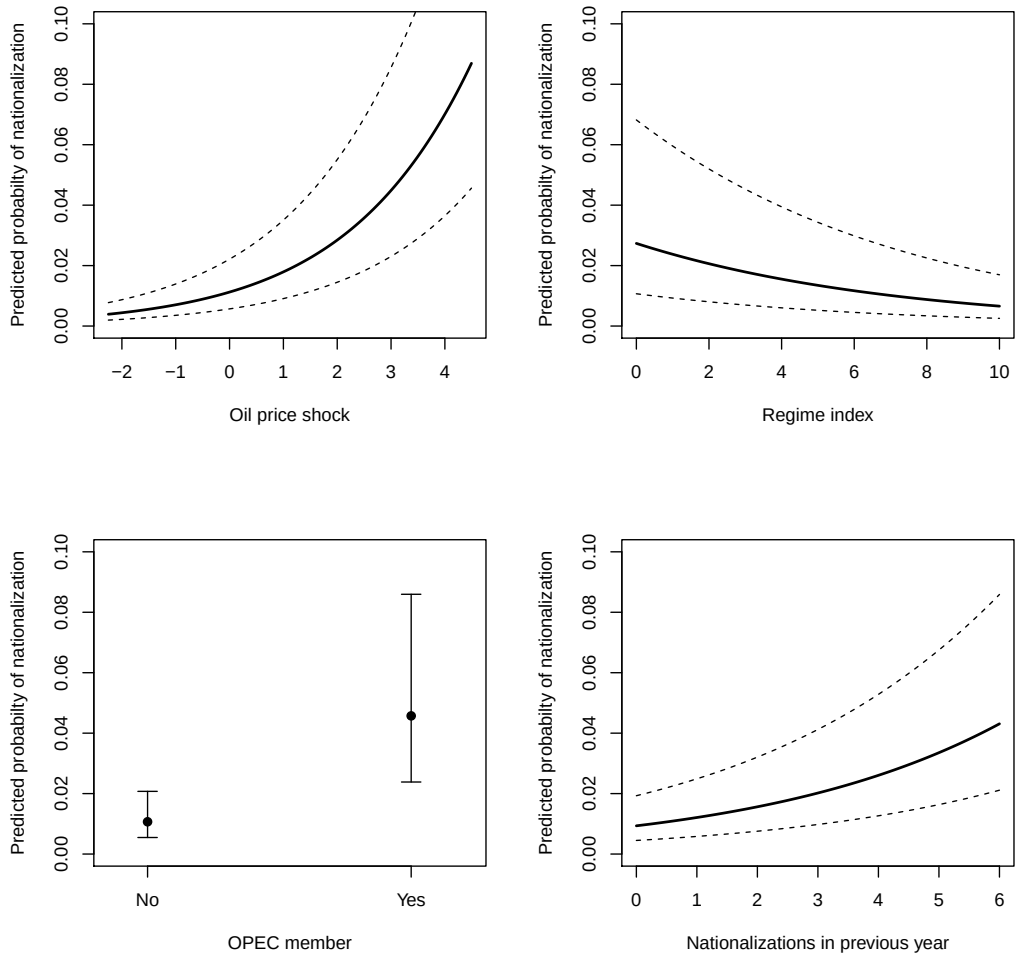
left plot shows the nationalization probability for a given country in a given year that is predicted by the model corresponding to changes in the oil price shock variable (measured in standard deviation units). With an oil price increase from the mean price across time (0) to a price 3 standard deviations above the mean, the predicted probability of nationalization increases from roughly 1% to 4%. The regime index partial regression plot shows the negative correlation between Polity scores and nationalization probability: as a country becomes more democratic, or more specifically, transitions from "full autocracy" to "full democracy" the predicted nationalization probability drops from 3% to less than 1%. As the OPEC dummy is a discrete predictor, the visualization of the "OPEC effect" is clear and easily interpreted: joining OPEC increases the nationalization probability from 1% to just less than 5%.

To better place the magnitude of these effects in context, I show scatterplots in Figure 2.2 of country-specific within-sample predicted probabilities for two periods of interest. The first is the change in predicted nationalization probability from 1959 to 1960, reflective of the formation of OPEC in 1960. If there were no change in predicted probabilities, then all countries would lie along the dotted line. This is generally the case, except for three of the 26 countries – Iraq, Saudi Arabia, and Venezuela – which are three of five the founding members of OPEC.[15] For these three states, the act of joining OPEC had a noticeable predicted effect on the probability of nationalization. For Iraq, the pre-OPEC nationalization probability is predicted to be 3%, which jumps three-fold to just under 10% the year Iraq joins OPEC.[16] Saudi Arabia, on the other hand, despite nearly tripling in probability

[15]There are only 26 cases plotted here instead of the full 61 due to the fact that 21 countries were not yet sovereign (independent) and 14 countries had already nationalized and thus removed from the sample post-nationalization. The other two founding members of OPEC had either already nationalized (Iran) or were not yet technically independent (Kuwait, which gained sovereignty from the UK in 1961).

[16]Iraq indeed nationalized its oil sector soon thereafter, when in 1961 the "Free Officers" led by Abd al-Karim Qasim passed Public Law 80 expropriating the privately-owned Iraq Petroleum Company and in 1964 established the Iraq National Oil Company (Alnasrawi, 2002).

Figure 2.1: Determinants of NOC formation: Model results from Bayesian analysis



Added-variable plots for logistic regression coefficients with 95% credible intervals for selected variables. Based on posterior estimates from the Bayesian hierarchical logistic model with informative priors. See results in Table 2.4 in the appendix for coefficient estimates.

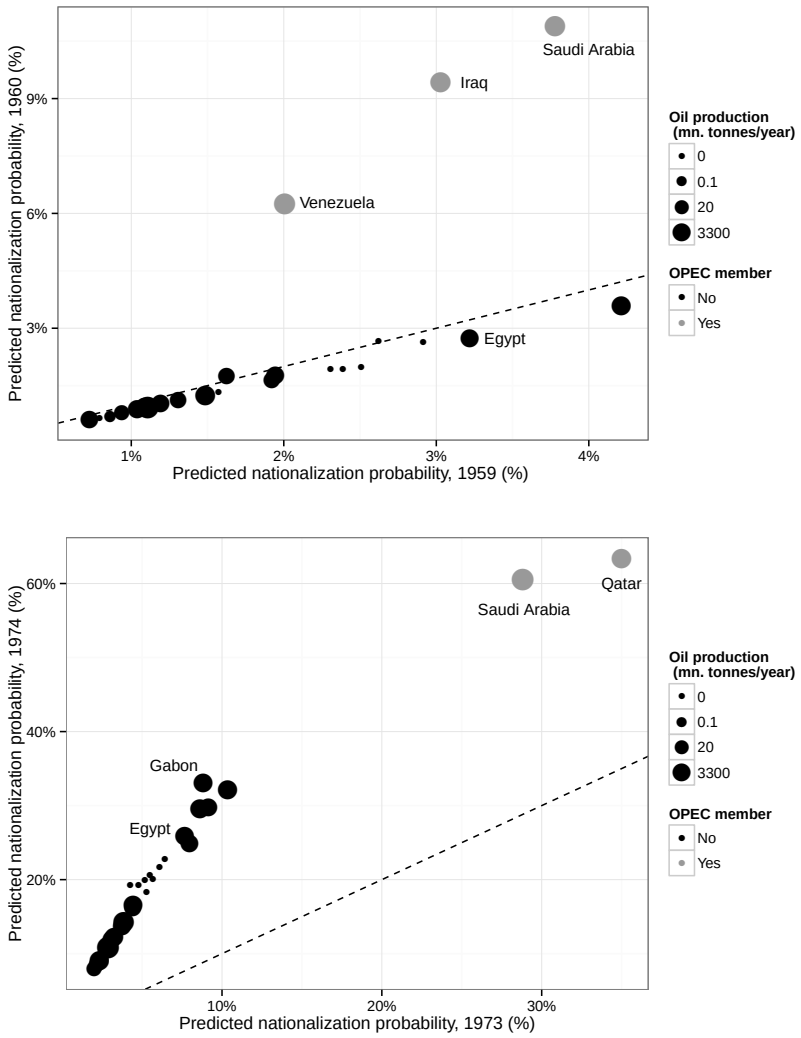
to nationalize after joining OPEC from 4% to 11%, did not nationalize until much later in 1974, with nationalization not complete until 1980.

The second two-year period of interest is 1973-74, shown in the bottom plot of predicted probabilities. This year-to-year change represents the increase in the price of oil following the 1973 Arab oil embargo when prices increased by 4.5 standard deviations, the highest one-year increase in the sample. With this price shift, the modeled nationalization probability increased for *all* 29 countries in the sample in that year, as indicated by the representation of all countries being above the dotted line. Gabon's predicted nationalization probability increases from roughly 9% in 1973 to 34% in 1974, while Qatar's probability increases from 35% to 62% (Qatar was also an OPEC member at the time). The highest predicted probabilities of the sample are estimated for the year 1974, indicative of substantively large coefficient estimates for the oil price shock and the OPEC dummy.

To assess predictive accuracy, I look at within-sample modeled outcomes compared to actual outcomes. This is accomplished by comparing the model's predictions over time for each country to its actual year of nationalization. Instead of plotting all 62 countries, I present six cases illustrative of the model's predictive strengths and weaknesses in Figure 2.3. For Canada, Malaysia, and Nigeria, the predicted probability of nationalization is indeed highest during the year of or before actual nationalization, which is represented in the plots by the dotted vertical line. Note that for all cases, predictions are absent during the years of a nationalized industry; for Canada, we see predicted values after nationalization due to the sector's privatization in 1995 (Grayson, 1981).[17] These cases represent instances of

[17]Privatization began as early as 1990, when the administration of PM Brian Mulroney (1984-1993) of the Progressive Conservative Party began its reform of the economic sector and announced privatization of Petro-Canada. In 1991, the government offered the first stage of public shares (30% of the company was privatized); and by 1995, the government had sold its majority shares and retained 19% of the company. Finally, in 2004, the government sold its remaining shares and in 2009, Petro-Canada merged with the private firm Suncor.

Figure 2.2: Year-to-year changes in predicted probability of NOC formation, 1959-60 and 1973-74



Year-to-year changes in predicted nationalization probability, based on posterior estimates from the Bayesian hierarchical logistic model including all control variables identified in the text. The dotted line represents the 45-degree line. Countries on the line reflect no year-to-year changes; countries above (below) the line reflect increased (decreased) predicted probability of nationalization. Size of points represents oil production (in millions of metric tons per year). Dark grey points are OPEC member countries; black points are all others.

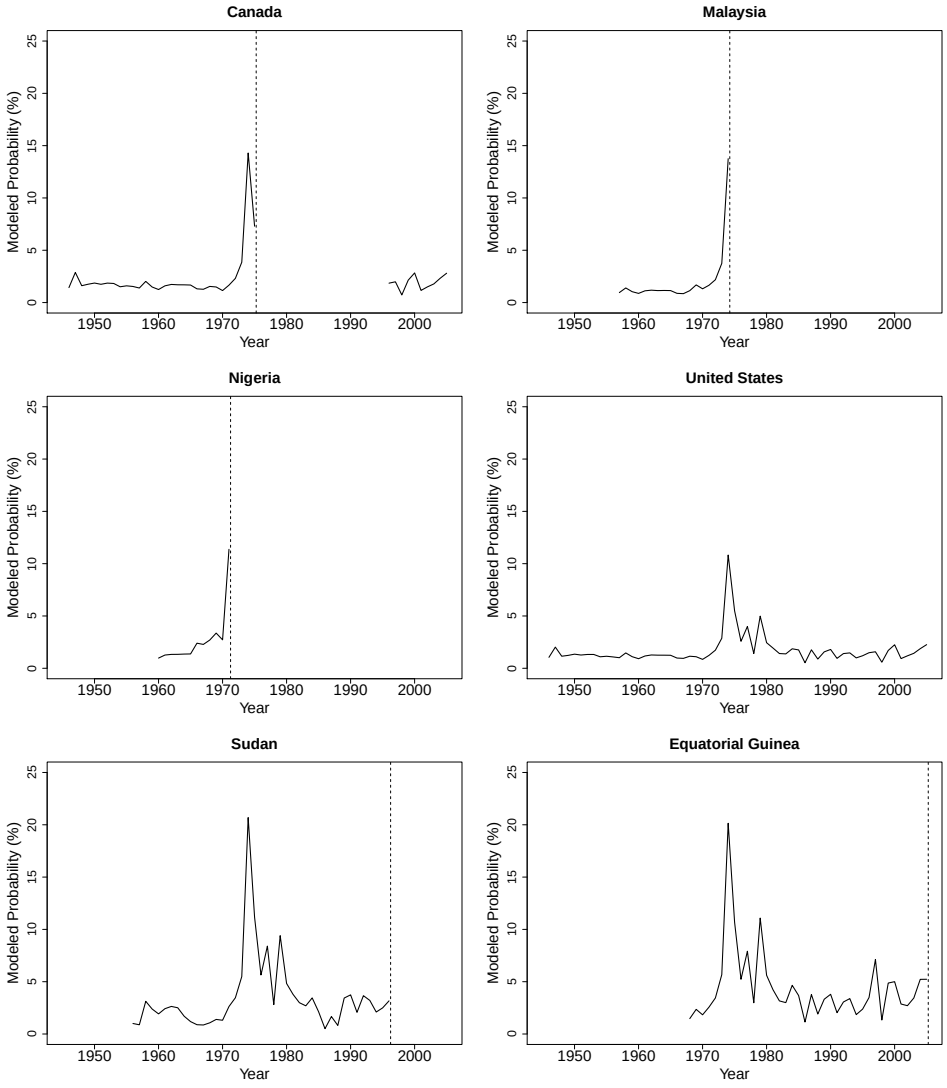
model predictions with relative accuracy of predicted vs. actual nationalization – note, however, that the magnitude of predictions (typically peaking at 20-30%) is relatively low due to the rare-event nature of nationalizations as discussed above.

For the United States, Sudan, and Equatorial Guinea, however, the model's predictions are noticeably weak. Sudan, for instance, is predicted to nationalize in the late 1970s when the model's predictions are at their highest levels (around 10%). Yet Sudan did not nationalize until much later, when in 1996 the government established Sudapet on the 15% expropriated stake of the Greater Nile Operating Company international consortium (Hansohm, 2007). Interestingly, Sudan's government pursued broad nationalizations in 1970s, expropriating assets in the agricultural, manufacturing, and financial sectors, yet did not nationalize the nascent oil industry. The United States never nationalized though the modeled probability of nationalization peaks at 10% in 1974.

Getting a sense of how the model predicts out-of-sample nationalizations is difficult given how rare nationalizations have been since 2005, the last year in the sample. However, there are two such cases of oil and gas nationalization for which I test the model's predictions: Bolivia (2006) and Uganda (2012). Based on the covariate characteristics of each country (GDP, years producing, oil price, etc.), the modeled probability for Bolivia is 4.80%, and for Uganda it is 0.28%. For Bolivia, while 4.80% may seem low, consider that the modeled probabilities for the previous two years (2004 and 2005) are 0.21% and 0.20%, respectively. The model clearly does not perform well for the Ugandan nationalization in 2012, though it should be noted that this new NOC plays almost no role in production and is merely a holding company for overseeing production-sharing agreements.[18]

[18] As of 2012, the state has approved the establishment of the Uganda National Oil Company to take a participatory role in production-sharing agreements with Tullow Oil, Total, and CNOOC. See Fred Ojambo (2014), "Uganda Draws Up Plan for National Oil Company to Steer Industry," *Bloomberg News* Jun 6, 2013. Retrieved May 13, 2014, from http://www.bloomberg.com/news/2013-06-06/uganda-draws-up-plan-for-national-oil-company-to-steer-industry.html.

Figure 2.3: Predicted probabilities of NOC formation for selected countries over time



Predictive probabilities of nationalization for selected countries based on posterior estimates from the Bayesian hierarchical logit model with informative priors. The dashed vertical line indicates actual year of oil nationalization.

Although these models include unit effects to capture the idiosyncracies of individual countries in the sample, predictive accuracy can still be reduced by potential omitted variables. One such factor is the economic ideology of political leaders, given that left-leaning governments are more likely than right-leaning governments to expropriate assets (Boix, 1997; Berrios, Marak and Morgenstern, 2011). Another potential omitted factor is a leader's time horizon: Warshaw (2012) speculates that leaders with longer time horizons might be less likely to nationalize given the long-run costs of expropriation via reduced productive efficiency. However, both factors are difficult to include in statistical analysis given the lack of reliable cross-national data on government ideology (especially in non-democratic governments and developing democracies) and on leader time horizons.

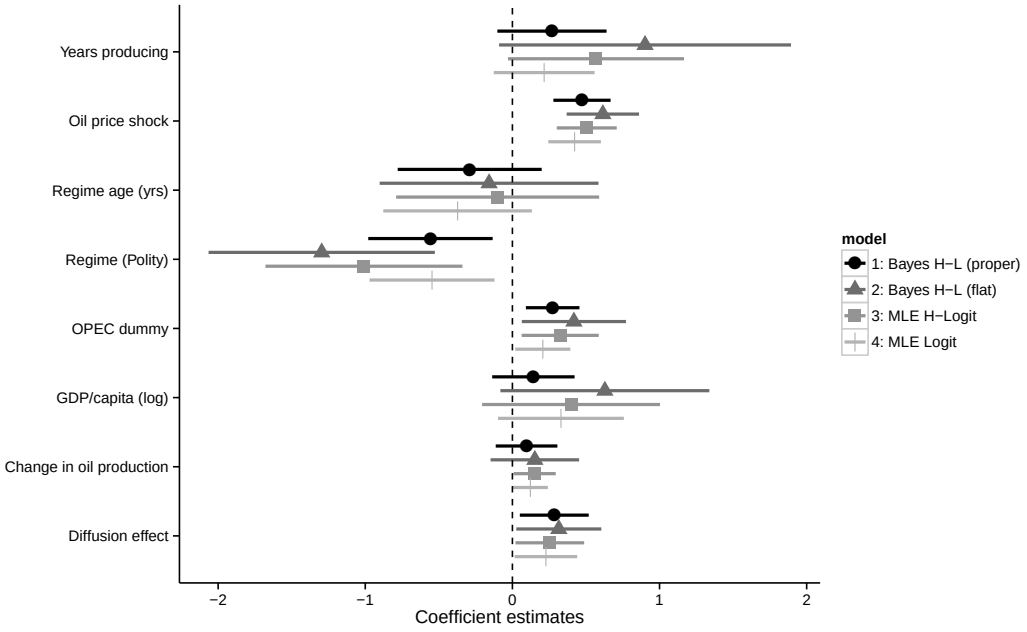
How do these results compare to those obtained using other model specifications? Does conducting a Bayesian analysis provide noticeably different point estimates? To answer these questions, I analyze the data using numerous model specifications and techniques,[19] the results from three of which are plotted in Figure 2.4.

In terms of direction, all models provide consistent coefficient estimates: negative estimates for regime; positive estimates for the oil price shock, OPEC dummy, and diffusion terms; and null estimates for all others. In terms of certainty, the Bayesian estimates are more precise, with smaller variance than the Bayesian model with flat priors and the maximum-likelihood estimation of the hierarchical logistic model.[20] The OLS linear probability model with and without unit fixed effects gives the same substantive results (shown in Table 2.5 in the appendix). The key message from these results, however, is that neither model specification

[19]Other models analyzed: pooled linear probability model (OLS), linear probability model with country fixed effects, maximum likelihood (MLE) logistic model with country fixed effects, MLE probit model with and without country fixed effects, Bayesian mixture model clustering by country and region, and a survival (Cox Proportional Hazards) model.

[20]This is simply a result of using more precise priors for estimation – even the quasi-informative priors have smaller prior variance than the typically used "flat" priors with mean 0 and standard deviation 1000.

Figure 2.4: Determinants of NOC formation: Alternative model specifications



Logit coefficient estimates with 95% confidence/probability intervals for four model specifications. The top (circle) in each grouping is the Bayesian Hierarchial Logit model with informative or "proper" priors, as discussed in the text. The second (triangle) is the Bayesian Hierarchial Logit model with non-informative or "flat" priors. The third (square) is the Maximum Likelihood Hierarchial Logit model. The bottom is the Maximum Likelihood conventional Logit model.

nor prior selection substantively alters the findings of the study.

Taken together, the empirical analyses presented here lend support to hypotheses that the likelihood of nationalization increases (1) with the price of oil, (2) when states join OPEC, (3) when other states nationalize in the previous year, and (4) in non-democratic states.

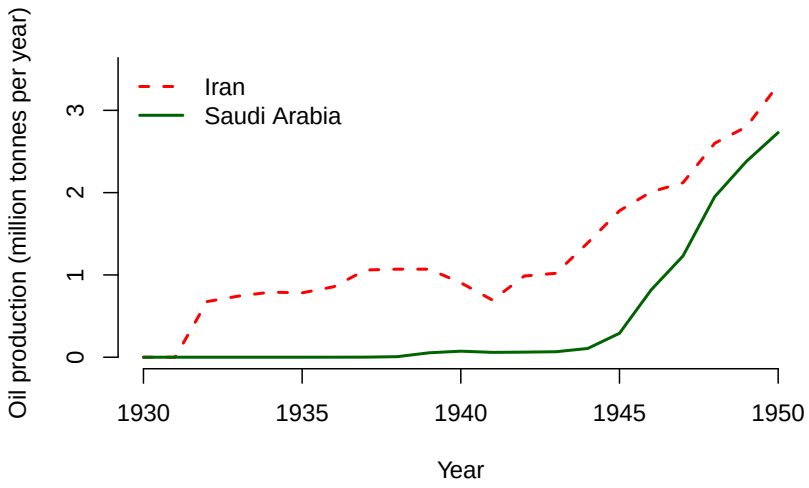
2.4.2 Resource nationalism in Iran vs. Saudi Arabia

There are cases where the modeled nationalization probability is near zero, yet nationalization occurs, or inversely the modeled probability is relatively high (25%) when no nationalization occurs. What accounts for this under- and over-prediction? What other factors could be driving the decision to nationalize? In this section, I explore one such determinant and apply a case comparison method to examine its relevance.

In both Iran and Saudi Arabia oil production began before 1940 and initial operations were conducted by foreign-owned oil companies. The production profiles shown in Figure 2.5 illustrate the near-convergence of production levels by the late 1940s. Yet the leaders of each country – King Abdulaziz ibn-Saud and Shah Mohammad Reza Pahlavi – took separate paths in natural resource ownership. Iran's government infamously nationalized the Anglo-Iranian Oil Company's (AIOC) operations in 1951. Saudi Arabia, on the other hand, waited until 1974 to nationalize the Arabian-American Oil Company (Aramco) and did so only gradually, with Saudi Arabia taking full ownership by 1980. Why did Iran nationalize the industry in the early 1950s while the Saudi leadership waited another quarter-century to follow suit?

I explore the differences in both oil-producing countries during their early years of production to show initial evidence in support of the resource nationalism and revenue maximization hypotheses. In Iran, the state sought to maximize

Figure 2.5: Oil production in the 1930-1950 period, Iran compared to Saudi Arabia



Data collected from Mu'assasat al-Naqd al-Arabi al Saudi (1960), Noori (1965), and Mikdashi (1966).

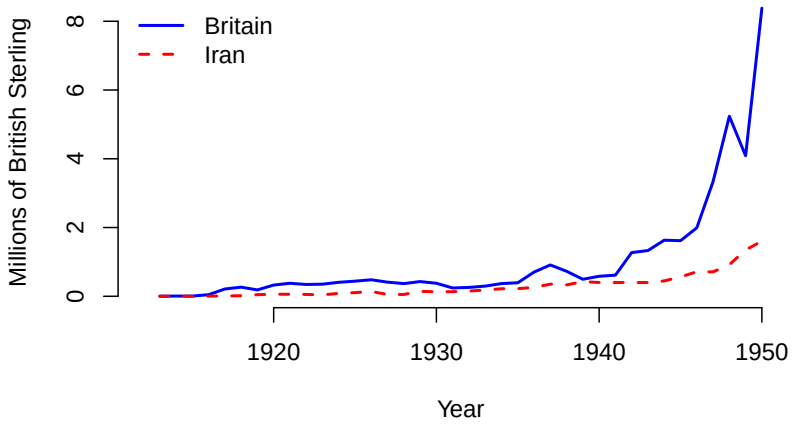
the government's share of resource revenues in conjunction with popular demand for resource sovereignty. In Saudi Arabia, the state did not nationalize because revenues from the sale of oil were perceived to be at a "fair" level vis-a-vis Aramco, as negotiated between King Abdulaziz ibn-Saud and the U.S. government (which oversaw operations by Aramco).

2.4.2.1 Iran

The perception of an unfair split in oil revenues between Britain and Iran began to be disputed politically with the passage of a new concession, now referred to as the 1933 Agreement. The discrepancy between the two countries' collected revenues is plotted in Figure 2.6. Immediately after 1933 there existed a small but noticeable gap between host and foreign state; from 1940 onwards Iran's absolute oil revenues did increase but clearly did so at a much slower rate than that of the

UK.

Figure 2.6: Oil revenues collected by the Iranian government versus the British government, 1911-1950



Data collected from Noori (1965) and Mikdashi (1966).

Fifteen years after the 1933 agreement, on October 22, 1947, Iranian MPs passed an amendment to the 1933 oil concession law requiring government officials to be present in AIOC policy decisions when they pertained to Iran's oil royalties. The motivation for this amendment originated in MPs' perceptions that "the rights of the nation were impaired" when it came to AIOC royalty receipts (Noori, 1965) and the 1933 Agreement was invalid as it "had been forced upon Iran" (Makki, 1950). Two years later, AIOC and the government negotiated the 1949 Supplemental Agreement, which provided for a modest increase in Iran's royalty payments. But noticeably absent from the new terms was any discussion of an even "50-50" split between the two countries. Hossein Makki, a member of the parliamentary opposition and the right-hand-man of future Prime Minister Mossadegh, charged before parliament that the 1949 agreement was still unfair to the Iranian people, especially when compared to the terms given to other oil

producers at the time:

> The new agreement deprived Iran of her share in the reserves of subsidiary and allied companies. ... While the Supplemental Agreement gave Iran seven shillings a ton, the government of Iraq was negotiating for a new agreement which would bring that country eighteen shillings per ton. In Venezuela, the government was receiving approximately thirty shillings per ton.[21]

With this speech, and several others by prominent opposition members, members of parliament rejected the agreement. The British, upon seeing the failure of the negotiated agreement to make it through Iran's parliament, told then-premier Saed that Iran should either take the 1949 agreement or leave it; but in no way was Britain to agree to a 50-50 sharing agreement (Noori, 1965).

After a disputed parliamentary election in 1949, the Shah tried to placate nationalistic demands with a new election in 1950. With campaign promises of a new oil settlement, Mohammad Mossadegh and his National Front Party secured only eight of the 143 seats in parliament. The new PM, Ali Razmara, was a conservative ex-soldier who sought to ease tensions between Iran and Britain with new negotiations between the government and AIOC. Upon Britain's rejection to open a new round of negotiations, Razmara was forced to take the unpopular 1949 Supplemental Agreement again before parliament where it was rejected in 1951 for the second time. In the face of growing public opposition to the AIOC and Britain's involvement in Iran – accompanied by street demonstrations throughout the Winter of 1950/51 – Razmara publicly rejected nationalization in March 1951, calling it "imperialistic and unwise" (Lenczowski, 1949, 17). This was to be his last speech, as the Premier was assassinated on March 7th by the extremist xenophobic group *Fedayan-e Islam*. Thirteen days after Razmara's death, both the Parliament

[21] Makki (1950, 332-40)

and the unelected Senate passed Mossadegh's nationalization bill on March 20, 1951 and soon thereafter established the National Iranian Oil Company.[22]

The Iranian nationalization of AIOC was a complex and drawn-out endeavor. There were grievances based on fair treatment of Iranian workers, demands for substituting foreign managers by Iranian nationals, adequate transparency of AIOC's accounting books, and the company's unwillingness to renegotiate terms of payment to the state. Yet the general message of the Iranian government's decision to nationalize was that the 1933 concession and 1949 agreement were fiscally unfair to Iran: the amount of revenues collected by the British was substantially higher than the payments sent to the Iranian government. Failure to renegotiate a payment plan or even consider a 50-50 profit-sharing agreement ultimately led to outright nationalization of AIOC in 1951. Had the British agreed to share profits from oil production in an equitable manner, Iran's parliament may not have approved nationalization. Thus a strong element in the government's decision to nationalize was the state's desire not only to increase its collected oil revenues but also to be on a level playing field with respect to profits collected by AIOC and the British.

2.4.2.2 Saudi Arabia

The first successful oil concession in the Kingdom was the 1933 drilling agreement between King ibn-Saud and the Standard Oil Company of California (Socal). After the discovery in 1938 of what Socal called a "veritable oil bonanza" the

[22]Though the consequences of nationalization are outside the scope of this vignette, the immediate response by the British was to send the Royal Navy to Iranian waters to threaten an occupation of the oil city of Abadan in order to protect British interests overseas. While the British never occupied Abadan, the navy was used to enforce an embargo of Iranian oil exports. After two years of back-and-forth negotiations and subsequent sanctions, Mossadegh was ousted as premier by the CIA and MI6 in what was then termed "Operation Ajax." The Shah was reinstated in full, and in 1954 reversed the nationalization bill to establish a joint consortium of the National Iranian Oil Company with American, British, and French oil companies. For more on the AIOC nationalization, see Mahdavi (2012).

company joined forces with Texaco in setting up Aramco.[23] Aramco soon discovered that it enjoyed a substantial market advantage over Western oil companies because of the relative ease in extracting Saudi oil: compared to the unit costs of producing American oil at $1.01 per barrel (or in Venezuela, $0.50/barrel), oil could be produced in Saudi Arabia for only $0.23 per barrel (Mikdashi, 1966, 94).

King ibn-Saud's desire to maximize oil revenue came not in the form of nationalization, but instead pushing Aramco for higher levels of production. So much so that Texaco's president later remarked to the Federal Trade Commission, "In order to keep King ibn-Saud satisfied with the operation of the concession, it is important that production be increased substantially so that the King would receive greater royalties."[24] To expand production, the Aramco consortium grew from a joint venture of two companies to a group of four companies including Socal, Texaco, Jersey, and Socony.

Prior to renegotiating the existing concession, the Saudi government pressed Aramco to give them a greater share of its income tax payments that were being paid to the United States. In 1948, Aramco's Chairman testified before the U.S. Congress that the company acquiesced to the king's demands to divert the money that was supposed to be paid to the IRS instead to the king's treasury:

> [The Saudi government] wanted more. They asked as early as 1948, "Isn't there some way in which we can get a greater take?" and a little later than that they said, "Isn't there some way in which the income tax you pay to the United States can be diverted to us in whole or in part?"[25]

[23] Standard Oil Company of California (1946), *Autumn Bulletin*, 33 (7): 1-2.

[24] Subcommittee on Monopoly of the Select Committee on Small Business, U.S. Senate, *The International Petroleum Cartel: Staff Report to the Federal Trade Commission* (Washington, DC: 1952, 124).

[25] United States Congress, *Emergency Oil Lift Program and Related Oil Problems, Hearings* (Washington, DC: 1957, 1429). Cited in Mikdashi (1966, 149).

On December 30, 1950, the company signed an agreement whereby the Saudi government taxed the net operating revenue of Aramco to the point of creating an equal 50-50 split of revenues. By 1952, Aramco revised the 1950 agreement and provided for a complete split of the profits *before* any payments were sent to the U.S. in the form of income taxes, effectively giving the Saudi government a greater share in operating revenues and profits than Aramco itself.

As opposed to the Iranian case, the Saudi experience in the 1940s and early 1950s reflects successful negotiations to reduce the revenue gap between host government and foreign operator. Instead of risking outright nationalization, Aramco understood the risks of not negotiating with their producer government, quite the opposite from AIOC's refusal to negotiate to create a fair sense of revenue-sharing with the Iranian state.

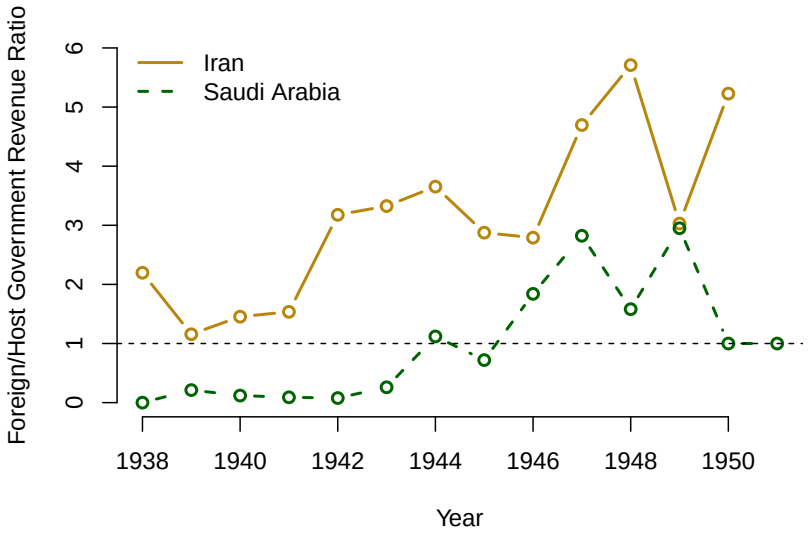
2.4.2.3 Comparing kings: Was revenue shared "unfairly" in Iran?

To shed light on the mechanism driving the resource nationalism hypothesis, I use a measure of the gap between host state and foreign state and/or company revenues from oil production. This is accomplished with data collected by Mikdashi (1966) and Noori (1965) on how revenues were divided between host state, foreign state, and foreign operating company.

Three possible measures can be constructed for the period 1938-1951, with the starting point being Saudi Arabia's first year of commercial production and the end point being Iran's nationalization. The first is the host state's share of total revenues from the sale of oil. A share of 50-50 is a natural benchmark for "parity," though the higher this share is for the host country the more "fair" a contract is deemed by the public and the leadership. The second is the host state's collection of oil revenues on a per-unit basis. This metric does not have a natural benchmark since fairness will only be determined in its relation to the

foreign state's collection of revenues. As such, an additional comparative metric is used, namely the ratio of collected oil revenues between foreign and host state. The benchmark for this metric is 1; values above the benchmark are more fair from the perspective of the host state. The foreign-to-host-state ratio of revenues is plotted for each case across time in Figure 2.7.

Figure 2.7: Ratio of collected oil revenues between foreign and host state, Iran versus Saudi Arabia, 1938-51



Higher values indicate more revenue for the foreign operator and state relative to the host state.

Comparing Iran to Saudi Arabia during this period using any one of these metrics reveals the stark differences between the two countries in how revenues were shared with their respective foreign states and operating companies. The mean values for each metric (averaged across time) along with one-tailed t-tests are presented in Table 2.1. Not only is the take-home revenue per unit higher in Saudi Arabia than in Iran on an absolute basis, but also on the two relative metrics. Indeed, for the 13-year period in consideration, Saudi Arabia received

more revenues than its operating partner, the United States. Whereas Iran only received 27% of oil revenues with Britain retaining the remaining 73%, Saudi Arabia collected 62% of oil revenues compared to the United States' 38%.

Table 2.1: Comparative metrics of oil revenue-sharing between host government and foreign government and/or operating company, Iran vs. Saudi Arabia, 1938-51.

	Iran	*Saudi Arabia*	*Difference*
Host-state share of revenues[1] (%)	27.07	61.88	−34.81***
			(4.58)
Host-state take of revenues per ton of production ($/ton)	0.41	3.16	−2.74***
			(5.81)
Foreign-to-host-state ratio of collected oil revenues	3.14	0.99	2.16***
			(4.54)
Note:			*p<0.1; **p<0.05; ***p<0.01

One-sided t-statistics in parentheses. (1) The data period for the host-state share of revenues is limited to 1943-51 while the rest of the metrics are calculated using data from 1938-51.

Looking at these metrics for Saudi Arabia, it is no surprise that the state opted not to nationalize Aramco in the 1940s and 1950s. At least according to the 50-50 profit-sharing agreement of 1950, the Saudi government was satisfied with the outcome of negotiations to the point of allowing Aramco to continue its operations unfettered from the prospect of expropriation. The document itself notes that the government, prior to 1950, "for a period of many months has been seeking additional revenue from Aramco [and] has held views different from those of Aramco on many long-standing interpretations of Aramco's concession and other agreements."[26] But upon completing negotiations, the government formally acknowledged that the agreement "constitutes a complete satisfaction

[26]The full text of the Agreement can be found in J.C. Hurewitz, (ed.), *Diplomacy in the Near and Middle East: A Documentary Record*, vol. 2: 1914-1956 (Princeton: D. Van Nostrand, 1956), pp. 314-21.

of all outstanding claims and demands of the Government with respect both to the past and to the future; the Government agrees that Aramco may continue to conduct its operations in accordance with the Aramco concessionary agreements in the same manner as in the past" (§3.1). Unlike in Iran, the Saudi government's grievances over profit-sharing were resolved by Aramco and the U.S. government, thereby reducing the chances of outright nationalization by King ibn-Saud.

The Iranian government similarly renegotiated its existing concessions with the signing of the 1949 agreement, as discussed above. Though the agreement was ultimately rejected by Iran's parliament, negotiations resulted in a more favorable foreign-to-host-state ratio in 1949 that, as reflected in Figure 2.7, was roughly the same ratio as in neighboring Saudi Arabia. Yet given the historically higher levels of revenue-sharing inequity between the British and Iranian governments, the agreement was not enough to resolve Iranian grievances: upon news of the British government's unfriendly offer, the public turned noticeably towards outright nationalization of AIOC. Left-wing and moderate newspapers such as *Rahbar*, *Zafar*, and *Razm* carried editorials that the oil fields belonged to Iran and that the Iranian government should end its policy of "generosity" towards Britain and the AIOC. Even the most right-wing newspaper of the country, *Ettelat*, charged the British government with "refusal to recognize the seriousness of the situation in Iran" (quoted in Noori (1965, 177)). Shortly thereafter, popular support for Mossadegh's platform of AIOC nationalization carried him to the premiership in March 1951.

Though it is difficult to ascertain a causal effect of how perceptions of revenue-sharing increased the risk of nationalization, it is clear that operating companies saw it as a determinant of nationalization. At the 1951 shareholders meeting for Standard Oil (New Jersey), then-president Eugene Holman outlined "a better basis than that now provided against the danger of nationalization" (Kuhn, 1951, 711). Among the factors that reduced the risk of nationalization, he stressed that

operating companies needed to "recognize that a foreign government which lets oil concessions may rightfully expect that an adequate participation in the proceeds should accrue to the government" (quoted in Kuhn (1951, 711)). Concession agreements that did not provide for satisfactory revenue-sharing were at risk of being forcibly renegotiated through nationalization, a process which Yergin and Stanislaw characterize as one that "was meant to put an end not only to the concessions themselves but to the humiliation that went with them" (Yergin and Stanislaw, 1998). Even in 2014, public grievances against foreign operators can be stoked by perceptions of unfair revenue-sharing in oil and gas contracts. In Tanzania in July 2014, for instance, a leaked gas contract between the government and the Norwegian company Statoil has prompted local media to declare that the Tanzanian government is getting "fooled" out of almost $1 billion in lost profits because of how production-sharing is structured over the long term.[27] Though there have been no serious calls to expropriate Statoil's concessions, it is likely that nationalization will be a bargaining threat if the contract is not renegotiated.

These vignettes lend initial support to the resource nationalism hypothesis proposed in this study. Going beyond a crude indicator of resource nationalism captured by OPEC membership, as employed in the cross-national analysis above, the data on host vs. operator revenue-sharing shed light on one mechanism for why leaders nationalize the oil industry that is reflective of public and state sentiments of unfairness which necessitates state control of precious resources. Specifically, I have argued here that AIOC's failure to resolve these grievances led to its nationalization by the Iranian government, while Standard Oil's understanding of this "danger of nationalization" led to a renegotiated agreement with the Saudi government that effectively delayed expropriation until 1974.

[27]The Citizen Reporter, 2014, "$1 bn. loss: Who's fooling Tanzanians?," *The Citizen*. Accessed 1 Aug 2014 from http://www.thecitizen.co.tz/News/-1bn-loss--Who-s-fooling-Tanzanians-/-/1840392/2382948/-/ya2a1oz/-/index.html.

2.5 Conclusion

The list of oil-exporting states has been consistently growing, with new producers emerging as of 2014 along the Gulf of Guinea (Ghana, Ivory Coast), East Africa (Uganda, Tanzania, Kenya), Central America (Belize), Central Asia (Afghanistan), and South America (Suriname, Guyana). Governments in these states have yet to decide on ownership structures of their nascent petroleum industries, with several in the midst of implementing new petroleum regulation at the time of writing. Indeed, many have already established NOCs, such as Staatsolie in Suriname, GPNC in Ghana, or the National Oil Corporation in Kenya.

In this chapter I have provided evidence for four factors that signal the likelihood of nationalization. The establishment of a NOC is most likely (1) in periods of high oil prices, when the risks of expropriation are outweighed by the financial benefits; (2) in non-democratic systems, where executive constraints are limited; (3) in "waves," that is, after other countries have nationalized, reflecting reduced likelihood of international retaliation; and (4) though with less empirical support for this finding, in political settings marked by resource nationalism when there exists a considerable profit-sharing gap between host and foreign governments.

In the next two chapters I turn to the consequences of establishing these NOCs. In chapter three, I look at the causes of corruption in the oil sector to find that NOCs play an important role. In particular, NOCs that control the awarding of lucrative contracts – which in chapter one I refer to as regulatory NOCs – foster the highest levels of corruption when compared to institutional structures where either there is no NOC or a NOC exists but has no regulatory power. In chapter four, I focus on another aspect of NOCs – the ability to produce oil in commercial levels, and operate the majority of oil produced in the country. There, I test my argument from chapter one that petroleum wealth promotes regime stability but only in states with NOCs, especially those NOCs with production capacity

(producer NOCs and integrated NOCs).

The findings from the current chapter will help to alleviate concerns about reverse causality in the remainder of the dissertation, where the establishment and existence of NOCs are used as explanations for political outcomes such as corruption and state stability. What this chapter has shown is that nationalization is not a function of regime strength or quality – other than the general characteristics of democracy vs. non-democracy – but rather of commodity prices, international activity, and how revenues are shared. This helps to refute somewhat the claim that nationalization promotes regime durability because more stable regimes are more likely to nationalize. Indeed the cross-national evidence (see, for instance, the results in Table 2.5) modestly supports previous claims (Guriev, Kolotilin and Sonin, 2011) that more stable regimes are *less* likely to nationalize. In the next chapter, I provide evidence that corruption and weak governance do not predict nationalization, and if anything there is some evidence that states with high levels of corruption are *less* likely to nationalize. These factors do not help in explaining the timing and nature of nationalization, but are themselves consequences of state intervention.

2.6 Appendix 1: Model specification

The outcome variable $\pi_{i,j}$ is the country-specific probability of nationalization at time j; $\mathbf{x}_{i,j}$ are a matrix of mean-centered and standardized predictors; α is a vector of the intercept and fixed effects; β_i is the country random effect; and $\epsilon_{i,j}$ is the over-dispersion parameter. The inverse-Wishart prior for the random effects variance τ is chosen for mathematical convenience (Box and Tiao, 1973). The model is given by:

$$y_{i,j}|\pi_{i,j} \sim \text{Bernoulli}(\pi_{i,j}) \tag{2.1}$$

$$\text{logit}(\pi_{i,j}) = \mathbf{x'}_{i,j}\alpha + \mathbf{z'}_i\beta_i + \epsilon_{i,j} \tag{2.2}$$

$$\alpha \sim \text{N}(m, v) \tag{2.3}$$

$$\beta_i|\tau^2 \sim \text{N}(0, \tau^2) \tag{2.4}$$

$$\tau^2 \sim \text{InvWishart}(r, R) \tag{2.5}$$

$$\epsilon_{i,j} \sim \text{N}(0, D) \quad \text{where } D = 1 \tag{2.6}$$

Prior information for m, v is a combination of three sources: an elicited prior, estimates from previous work, and the quasi-informative range method for parameters which have not yet been estimated in the literature.[28] The elicited prior is used for the intercept (α_0), and is drawn from interviews in October, 2012, with oil experts working at petroleum consulting firms in Dubai, UAE (set of questions listed in Table 2.2). The experts noted a 0.5% percent chance of nationalization in a given country in a given year, all other factors equal, with a minimum estimate of 0.1% and maximum of 1%.[29] Priors for some predictors – oil price,

[28]The prior for the inverse-Wishart degrees of freedom parameter r is set at k number of countries ($k = 60$). The prior for the hyperparameter $\mathbf{R}_{1\times1}$ is estimated using a variation of the range method. In this case, $\mathbf{R}_{1\times1}$ is set to $\left(\frac{\text{logit}(.95)-\text{logit}(.05)}{9}\right) = 0.654$.

[29]This is transformed to the Logit scale to a mean of -5.29 with a variance of

regime index, and GDP – are collected from previous work by Guriev, Kolotilin and Sonin (2011), who employ a different dataset (adapted and updated from Kobrin (1985)), replicated in Table 2.3 in the Appendix.[30] Priors for the remaining predictors – the OPEC indicator, diffusion effect, GDP growth, years since first production, and offshore dummy – are estimated using the range method.[31]

Table 2.2: Interview questions used in eliciting priors for Bayesian analysis

(1) What is your guess for how many oil nationalizations will occur in the coming decade?
(2) What is your guess for the maximum number of oil nationalizations in the next decade?
(3) In a given country, what is your guess for the probability of oil nationalization next year, all other factors equal? What is the maximum probability? The minimum probability?
(4) What information are you using to make these guesses? Experience, data, risk models?
(5) Have you ever used or heard about the Kobrin expropriation dataset?

Questions used for prior elicitation for the intercept term α_0. Question #3 in particular is used for m_0 and v_0, mean and variance of α_0.

Table 2.3: Model results from Guriev et al (2011) analysis of oil expropriations

	Odds ratio	2.5%	97.5%
Oil price	1.038	1.0125	1.0635
Executive constraints	0.994	0.9920	0.9956
Log GDP per capita	1.000	0.9902	1.0098

Regression estimates from Guriev et al. (2011: 316; Table 3, Column 7) as Odds Ratios with 95% CI. Sample size is 1718. 'Executive constraints' is one measure included in the Polity index of regime type used in this study. These estimates – which the authors transformed from the Logit coefficients to odds ratios – are transformed back into the Logit scale for prior estimates.

$\left(\frac{\text{logit}(.01)-\text{logit}(.001)}{2}\right)^2 = 1.34$.

[30] Guriev, Kolotilin and Sonin (2011) also estimate a logistic model, the values for m and v are the coefficient estimates and inflated standard errors (obtained from reported 95% CIs, and downweighted to represent 1% as many observations as the data; this specification is relaxed in sensitivity analysis).

[31] This assumes a normal distribution with mean zero and variance $\left(\frac{1}{2}\frac{\text{logit}(.95)-\text{logit}(.05)}{x_H-x_L}\right)^2$.

2.7 Appendix 2: Additional tables

Table 2.4: Determinants of NOC formation: Model results from Bayesian hierarchical logistic regression

	Mean	SD	2.5%	97.5%	P(>0|Y)
Intercept	-4.477	0.235	-4.930	-4.059	0.000
Years producing	0.269	0.222	-0.185	0.692	0.890
Oil price shock	0.473	0.116	0.235	0.694	1.000
Regime age (yrs)	-0.290	0.293	-0.891	0.275	0.162
Regime (Polity)	-0.557	0.253	-1.062	-0.077	0.011
OPEC dummy	0.274	0.109	0.058	0.479	0.992
GDP/capita (log)	0.143	0.168	-0.174	0.478	0.802
Change in oil production	0.096	0.125	-0.188	0.290	0.821
Diffusion effect	0.285	0.140	-0.005	0.537	0.974
GDP growth	0.036	0.151	-0.251	0.331	0.611

Posterior estimates for fixed effects from Bayesian hierarchical logistic regression with informative priors. Coefficient estimates are on the logistic scale.

Table 2.5: Determinants of NOC formation: Model results from OLS and Maximum-likelihood estimation of logistic regression

	Dependent variable:					
	NOC nationalization			Guriev Expropriation		
	OLS	*OLS, cfe*	*logistic*	*OLS*	*OLS, cfe*	*logistic*
	(1)	(2)	(3)	(4)	(5)	(6)
Years producing	0.005	0.044	0.222	−0.0002*	−0.003***	−0.001
	(0.005)	(0.028)	(0.206)	(0.0001)	(0.0004)	(0.005)
Oil price shock	0.024***	0.026***	0.432***	0.073***	0.064***	1.721***
	(0.005)	(0.005)	(0.106)	(0.013)	(0.013)	(0.341)
Regime age	−0.010	−0.006	−0.367	−0.001***	−0.001**	−0.073***
(years)	(0.007)	(0.013)	(0.303)	(0.0002)	(0.0003)	(0.015)
Regime index	−0.018**	−0.026**	−0.539**	−0.001	0.001	−0.048
(Polity)	(0.007)	(0.013)	(0.255)	(0.001)	(0.002)	(0.046)
OPEC dummy	0.021***	0.031***	0.208*	0.065***	0.021	1.553***
	(0.005)	(0.006)	(0.113)	(0.010)	(0.027)	(0.283)
GDP/capita (log)	0.014*	0.010	0.323	0.015***	0.113***	0.192
	(0.008)	(0.023)	(0.256)	(0.005)	(0.013)	(0.136)
GDP growth	0.001	0.010**	0.021	0.036	−0.037	0.876
(percent)	(0.005)	(0.005)	(0.132)	(0.054)	(0.054)	(1.311)
Change in	0.007	0.007	0.124*	0.00001	0.00000	0.0004
oil production	(0.005)	(0.004)	(0.071)	(0.00001)	(0.00001)	(0.0003)
Count of previous	0.012**	0.011**	0.255**	0.026***	0.020***	0.465***
nationalizations	(0.005)	(0.005)	(0.125)	(0.003)	(0.003)	(0.069)
Constant	0.032***		−3.902***	−0.096***		−4.957***
	(0.005)		(0.221)	(0.036)		(1.075)
Observations	1,260	1,260	1,260	2,314	2,314	2,314
R^2	0.065	0.256		0.096	0.188	
Adjusted R^2	0.059	0.218		0.093	0.166	
Log likelihood			−150.909			−247.881
Akaike Inf. Crit.			321.818			515.762
Note:						*p<0.1; **p<0.05; ***p<0.01

OLS refers to the linear probability model; OLS cfe refers to the linear probability model with country fixed effects.

Table 2.6: Determinants of NOC formation: Additional model results (1)

	Dependent variable:				
	NOC Nationalization				
	(1)	(2)	(3)	(4)	(5)
Years producing	0.043	0.042	0.040	0.021	0.021
	(0.028)	(0.026)	(0.026)	(0.028)	(0.028)
Oil price shock	0.026***	0.009*	0.009*	0.025***	0.026***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Regime age (years)	−0.006	−0.006	−0.007	−0.006	−0.005
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Regime index (polity)	−0.027**	−0.027**	−0.028**	−0.027**	−0.025*
	(0.013)	(0.012)	(0.012)	(0.013)	(0.013)
OPEC dummy	0.031***	0.021***	0.021***	0.030***	0.029***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
GDP/capita (log)	0.011	0.011	0.013	0.0004	0.004
	(0.023)	(0.022)	(0.022)	(0.024)	(0.023)
GDP growth (percent)	0.009*	0.006	0.006	0.008	0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Count of previous nationalizations	0.009*		−0.004	0.009**	0.008*
	(0.005)		(0.005)	(0.005)	(0.005)
Count of previous nationalizations (within region)		0.060***	0.061***		
		(0.005)	(0.005)		
Change in oil production	0.007	0.006	0.006	0.005	0.004
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
Oil production levels (log)				0.030***	0.034***
				(0.010)	(0.010)
Oil production change × levels					0.120***
					(0.029)
Observations	1,260	1,260	1,260	1,260	1,260
R^2	0.253	0.331	0.331	0.258	0.269
Adjusted R^2	0.215	0.297	0.297	0.221	0.231
Note:					*p<0.1; **p<0.05; ***p<0.01

Additional regression results, controlling for regional diffusion (models 1-3) and changing oil production (models 4-5). Compare to main results from Model 1, Table 2.5. All models are run using the linear probability model specification with country fixed effects.

Table 2.7: Determinants of NOC formation: Additional Model results, continued (2)

	Dependent variable:			
	NOC nationalization			
	(1)	(2)	(3)	(4)
Years producing	0.043	0.038	0.040	0.039
	(0.028)	(0.028)	(0.028)	(0.028)
Oil price shock	0.025***	0.028***	0.026***	0.027***
	(0.005)	(0.005)	(0.005)	(0.005)
Regime age	−0.005	−0.007	−0.007	−0.007
(years)	(0.013)	(0.013)	(0.013)	(0.013)
Regime index	−0.026**	−0.030**	−0.028**	−0.029**
(polity)	(0.013)	(0.013)	(0.013)	(0.013)
OPEC dummy	0.031***	0.032***	0.031***	0.031***
	(0.006)	(0.006)	(0.006)	(0.006)
GDP/capita (log)	0.011	0.016	0.013	0.016
	(0.023)	(0.023)	(0.023)	(0.023)
GDP growth	0.009*	0.009*	0.009*	0.009*
(percent)	(0.005)	(0.005)	(0.005)	(0.005)
Change in	0.006	0.007	0.007	0.007
oil production	(0.004)	(0.005)	(0.005)	(0.005)
NOC_2	0.011**			
	(0.004)			
NOC_3		−0.003		
		(0.005)		
NOC_4			0.005	
			(0.005)	
NOC_5				−0.002
				(0.005)
Observations	1,260	1,260	1,260	1,260
R^2	0.254	0.251	0.251	0.251
Adjusted R^2	0.217	0.213	0.214	0.213
Note:				*p<0.1; **p<0.05; ***p<0.01

Additional regression results, controlling for differing lags in the diffusion effect. For example, NOC_2 is the count of nationalizations two years prior to the current given year. Compare to main results from Model 1, Table 2.5. All models are run using the linear probability model specification with country fixed effects.

Table 2.8: Determinants of NOC formation: Additional model results, continued (3)

	Dependent variable:			
	NOC nationalization			
	(1)	(2)	(3)	(4)
Years producing	0.045	0.043	0.044	0.043
	(0.028)	(0.028)	(0.028)	(0.028)
Oil price shock	0.024***	0.024***	0.024***	0.024***
	(0.005)	(0.005)	(0.005)	(0.005)
Regime age	−0.005	−0.006	−0.006	−0.006
(years)	(0.013)	(0.013)	(0.013)	(0.013)
Regime index	−0.025*	−0.026**	−0.026**	−0.027**
(polity)	(0.013)	(0.013)	(0.013)	(0.013)
OPEC dummy	0.030***	0.030***	0.030***	0.031***
	(0.006)	(0.006)	(0.006)	(0.006)
GDP/capita (log)	0.010	0.011	0.010	0.011
	(0.023)	(0.023)	(0.023)	(0.024)
GDP growth	0.009*	0.009*	0.010*	0.010*
(percent)	(0.005)	(0.005)	(0.005)	(0.005)
Change in	0.007	0.007	0.007	0.007
oil production	(0.004)	(0.005)	(0.005)	(0.005)
NOC_{c2}	0.007***			
	(0.003)			
NOC_{c3}		0.004*		
		(0.002)		
NOC_{c4}			0.003*	
			(0.002)	
NOC_{c5}				0.002
				(0.001)
Observations	1,260	1,260	1,260	1,260
R^2	0.255	0.253	0.253	0.252
Adjusted R^2	0.218	0.215	0.215	0.215
Note:				*p<0.1; **p<0.05; ***p<0.01

Additional regression results, controlling for differing lags in the diffusion effect, calculated as cumulative sums. For example, NOC_{c2} refers to the cumulative count of nationalizations within the previous two years. Compare to main results from Model 1, Table 2.5. All models are run using the linear probability model specification with country fixed effects.

CHAPTER 3

Oil and extortion: Not all NOCs corrupt

3.1 Introduction

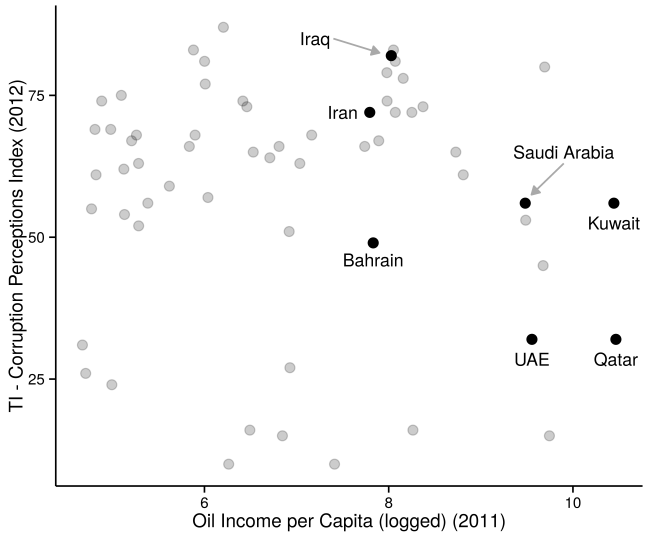
Why do oil-rich countries exhibit such wide variation in corruption?[1] Given that U.S.-based firms have roughly $1.25 trillion dollars[2] invested in the oil sectors of these countries, the answer to this question has implications for patterns of U.S. foreign investment and good governance. A scatterplot of oil wealth and corruption, presented in Figure 3.1, illustrates the high variance in outcomes across differing levels of resource income. For example, Kuwait and Saudi Arabia are perceived as much more corrupt than Qatar and the UAE, respectively, though each has roughly the same levels of oil income on a per capita basis. The variance in corruption is even higher when comparing other Middle East producers such as Iraq, Iran, and Bahrain.

Despite this high variance, some scholars suggest a positive linear relationship between oil and corruption (Karl, 1997; Bhattacharyya and Hodler, 2010; Vicente, 2010; Anthonsen et al., 2012; Arezki and Brückner, 2012; Brollo et al., 2013), while others find no such relationship (Ades and Di Tella, 1999; Leite and Weidmann, 2001; Aslaksen, 2007; Treisman, 2007). Still, the general perception is that indeed oil causes corruption — to the point that there are countless think-tanks, policy

[1] Throughout this chapter, I define an "oil-producing country" as any country producing greater than $100 of per capita income from the sale of oil and gas in 2011 (Ross, 2012). This list is similar to the list of producers used in the previous chapter, based on a threshold of 1,000 metric tonnes of oil production per year.

[2] This figure as of 2007. See: Ernst & Young (2007) "Investment and Other Uses of Cash Flow By the Oil Industry, 1992–2006," Prepared for the American Petroleum Institute, pp. i-ii.

Figure 3.1: Oil and perceptions of corruption in 2011-12



Scatterplot of oil income per capita (x-axis) and Transparency International's Corruption Perceptions Index (y-axis; the scale is transformed so that higher values represent more corruption) for major oil producers, which are defined as having at least $100 of oil income per capita as of 2011 (Ross, 2012). Major Middle Eastern producers are highlighted in black along with corresponding country names. The mean TI-CPI score for major oil producers is 41.9, with a standard deviation of 20.8.

initiatives, and non-governmental organizations with the stated objective of reducing oil's corrupting effects.[3] Yet even if there is a causal relationship between oil and corrupt outcomes, why does the effect of oil on corruption vary so greatly across countries?

In this chapter, I move from the factors determining nationalization to the first of three political consequences of nationalization – corruption – that I consider in this dissertation. I argue that the political institutions employed by states to govern their petroleum wealth explain much of the variation in corrupt outcomes

[3]Some examples include the joint U.N.-World Bank Stolen Assets Recovery Program (StAR), Transparency International, the Publish-What-You-Pay Coalition, the Natural Resource Governance Institute, Global Witness, the U4 Anti-Corruption Resource Centre, and the Extractive Industries Transparency Initiative (a collaborative effort between Transparency International and the World Bank).

across oil-producing countries. I show not only that institutions matter for corruption — a long-held view in political economy — but also which specific institutions are relevant to the study of corruption and *why* they matter. Specifically, I argue that when resource revenues are funneled through national oil companies (NOCs) instead of private firms and government ministries, there are greater opportunities and incentives for state officials to engage in corrupt behavior.

This chapter builds on the broader literature on whether oil hinders good governance (Karl, 1997; Ades and Di Tella, 1999; Ross, 2001; Smith, 2007), but looks to unearth the specific mechanisms linking oil production to corrupt outcomes. In recent years, scholars have argued that the impact of oil on the quality of government is mediated by political institutions (Mehlum, Moene and Torvik, 2006; Robinson, Torvik and Verdier, 2006; Luong and Weinthal, 2010). The separate literature on political corruption has similarly shown that rent-seeking is exacerbated by or borne out of so-called "bad" institutions (Krueger, 1974; Rose-Ackerman, 1975; Buchanan, Tollison and Tullock, 1980; Rose-Ackerman, 1999; Alt and Lassen, 2003; Lederman, Loayza and Soares, 2005). "Good" institutions on the other hand foster accountability, transparency, and therefore low levels of corruption. Yet these institutions often remain vague scholarly constructs, with little attention to what specific institutions promote or prevent corruption, especially when considering sector-specific corruption. In addition, what has made the question of whether oil promotes corruption particularly difficult to answer is the lack of reliable data on cross-national corruption. What is needed for refined analysis of the specific mechanisms linking oil to corruption are measures that are comparable across countries but without being conflated by broader social corruption in other, non-resource sectors of the economy.

I contribute to this debate in three ways. First, I introduce new and more refined measures of corruption that capture corrupt practices involving high-level government officials, cases which are often labeled as examples of "grand cor-

ruption" (Rose-Ackerman, 1975). These measures are drawn from U.S. government data on violations of the Foreign Corrupt Practices Act (FCPA) in 39 oil-producing countries during the period 1997–2013. Second, using the Department of Justice (DoJ) and Securities and Exchange Commission (SEC) archives on FCPA violations, I am able to reveal dramatic differences in the levels of corruption across oil-producing countries in a way that is both specific to the oil sector and cross-nationally comparable. Third, I show that this variance is in large part associated with a specific institutional choice. I find the highest corruption levels in oil-producing countries with regulatory structures where the authority to solicit and award concessions (i.e., licenses and/or contracts to drill for oil in a given field) is vested in NOCs instead of in ministries or other regulatory agencies. This pattern is illustrative of corruption arising in contexts where officials have both the opportunities to engage in bad government behavior (Rose-Ackerman, 1999) and the incentives to solicit bribes from would-be contract winners (Krueger, 1974).

The chapter proceeds as follows. In section two, I review existing explanations for corruption and present a theorized mechanism through which regulatory structure affects corrupt behavior in the oil sector. I continue in section three by describing the proposed measures of corruption and the institutions regulating the oil sector. In section four, I outline the methods used in section five, where I present results of the statistical analysis of oil-related corruption. I discuss alternative explanations and potential endogeneity concerns between pre-existing corruption and NOC institutional choice in section six. I conclude with a discussion of future research avenues in section seven.

3.2 Theory and expected implications

What explains the variance in corruption outcomes across the world? Why are some countries more corrupt than others? The conventional wisdom in political

economy is that corruption is the result of weak political institutions that cannot suppress rent-seeking behavior (Becker, 1968; Krueger, 1974; Bhagwati, 1982). Other economic studies on the determinants of corruption argue that rent-seeking and corrupt activity is lower when government restrictions are limited and public sector employees are well paid, both of which work to diminish incentives for rent-seeking (Rauch and Evans, 2000; Van Rijckeghem and Weder, 2001).

Earlier arguments were based on "cultures" of corruption whereby differences in moral standards across countries account for the global variation in corruption (Leff, 1964; Nye, 1967). More recent work has also stressed the moral as opposed to the institutional determinants of corruption (Aidt, 2003; Fisman and Miguel, 2007), drawing on Jon Elster's emphasis on a values-based explanation that "the variation in corruption across countries is explained largely by the degree of public-spiritedness of their officials, not by the cleverness of institutional design" (Elster, 1989, 158).

In contrast with these cultural explanations for corruption, Krueger (1974) and Rose-Ackerman (1975) argue that corruption arises from opportunities and incentives for government officials to engage in corrupt behavior. For cases of grand corruption, Rose-Ackerman finds that bribes are facilitated both by the ease of making illicit payments without getting caught and when "state officials have the power to allocate scarce benefits and impose onerous costs" (Rose-Ackerman, 1999, 39). Specifically, extortion often occurs in the process of bidding for and winning lucrative government contracts (Reinikka and Svensson, 2004; Olken, 2007), especially when government officials have more regulatory discretion (Kaufmann and Wei, 1999). For oil-related corruption in particular, these studies imply that corruption can be fostered by the opportunity for high-level officials to solicit a bribe given their capacities for regulating valuable state contracts, which often result in extraordinary profits for winning firms.

Another literature stresses the role of political competition, since more com-

petitive electoral environments promote greater transparency and accountability of public officials (Montinola and Jackman, 2002). In particular, freedom of information laws and a free press can work to increase the probability and cost for public officials of getting caught engaging in corrupt behavior (Besley, 2006).

There is perhaps the most consensus on the role of income and economic development: work by Treisman (2007) highlights the robustness of income per capita as a determinant of corruption across different specifications, cases, and time periods. Higher levels of income and economic development, as the argument goes, lead to more stable government and stronger political institutions which inhibit corrupt behavior (Jain, 2001; Lederman, Loayza and Soares, 2005).

With respect to oil wealth and corrupt activity, scholars expect corruption somewhere in the fiscal pathway of oil revenues from the well-head to the treasury because of the large amount and opacity of petroleum rents (Karl, 1997; Ross, 2012). Consistent with this logic, Leite and Weidmann (2001, 3) provide evidence that oil wealth causes corruption because "natural resource exploration is an extremely high rent activity likely to foster rent-seeking behavior."[4] A host of cross-national studies find a consistent pattern between natural resource wealth and perceptions of corruption (Bhattacharyya and Hodler, 2010; Vicente, 2010; Anthonsen et al., 2012; Brollo et al., 2013). Empirical work by Arezki and Brückner (2012) lends support to this relationship by looking specifically at within-country variance in oil rents and their effects on corruption and state stability.

Yet doubts exist on the negative effects of natural resource wealth. Haber and Menaldo (2011) find that oil has a non-negative impact on democracy, while Alexeev and Conrad (2009) call into question the effects of natural resources on

[4]Indeed the perception that corruption is rampant in oil-rich states is so prevalent that much effort has been directed by the international community towards improving transparency and accountability in these countries. Organizations such as Transparency International and the Extractive Industries Transparency Initiative, in which the U.S. is currently in the process of becoming a member, strive to reduce the opacity of oil rents in order to fight corruption and improve the delivery of resource wealth towards development-promoting activities.

governance indicators such as the World Bank's rule of law index and government effectiveness measure. Dunning (2008) shows that the resource curse is conditional on institutional factors that can mediate oil's effect on democracy. Lederman and Maloney (2008, 32) suggest that these conditions depend on whether or not "good institutional characteristics emerged prior to the discovery of natural resources." As I discussed in chapter one, the debate has been somewhat reframed to an analysis of the factors involved in the "conditional resource curse," whereby some countries seem cursed by oil while others seem blessed by it. Though the effects of oil on corruption conditioned by institutions remain unclear, the large variance in corruption outcomes across the oil-producing world — as shown in Figure 3.1 — suggest that oil wealth by itself is not enough to determine corrupt outcomes.

I propose that the regulatory structure of a country's oil sector is one institution that helps explain the variance in oil-related corrupt behavior. Specifically, I posit that countries where NOCs have the authority to solicit and award concessions have the greatest opportunities for grand corruption when compared to countries either without NOCs or with NOCs that lack regulatory powers.

I expect this pattern because a regulatory structure that grants contract-awarding authority to a NOC fosters an opaque environment in which bids are evaluated with little public disclosure, and with little oversight or control by other governmental elements. The alternative structure is to vest these powers in an independent state agency — such as a ministry, legislative committee, or regulatory body (for example, the Norwegian Petroleum Directorate or Oman's Directorate General of Management of Petroleum Investments) — that is typically overseen by a country's legislature, a higher regulatory agency, or even the executive office. It comes as no surprise that NOCs are not transparent entities (Victor, Hults and Thurber, 2012; Ross, 2012; Stevens, 2007). The vast majority of NOCs with contract-granting powers do not publicly disclose information about contracts, tenders, and the list of bidders vying for concessions (Revenue Watch Institute,

2013). Government agencies, on the other hand, are pressured to publish information given their formal ties to legislatures and judiciaries (even in authoritarian regimes), and informal ties to the mass public (O'Donnell, 1973; Wilson, 1989).

Table 3.1: Transparency in oil governance for 39 oil-producing countries, 2012.

Resource Governance Indicator	No NOC	Non-regulatory NOC	Regulatory NOC
Reporting Practices	54.6	60.5	43.9
Enabling Environment	49.3	54.0	27.0
Composite Transparency Score	55.0	59.8	42.1
N	*8*	*11*	*20*

Transparency in oil governance in 2012 is measured by the Resource Governance Index (range: 0-100, higher values indicate more transparency). Regulatory NOCs represent countries with NOCs that have contract-awarding authority. A full list of countries in each case is presented below in Table 3.2. Source for Resource Governance Indicators: Revenue Watch Institute (2013).

Data on fiscal transparency show support for this claim. Using the Resource Governance Index as a measure of transparency in resource-producing countries, I am able to show in Table 3.1 that countries with NOCs which have contract-awarding authority – which I refer to in chapter one as regulatory NOCs – fare worse on the index (which runs from 0 to 100, with higher values representing more transparency) when compared to countries without NOCs or with NOCs that do not have contract-awarding authority. This is true for three separate measures of transparency: (1) reporting practices with respect to making information about revenues and contracts public; (2) the "enabling environment" which captures government effectiveness, the opacity of budgets, and broad accountability; and (3) a general score of transparency.[5] Placing contract-awarding authority in the

[5]See Revenue Watch Institute (2013) for more details on this measure and how the scores are computed. In brief, the index is compiled using surveys filled out by country experts about how easy it is for a member of the general public to access a variety of information about resource production, revenues, trade volumes, contract and license information, and several

hands of NOCs instead of other government agencies therefore reduces the visibility of how contracts are decided, thereby lowering the costs and probability of getting caught for both the briber and the bribe recipient.

It is important to note that the argument put forth here is not tautological: that is, I am not arguing that "corrupt payments to government officials to win contracts are more likely when government officials control the awarding of contracts." In nearly every country where oil is produced in commercial volumes, subsoil resources are sovereign properties of the state and the authority over contract allocations is vested in the offices of public officials. Even in the United States, perhaps the most deregulated and decentralized oil-producing country in the world, firms seeking to produce oil in federal territories (including the offshore Gulf of Mexico oil fields) must obtain contracts from the Department of the Interior. Thus in any regulatory structure — non-nationalized, nationalized with contract-awarding NOCs, or nationalized without contract-awarding NOCs — there is the possibility for corrupt payments to public officials to procure concessions and licenses. What makes the contract-awarding NOC structure most susceptible to corruption is a concentration of contract-granting authority in an opaque organizational environment, which reduces transactions costs and the probability of being exposed engaging in corrupt behavior.

To illustrate the role of NOCs with contract-awarding authority in corrupt practices, consider the following transcript from a DoJ-prosecuted case of a FCPA violation in Kazakhstan:

> Beginning in or about 1997, the Government of Kazakhstan and the national state-owned oil company, Kazakhoil, entered into a Final Production Sharing Agreement with a consortium of four international oil companies known as the Karachaganak Integrated Organization

other indicators. See http://www.revenuewatch.org/rgi/report for a complete listing of questions used in the survey.

("KIO"), for the development and operation of the oil production facilities in Karachaganak.

Four international oil companies formed the Karachaganak Petroleum Operating Company, B.V. ("KPO"), a company organized and registered under the laws of The Netherlands, which maintained its principal offices in the Republic of Kazakhstan. KPO was responsible for developing and operating the Karachaganak field on behalf of all partners in the KIO joint venture. KPO solicited bids from outside vendors for comprehensive oil-field drilling services and products, including project management, oil drilling and engineering support.

Although it was not a member of the consortium, Kazakhoil wielded considerable influence as Kazakhstan's national oil company and, in effect, the ultimate award of a contract by KPO to any particular bidder depended upon the approval of Kazakhoil officials.

Ultimately, it was Texas oil services company Baker Hughes Inc. that was approached by agents connected to Kazakhoil to pay a "supplementary fee" of 3% of the total revenue earned by the firm should it win the contract. Needless to say, in October 2000, Baker Hughes was awarded the Karachaganak contract. Merely seven years later, the firm was prosecuted and charged for violating the FCPA for this bribe along with a second bribe intended to secure an oil pipeline contract, with the SEC releasing the following statement:

Baker Hughes paid approximately $5.2 million to two agents while knowing that some or all of the money was intended to bribe government officials, specifically officials of State-owned companies, in Kazakhstan. The complaint alleges that one agent was hired in September 2000 on the understanding that Kazakhoil, Kazakhstan's national oil

> company at that time, had demanded that the agent be hired to influence senior level employees of Kazakhoil to approve the award of business to the company. Baker Hughes retained the agent principally at the urging of Fearnley (the first agent). According to the complaint, Fearnley told his bosses that the "agent for Kazakhoil" told him that unless the agent was retained, Baker Hughes could "say goodbye to this and future business." Baker Hughes engaged the agent and was awarded an oil services contract in the Karachaganak oil field in Kazakhstan that generated more than $219 million in gross revenues from 2001 through 2006.

The bribes paid by Baker Hughes went to Zhakyp Marabayev, who was on the board of Kazakh Oil from 1999 to 2001 and later became deputy director of the state-owned subsidiary North Caspian Oil Company.[6] This case illustrates not only that the bribe recipients were concentrated in the NOC, but also that the bribe recipients wielded considerable authority over the delivery of successful contract awards. The board of directors of Kazakhoil had the final say on which companies would win the concession for the Karachaganak oil fields, with no mention of other government agencies involved in the contract-awarding process.[7]

From this vignette and the above arguments, I consider the following testable hypothesis: *Among oil-producers, corruption is higher in states with NOCs with contract-awarding authority than in states without NOCs and states without contract-awarding NOCs.* Notice that this proposed explanation for variance in oil-related

[6] "Kazakhstan: Baker Hughes Seeks to Limit Fallout from FCPA case," Wikileaks case id 07ASTANA919_a, dated April 11, 2007. Accessed April 14, 2014, from http://www.wikileaks.org/plusd/cables/07ASTANA919_a.html.

[7] This regulatory structure changed in 2010, when a new Ministry of Oil and Gas was established to manage contracts and play the role as primary regulator of oil and gas development in the country. A report by the U.S. Energy Information Administration notes that "with this realignment, [the NOC] is no longer involved in the regulation of the sector, effectively removing the potential for conflicts of government and commercial interests." See United States Energy Information Administration, (2013), "Kazakhstan," Country Analysis Brief. Accessed 25 Aug 2014 from http://www.eia.gov/countries/analysisbriefs/Kazakhstan/kazakhstan.pdf.

corruption does not identify nationalization by itself as the culprit for corrupt governance. The salient dimension of this process is whether regulatory powers are vested in state-owned enterprises or instead in independent state agencies.

A final point is warranted before turning to a discussion of data and methods. Because the institutional choice of regulatory structure is by no means exogenous to political factors, it could be the case that corrupt leaders choose to establish a regulatory NOC whereas non-corrupt leaders choose either not to nationalize or to nationalize but with a NOC without contract-awarding authority. In the discussion section, I analyze whether the quality of pre-existing governance correlates with the decision to nationalize and to establish a NOC with regulatory authorities. In short, I do not find any evidence at the time of nationalization that countries which adopt the regulatory NOC structure are any more corrupt than countries choosing to vest contract-awarding authority in agencies other than the NOC.

3.3 Data

Testing the relationship between regulatory structure and corruption requires reliable measures of oil-related institutions and of corrupt behavior in the oil sector. In this section, I propose and describe new measures for each.

3.3.1 National oil company data

My analysis in this chapter continues the use of the NOC data presented in chapters one and two. More relevant to this chapter, however, is not the presence and establishment of a NOC, but rather the contract-awarding structure of the oil industry as it is manifested through the type of NOC in place, if there is one. Here I define and measure a NOC with regulatory authority as having the capacity to solicit and award licenses, contracts, and/or blocks for oil exploration

and production to operating companies (such as ExxonMobil or BP), or service companies (such as Halliburton or Schlumberger). These regulatory NOCs are typically autonomous in making decisions on which bids ultimately are awarded concessions (with the board of directors of the NOC playing a prominent role in the decision-making process). Keeping with the discussion in chapter one, this category includes both the regulator NOC without production capacity and the integrated NOC types.

For example, the Peruvian state-owned oil company PeruPetro is outfitted with the authority for engaging in joint venture contracts and participatory production agreements with outside firms. According to the country's petroleum law (Law No. 26221, amended 1993), "In its status as a Contracting Party, vested upon it by the Government in keeping with the present law, PERUPETRO S.A. may negotiate, enter into and supervise the Contract, which this Law establishes; as well as the technical evaluation agreements."[8] This is in contrast with NOCs that do not have regulatory or contract-awarding powers, which I refer to as non-regulatory NOCs (this category includes both hollow NOCs and producer NOCs). In these cases, regulation is vested in a separate and often independent agency such as a ministry, regulatory agency, or government department. In Brazil, for instance, state-owned Petrobras and its board do not have any authority over which companies are awarded production contracts. Instead, Article 8 of Law No. 9478 (1997) stipulates that the independent National Agency of Petroleum (ANP) has the authority to award licenses to operating firms (for participation in joint ventures with Petrobras) subject to parliamentary review.

As also described in chapter one, I use primary documents such as these petroleum laws to categorize the regulatory structure of all oil-producing states, including countries without NOCs, whose regulatory structure is similar to the

[8]Article 6 of Law No. 26221, "Organic Law for Hydrocarbons," amended by the eleventh Supplementary Provision of Law No. 26734.

non-regulatory NOC cases where ministries or agencies have authority to award concessions. Though I have assembled these data for all states since 1900, for the purposes of this chapter I focus only on the most recent year of data, 2012.[9] The categorization of cases into no NOC, non-regulatory NOC, and regulatory NOC is presented in Table 3.2, disaggregated by broad region to allow for ease of geographical comparison. There is little geographical clustering of institution types, such that no one region dominates a specific regulatory structure nor does one regulatory structure dominate a given region. Note, however, that most Middle Eastern and African states have NOCs, though there is reasonable balance across both regulatory and non-regulatory NOCs in each region.

Conditional on nationalization, what factors might influence a state to choose a regulatory NOC over a non-regulatory NOC? While I leave a more rigorous empirical analysis of this question to the discussion section, here I review selected examples of NOC formation to trace out the process of this institutional choice. Consider the case of nationalization in the United Arab Emirates. When Sheykh Zeyed established the Abu Dhabi National Oil Company (ADNOC) in 1971, he and his council decided that contract-awarding authority would be vested in another agency and not ADNOC.[10] This was part of a broader agenda of what Zeyed called "partial nationalization" that would allow international oil companies to continue with favorable contracts and regulations, a choice which Rai and Victor (2012) attribute to the high geological risks inherent in the country's nascent oil and gas fields.

In contrast, exploration and production in nearby Kuwait was not so risky

[9]The categorization of NOCs in 2012 is the same as in 1997, the starting point in the statistical analysis below, except for Kazakhstan which switched to a non-regulatory NOC in 2010 and three new NOCs in Congo-Kinshasa, Congo-Brazzaville, and Equatorial Guinea in 1998–2001.

[10]This other agency was known as "The Petroleum Department." In accordance with Law No. 8 of 1978, "all oil operations and relations with the operating companies of those which have concession agreements should be carried out" by the regulatory agency and not ADNOC. This agency was re-established as the Supreme Petroleum Council (SPC) by Law No. 1 of 1988, with decisions regarding contracts to be made in conjunction with both the monarch and the *Majlis al-Wattani al-Ittihadi* (Parliament).

Table 3.2: Categorization of regulatory structures for all oil-producing states as of 2012

Region	No NOC	Non-regulatory NOC	Regulatory NOC
Americas	Belize Barbados Canada Cuba Suriname USA	Argentina Brazil Colombia Peru Trinidad & Tobago Venezuela	Bolivia Ecuador Mexico
Asia & Oceania	Australia New Zealand Papua New Guinea Thailand	India* Pakistan*	Brunei China Indonesia Malaysia Vietnam
Europe & Eurasia	Albania Austria Belarus Croatia Romania UK	Denmark Netherlands Norway Russia	Azerbaijan Kazakhstan Turkmenistan Uzbekistan
Middle East & North Africa	Afghanistan Turkey	Bahrain Egypt Oman Qatar Saudi Arabia Tunisia UAE	Algeria Iran Iraq Kuwait Libya Syria Yemen
Sub-Saharan Africa	Chad Gabon	Ghana Equatorial Guinea Uganda	Angola Cameroon Congo, Dem. Rep. of Congo, Rep. of Nigeria Sudan
Total:	*20*	*22*	*25*

Oil-producer is defined as producing greater than $100 of per capita income from the sale of oil and gas in 2011 (Ross, 2012). The total sample includes 67 countries, with no missing values. (∗) *Though they do not meet the threshold requirement of oil producer, India and Pakistan are included in the table for illustrative purposes given the prominent role their NOCs (ONGC in India and PSO in Pakistan) play in their respective political economies. Other countries with NOCs that do not meet the threshold of oil-producer (and not represented in this table) are Chile, Poland, and South Africa.*

given the history of commercial oil operations since 1934 (Ward, 1965). After the nationalization of the Western-owned Kuwait Oil Company (KOC) during the 1972–74 period by then-Emir Sabah III al-Sabah,[11] Emir Jaber al-Sabah established the Kuwait Petroleum Corporation (KPC) as both the lead producer of the country's oil fields and the regulator of all joint ventures and production-sharing agreements (Zahlan, 1998; Stevens, 2008).[12] Unlike the UAE, Kuwait's monarchs were not influenced by tough geological constraints which would have forced the state to adopt a strong regulatory agency to manage licenses to international firms.

Regulatory authority is not necessarily tied to production capacity.[13] In Cameroon, the nationalization of the French oil company Elf Aquitaine in 1980 led to the creation of the state-owned oil company, Société Nationale de Hydrocarbures (SNH). In contrast to ADNOC or KPC, SNH was not founded as an operator or producer of oil; the company only plays a regulatory role wherein SNH manages licensing contracts (Soares de Oliveira, 2007).[14] While the state decided against establishing a producing NOC, it opted for a NOC with contract-awarding authority to serve as an intermediary between the state and foreign oil companies in joint ventures (Gauthier and Zeufack, 2009). Given favorable geology, the NOC can monitor foreign operators with little information asymmetry, making licensing oversight a

[11]The process of nationalization was formalized with the General Agreement on Participation in 1972 whereby companies would be compensated by the state to the tune of $200 per barrel of oil capacity to gain state-owned equity shares. In Kuwait, the originally agreed upon 25% share was increased to 40% in 1972, to 60% in early 1974, and to 100% in mid 1974, when KOC (and others) became a fully state-owned company.

[12]The petroleum law stipulates in particular that "the Board of Directors (of KOC) shall have powers for ... takeover of existing companies, participating therein, or cooperating therewith in joint activities." (Government of Kuwait, "Decree Promulgating Law No. 6 Concerning the Establishment of the Kuwait Petroleum Corporation," amended 4 Sep, 1980.)

[13]See Table 3.5 in the Appendix for a cross-tabular breakdown of the 50 countries with NOCs as of 2012.

[14]Article 4 from Presidential Decree 13-3 of March 1981 stipulates that "the National Hydrocarbon Company (SNH) conducts all studies, collects all information, supervises the execution of contracts between the state and foreign oil companies, and undertakes the training of Cameroonian personnel relative to the petroleum industry." Translation from French provided in Mark D. DeLancey, Rebecca Mbuh, and Mark W. DeLancy (eds.) (2010), *Historical Dictionary of the Republic of Cameroon* (Lanham, MD: Scarecrow Press, p. 347).

relatively straightforward endeavor without having to shift to a more established and intricate regulatory agency.[15]

In neighboring Equatorial Guinea, the NOC (Gepetrole) similarly lacks operational capacity, which is handled exclusively by international oil companies. But here the geology is more complex than in Cameroon given the location of wells in deepwater offshore fields (Mobbs, 2001). As such, President Obiang opted for what I refer to in chapter one as a hollow NOC wherein the state-owned oil company neither produces nor regulates but instead only serves as a holding company allowing the state to collect revenues from other operating firms (Victor, Hults and Thurber, 2012). Because the state lacks even the capacity to discern the appropriate firms to explore and produce its oil, contract-awarding authority is outsourced to Western oil services firms such as InSies Terra and Glencore (Soares de Oliveira, 2007; Silverstein, 2014). This makes for a non-regulatory and non-producing NOC where theft might be rampant (McSherry, 2006), but there is little opportunity for NOC agents to solicit bribes from operating firms.

While far from being an exhaustive list of cases, these four are representative of institutional choices in developing countries that have nationalized the oil sector. Political factors may drive the decision to nationalize (as I argued in chapter two) but the specific institutional choices made by leaders upon nationalization appear driven to a larger extent by geological context and the timing of nationalization with respect to the country's oil production history. Further, countries with high levels of corruption prior to nationalization — such as Cameroon and Equatorial Guinea — seem to opt for both regulatory and non-regulatory NOCs, providing some preliminary evidence that corrupt leaders are not embracing one institutional choice over the other.

[15]Much of the country's oil is offshore but in relatively shallow waters (less than 75 feet deep) and the quality of crude is high (around 34 API gravity and mostly free of sulfur); both the location and quality of reserves are illustrative of a relatively "easy" petroleum geology.

3.3.2 Corruption data

Within the political economy literature, corruption is a well-defined concept — the misuse of public office for private gain. Specific to the argument I present in this chapter is a narrower definition of corruption as any "illegal or unauthorized transfer of money or in-kind payment" (Rose-Ackerman, 1975), which for the case of bribes to high-level government officials is referred to as grand corruption.

Measuring corruption, however, has proven difficult, particularly in cross-national settings given the expected differences between what constitutes an illegal payment in differing contexts (Treisman, 2007). For this reason, among others, the first cross-national studies of corruption relied on measures obtained by surveying country experts on their perceptions of corruption in a given country, notably Transparency International's Corruption Perceptions Index (CPI) or the World Bank Governance Index (KKZ) (Ades and Di Tella, 1999; La Porta et al., 1999; Kaufmann, Kraay and Zoido-Lobatón, 1999; Treisman, 2000; Persson, Tabellini and Trebbi, 2003). Unlike the incidence of corrupt activities, perceptions of corruption by experts having conducted business in a given country are more comparable.

Yet these measures do not allow for any analysis of quantifiable acts of corruption. They can be biased by any number of outside factors such as unfavorable media coverage of a country's business sectors or idiosyncratic personal experiences of survey respondents (Treisman, 2007; Donchev and Ujhelyi, 2014; Escresa and Picci, 2014; Golden and Mahdavi, 2015).[16] Nor can perceptions-based measures like the CPI or KKZ scores be employed for analysis of corruption in sector-

[16]Other measures that are more experience-based — such as the UN Interregional Crime and Justice Research Institute (UNICRI) and the World Bank's World Business Environment Survey (WBES) — ask survey respondents about their experiences in which a government official asked or expected the respondent to pay a bribe for his/her services. Yet even these measures are difficult to compare across countries: there might be local differences in what counts as an "expected bribe" versus what is just the "tax" one has to pay for certain government services (Clarke, 2012).

specific contexts. More recent studies such as Olken (2007), Golden and Picci (2005) and Di Tella and Schargrodsky (2003) address this problem by measuring differences in prices and costs of goods and services such as infrastructure construction and hospital equipment over time. Yet, as Treisman (2007, 216) notes, "clearly, these approaches would be hard to extend cross-nationally." How can we reliably determine the causes of corruption when corruption is either poorly measured or captured in contexts that are difficult to generalize cross-nationally? Further, how can we capture what determines corruption in one specific sector of a country's economy?

To address this measurement problem, I introduce a new cross-national dataset of grand corruption that is not only comparative and quantifiable, but also sector-specific. Using this measure, acts of corruption can be disaggregated by business sectors such as telecommunications, pharmaceuticals, and relevant for the current study, the oil and gas sector. What I propose and measure are the quantifiable penalties paid by firms for violating the U.S. Foreign Corrupt Practices Act by bribing or intending to bribe foreign government officials. Specifically, I measure corruption in a given country by the level and number of penalties assessed for violations of the FCPA within that country's oil and gas sector.

The FCPA was enacted in 1977 in the U.S. to prosecute any firms — either based in the U.S. or with securities listed in U.S. stock exchanges — doing business abroad that were bribing government officials, who are defined as "any officer or employee of a foreign government or any department, agency, or instrumentality thereof."[17] Prosecutions are made by the DoJ and SEC. To get a sense of the scope of prosecutable companies, consider that seventy-six of the *Oil and Gas Journal* "Top 100" oil and gas companies outside the United States are eligible for prosecution under the FCPA given their listing of equities on an American

[17] 15 U.S.C. §§78dd-1. See also §78m regarding prosecution of foreign-based firms with shares listed on U.S. stock markets.

stock exchange.[18] This list even includes national oil companies such as CNOOC (Nasdaq: CEO), PetroChina (NYSE: PTR), EcoPetrol (NYSE: EC) and Gazprom (NYSE: OGZPY, traded as "over-the-counter").[19]

Since 1977 up to 2013, there have been 143 prosecuted cases, with 41 cases involving firms accused of bribing officials for contracts related to the oil and gas industry. Within these 41 oil-related cases there are 337 specific violations of the FCPA. The majority (64%) of cases have been prosecuted during the 2007–2013 period, indicative of the U.S. government's active policy to ramp up anti-corruption measures during the tail end of the George W. Bush administration (United States Department of Justice, 2012).

For each case, the DoJ or SEC provides detailed information along with supplementary case documents outlining the following facts: (1) the firms involved in bribery allegations, (2) the countries in which bribery was taking place, (3) the government institution or organization soliciting/accepting bribes in the host country, and (4) the penalties paid by prosecuted firms for violating the FCPA. There is also information on the size of the bribes paid and the value of contracts for which bribes were extorted, though these data are not available for all cases.

Consider the example of the FCPA prosecution of Total, S.A., a French oil and gas firm publicly-traded on the NYSE and other international stock exchanges. During the 1995–2002 period, Total made illicit payments to Iranian officials at the National Iranian Oil Company (NIOC) to ensure the successful awarding of concessions to the offshore Sirri oil and gas fields in the Persian Gulf. Information purporting illegal activity was reported by a whistle-blower to the SEC and French regulatory authorities, with the case ultimately being settled in May 2013. The

[18] A list of the top 100 companies by production is available at http://www.ogj.com/content/dam/ogj/print-articles/Volume111/sept-02/OGJ100-Leading-oil-and-gas-companies-outside-the-US.pdf

[19] NOCs not listed in any way on a U.S. stock exchange include 15 of the 16 NOCs in the Middle East and Africa (South Africa's Sasol Ltd is traded on both the NYSE and Nasdaq), as well as Mexico's Pemex, Venezuela's PdVSA, Indonesia's Pertamina, and Malaysia's Petronas.

following passage offers an illustration of the type of information contained in the court documents:

> ... [A]t the direction of the 'Iranian Official', TOTAL paid approximately $44 million over a seven-year period to accounts designated by an intermediary. TOTAL mischaracterized the payments under various consulting agreements as 'business development expenses,' when they were, in fact, unlawful payments for the purpose of inducing the Iranian Official to use his influence in connection with the granting of development rights to the Sirri A and E and South Pars fields, and improperly characterized the unlawful consulting agreements as legitimate consulting agreements.

This case provides a clear example of (a) the ability of the DoJ and SEC to prosecute non-American firms, (b) the amount of bribes paid to a foreign official, (c) the country in which bribes were paid, and (d) the intended contract for which the firm paid bribes. Importantly, the case also identifies the target of the bribe and his/her perceived authority to ensure a successful contract award upon payment of a bribe. In other documents connected to the case, the DoJ and SEC identified that the 'Iranian Official' was the managing director of a NIOC subsidiary and on the board of directors of NIOC. Further, the case documents identified the penalty amount paid to the DoJ ($398 million).

To create the FCPA measure of corruption, I aggregate penalty amounts drawn from all oil-related FCPA cases by country. For the Total case, all of the bribe-related activity took place in Iran and so the penalty amount is added to other penalty amounts from other Iran FCPA cases. For some cases, there are bribes directed towards foreign officials in multiple countries; in these instances DoJ documents provide penalties broken down by country.

There are 41 cases concerning 337 FCPA violations that occur in the oil, gas, or

other energy sectors; 37 of these cases occur in the 1997–2013 period. Violations were prosecuted in 40 unique countries with an average $63.3 million paid in penalties by firms doing business in these countries.[20] There are 52 additional countries in which no energy-related FCPA violations were prosecuted but in which there were violations in other economic sectors. The full list of cases, including countries in which offenses took place and firms implicated, is presented in Appendix 1. Since this study only looks at corruption in the oil sector, I restrict the analysis to oil-producing countries as defined above. This leaves a total sample of 39 countries with data on FCPA violations out of a possible 63 oil-producing countries.[21]

As is the case with any cross-sectional measure in the social sciences, the FCPA measure of corruption comes with some notable shortcomings. First, countries in which no American firms or multinationals listed on U.S. stock exchanges operate are not eligible for FCPA violations. A country like Somalia, for instance, is omitted from the FCPA data because no prosecutions of violations are possible. Nonetheless, there are few countries on the planet that are completely closed off to foreign multinationals. Even South Sudan, under heavy sanctions, contains foreign operators in the oil industry such as Canada's Talisman Energy (NYSE: TLM).

A second and perhaps more problematic issue is that FCPA cases are prosecuted with political motivations. That is, the DoJ and SEC might be *a priori* inclined to pursue some companies more than others, making the probability of being caught not equal across cases of prosecutable bribery. For example, say there is

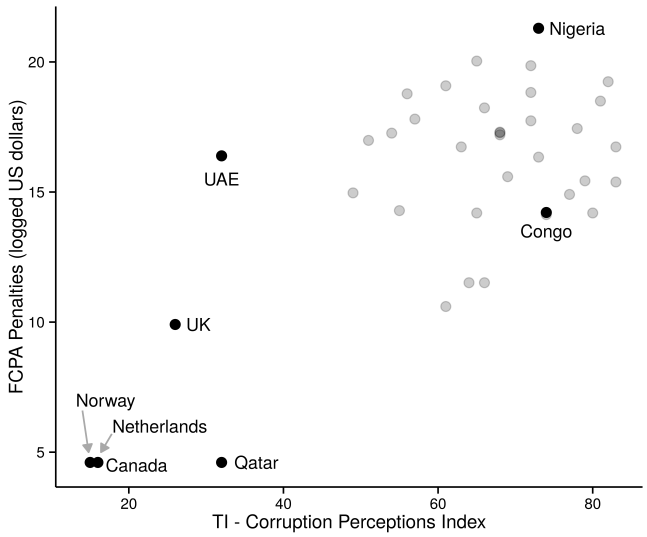
[20]The penalties paid by firms in violation of the FCPA are proportional to (a) the perceived amount of bribes paid to foreign officials and (b) the estimated net gain in revenue from having won a contract for which a bribe was paid (Karpoff, Lee and Martin, 2014). For FCPA cases in the energy sector for which bribe amounts are available (spanning 21 different countries), the average bribe-to-penalty ratio is 0.23, implying that penalties are roughly four to five times as large as the perceived bribe amount paid or intended to be paid.

[21]This list does not include minor producers such as India, Pakistan, and Uganda which have national oil companies and data on FCPA violations.

a protectionist executive agenda that pressures the DoJ to go after non-American firms like Total and BP more than American firms. Then, the resulting FCPA measure of corruption might be over-estimating oil-related bribes in Franco-phone and Anglo-phone countries relative to countries where primarily U.S.-based firms like Chevron do business (e.g. Liberia, The Philippines, Iraq). However, with respect to corruption in the oil industry this pattern is difficult to accept based on the data: since the oil industry is dominated by a small number of international oil companies, nearly all major oil companies have been prosecuted with FCPA violations, be they American (Chevron, ConocoPhillips, Baker Hughes) or non-American (Total, BP, Royal Dutch/Shell). Further, based on financial models of FCPA prosecutions, Karpoff, Lee and Martin (2014) show that the prosecution probability of bribe-related activity by any given firm has low variance across firms and countries in the sample (and is centered around 6%).

To assess the relationship of this measure with existing corruption data, I compare the FCPA measure of corruption across all economic sectors to the Transparency International Corruption Perceptions Index (CPI) from 2012. In Figure 3.2, I present the graphical correlation of the two measures for major oil-producing countries. The Pearson correlation between the two indicators is 0.72. Countries ranked as "highly transparent" on the CPI, such as Canada, the Netherlands, and Norway, have the lowest FCPA penalties assessed. Moving away from this cluster, the relationship between FCPA penalties and CPI score is less clear. Indeed, when countries in the bottom left corner of the plot are removed, the Pearson correlation drops to 0.09. This would suggest that aside from the highly developed oil-producers in the OECD, perceptions of corruption (as captured by CPI scores) do not correlate with bribery to high-level government officials (as captured by FCPA penalties). Indeed, countries with the same CPI scores such as Qatar and the UAE or the Congo and Nigeria, have drastically different levels of FCPA violations occurring within their borders.

Figure 3.2: FCPA penalties and perceptions of corruption among major oil producers, 1997-2013



Correlation among major oil producers between FCPA violation penalties (in logged US dollars) and Transparency International's CPI measure of corruption (scale reversed so that higher values indicate more corruption). The correlation coefficient is 0.72*. After excluding outlying points in the bottom left of the plot, this correlation drops to* 0.09*. Note that the FCPA penalties are for all sectors, including corruption in the oil sector.*

The UAE in particular is an interesting example of the disconnect between perceptions of corruption and corruption in practice. While the Emirates are often believed to be relatively free of corrupt practices — a perception that is reflected in corruption measures from the World Bank and the International Country Risk Guide (ICRG) as well — FCPA violations in the country exceeded $13 million across all sectors. This places the UAE as the 36th most corrupt out of 90 countries in the FCPA all-sector sample, on par with countries more commonly associated with corruption such as Angola and Turkmenistan. The mismatch between the CPI and FCPA measures for cases such as the UAE speaks to existing measurement concerns in the literature, notably that "perceived corruption may reflect many other things besides the phenomenon itself" (Treisman, 2007, 215).

3.4 Methods for measuring and predicting corruption

The disconnect between corruption measures presents an interesting methodological challenge. While the FCPA measure is sector-specific and captures quantifiable acts of corruption, it comes with the caveats identified above. One way to address these concerns is to leverage the information contained in existing measures of corruption (such as the CPI) with estimates of the proposed FCPA measure. But how can we reliably capture information from both sources? How can we combine a perceptions-based measure of broad corruption with an incidence-based measure of sector-specific corruption?

I consider two approaches to address this challenge. The first is to consider the processes as related and employ a bivariate outcome model, which is often referred to as a seemingly unrelated regressions (SUR) model. The second is to model the two measures as latent indicators of the same underlying outcome, namely the level of inherent corruption in a given country, which is unobserved to the researcher. I focus on the first approach throughout the text, but interested

readers should consult the appendix for modeling and results from the second approach.[22]

There are seven predictors in the analysis measured at the country (j) level, averaged across the timeframe of FCPA data considered, 1997-2013: a constant (x_{1j}), a binary variable for the existence of a regulatory NOC[23] (x_{2j}), and controls based on existing explanations for corruption, including logged GDP per capita (x_{3j}), logged oil income per capita (x_{4j}), non-energy-related FCPA violations (x_{5j}) to account for corruption in other economic sectors, democratic institutions as measured by Polity scores (x_{6j}), and freedom of information and the press as measured by newspaper circulation (x_{7j}). There are two outcome measures: FCPA penalties and the TI-CPI scores discussed above. Instead of using the raw FCPA penalties, I normalize this measure to account for differences in the levels of oil production across countries. This follows from the expectation that countries with more oil production will solicit contracts with larger monetary values, and therefore attract larger bribes and subsequently larger FCPA penalties if caught. I normalize these data by dividing the FCPA penalties value (in US dollars) by the average oil production in each country (in thousands of barrels per year).[24]

If we consider perceptions of corruption as conceptually related to quantifiable acts of corruption, then one approach (among several)[25] is to assume that the error

[22]The results from the second approach can be viewed as a parameter restriction on the SUR model, where estimated effects are restricted to being proportional across the models of both outcome measures (Bollen, 1998). This characterization only holds because the predictors in the SUR model are the same across both outcomes.

[23]For robustness, I also try a categorical variable with three levels: no nationalization, nationalization without a regulatory NOC, and nationalization with a regulatory NOC. The results are consistent with using a binary measure in terms of the comparison between regulatory NOC and no NOC, and an even larger difference between the regulatory NOC and non-regulatory NOC, which is predicted to have lower corruption levels than the no NOC case as well. See Figure 3.9 in the Appendix.

[24]In the Appendix I present results using the non-normalized FCPA penalties; the results are substantively the same.

[25]Alternative approaches include two-step models, instrumental variables models, and structural equations models. Further, one could use the perceptions-based measures as priors in a Bayesian framework that models the determinants of FCPA violations, though problematically both measures are potentially representing the same unobserved outcome, which in this case

terms of both equations are potentially correlated and can be estimated from the data. This approach would suggest the following bivariate normal specification:

$$\begin{bmatrix} Y_{j1} \\ Y_{j2} \end{bmatrix} \sim \mathcal{N}\left(\begin{bmatrix} \mathbf{X_j}'\boldsymbol{\beta}_1 \\ \mathbf{X_j}'\boldsymbol{\beta}_2 \end{bmatrix}, \begin{bmatrix} \sigma_{j11} & \sigma_{j12} \\ \sigma_{j21} & \sigma_{j22} \end{bmatrix} \right) \tag{3.1}$$

where Y_{j1} and Y_{j2} represent the FCPA penalties and the CPI score, respectively, for country j; $\mathbf{X_j}$ is a matrix of country-level covariates including regulatory structure; and $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are vectors of coefficients to be estimated for each model. The scale matrix (which can be denoted $\boldsymbol{\Sigma}$) contains normally distributed error terms for each model along with a term to capture cross-equation covariance, where $\sigma_{j12} = \sigma_{j21}$. The model is equivalent to the SUR model proposed by Zellner (1962).[26] Note that by using a SUR model, I am not improving the efficiency of the estimates of $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ beyond what can be gained from running separate OLS models. What is gained from using this approach is a model with fewer assumptions about the data structure,[27] as well as the ability to estimate the correlation of variances across both perceptions-based and incidence-based measures of corruption as predicted by the same covariates $\mathbf{X_j}$.

These models are estimated using a Bayesian framework.[28] Among others, two reasons stand out for this methodological choice. First, Bayesian analysis allows for easier interpretation of results and the uncertainty of estimated quantities (Jackman, 2009). Second, computation of the bivariate model is more straightforward using Markov Chain Monte Carlo methods given the weak identification

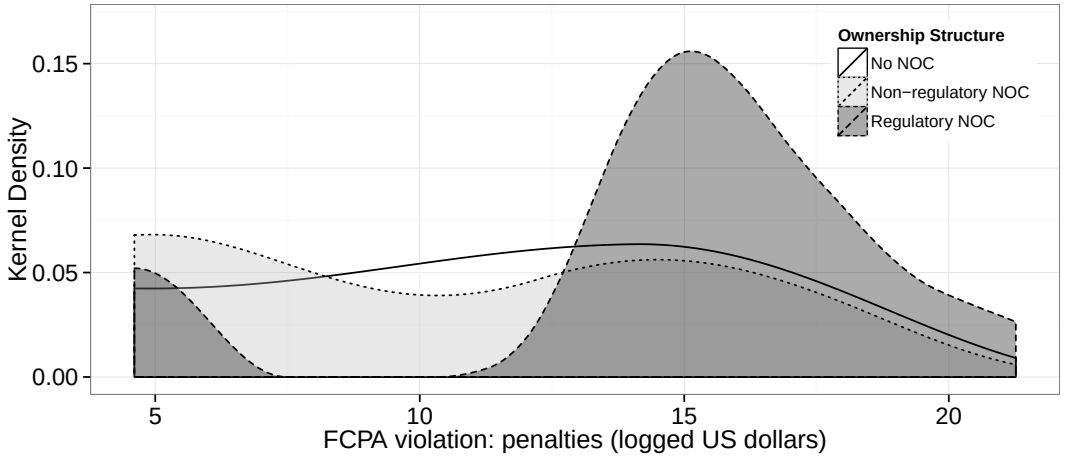
would be "underlying corruption" in a given country. The approach developed in this paper's appendix considers this problem using a latent measurement model, along with a brief analysis of the more familiar factor analysis and principal components models.

[26] One difference of note is that in this case the parameters in the scale matrix $\boldsymbol{\Sigma}$ follow an inverse-gamma distribution instead of a Gaussian distribution. See also A. C. Aitken (1935), "On Least-Squares and Linear Combination of Observations," *Proceedings of the Royal Society of Edinburgh*, 55: 42-8.

[27] In particular, the SUR model relaxes the assumption that the two processes of perceived and quantifiable corruption are independent of one another.

[28] Note: non-informative priors are used throughout the analysis.

Figure 3.3: Distribution of FCPA penalties in logged U.S. dollars for 39 oil-producing states.



Note that here the penalties are only for violations of the FCPA in the oil and gas sector, not for all sectors as in Figure 3.2.

of all parameters in the model, which is further exacerbated by the small sample size ($n = 39$ countries with complete data).[29]

3.5 Results

I find support for the hypothesized relationship between regulatory NOC ownership structure and oil-related corruption levels as measured by FCPA penalties per thousand barrels of annual oil production. States with regulatory NOCs have higher corruption levels than states without NOCs or with NOCs without regulatory authority. The results provide stronger evidence for the relationship between regulatory structure and oil-related corruption than for a relationship between NOC structure and social corruption more broadly, as measured by TI-CPI scores. This is to be expected given the weak theoretical connections between regulatory

[29]For robustness, the bivariate models are estimated using maximum likelihood techniques along with conventional OLS regressions of each outcome as separate models, with results presented in Appendix 1.

structure in the oil industry and corruption in all aspects of the economy.[30]

To assess the immediate relationship between regulatory structure and corruption, in Figure 3.3, I show a simple bivariate analysis of nationalization structures and FCPA penalties in the oil sector using overlapping kernel density plots. Prior to any statistical modeling, the data show that states with regulatory NOCs (shaded in dark gray) almost exclusively have high corruption levels, while states without NOCs or without regulatory NOCs have lower levels of corruption, though notably the non-regulatory NOC cases show the highest variance.

Results from the Bayesian SUR models are plotted in Figure 3.4, which visualizes the posterior distributions of the estimated coefficients of the regulatory NOC indicator and the various control measures for both oil-related FCPA violations and TI-CPI scores as the two dependent variables of interest. To allow for ease of comparison, both outcome measures and all control variables have been standardized.

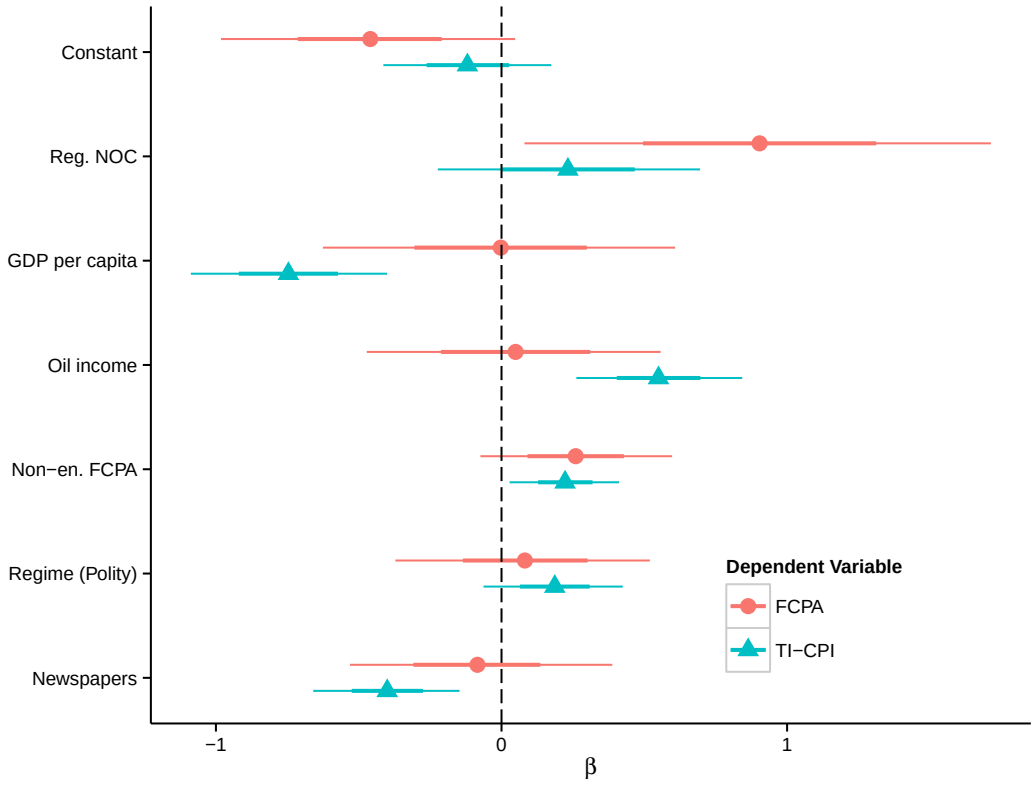
When modeling the FCPA corruption measure using the SUR approach, I find that a regulatory NOC structure corresponds to an increase in corruption by 0.9 standard deviations.[31] Posterior predictions imply that the average country with no NOC or a NOC without contract-awarding authority is predicted to have somewhere between \$0.37 and \$1.05 in FCPA penalties per thousand barrels of oil production with a median \$0.63 in penalties, whereas a country with a regulatory NOC is predicted to have somewhere between \$0.96 and \$2.59 in FCPA penalties per thousand barrels of oil production with a median of \$1.56 in penalties.[32] To put these numbers in perspective, consider a country like Iran, with an average of 1.4 billion barrels of annual oil production (across the 1997–2012 period). The

[30]This difference diminishes when restricting the sample to oil-dominated economies such as Saudi Arabia or Angola, with high levels of oil income per capita and oil income per unit of GDP.

[31]Note this is an identical estimate to modeling FCPA measures alone using OLS which are presented in Table 3.7 in the Appendix.

[32]Similar results from a model which includes terms for both non-regulatory NOCs and regulatory NOCs (with the no NOC case as the baseline) are presented in Figure 3.9.

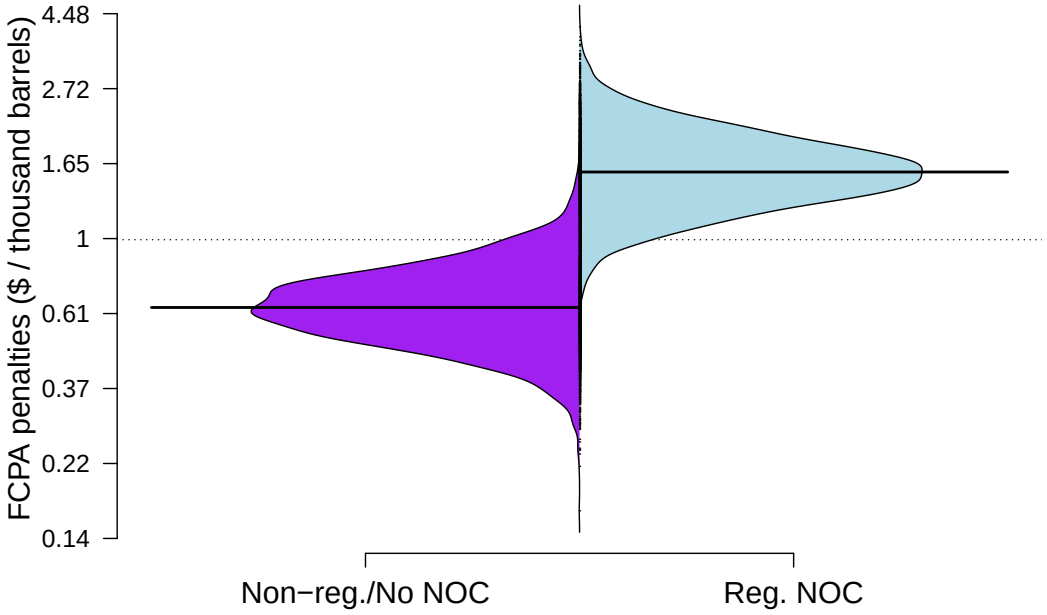
Figure 3.4: Determinants of corruption in the oil states: Model results from Bayesian bivariate outcomes (SUR) analysis



Posterior distributions of coefficients for two dependent variables, FCPA penalties per thousand barrels of oil production (represented in red and with circles) and the TI-CPI corruption scores (represented in blue and with triangles) using the bivariate outcome/SUR model specified in equation (1). All variables except the Regulatory NOC indicator are standardized to allow for ease of comparison.

difference in median predicted FCPA penalties would be $892,188 in penalties if it had no regulatory NOC and $2,204,130 if it had a regulatory NOC.[33] Such a shift would be akin to the difference between Egypt ($821,719 in penalties) and Azerbaijan ($2,425,850 in penalties).[34] The full range of predicted values is visually represented in the posterior predictive distributions shown in Figure 3.5.

Figure 3.5: Determinants of corruption in the oil states: Predicted



Predicted FCPA violations, in U.S. dollars per thousand barrels of oil production (exponentiated from the log scale), computed from posterior distribution of coefficient estimates for a country with average GDP, polity, oil income, non-energy FCPA violations, and newspaper circulations, with a regulatory NOC (right) or with either no NOC or a non-regulatory NOC (left). The horizontal dotted line is plotted at the 2.5th or 97.5th quantile of the distributions, respectively, to give a sense of the statistical difference between both distributions.

[33]Taking into account the specific covariate values for Iran, such as its GDP and polity score, the predicted difference in medians would be $624,971 and $1,547,386.

[34]Both have similar levels of annual oil production, with Egypt producing 247 million barrels per year and Azerbaijan at 204 million.

Turning attention now to the control variables, the results largely corroborate with previous studies on corruption when modeling TI-CPI scores. As expected, the level of economic development as measured by GDP per capita negatively correlates with corruption, implying that wealthier and more developed countries are less likely to be perceived as corrupt. Interestingly, there is no discernible relationship between GDP and the FCPA measure of corruption, suggesting that within the realm of oil-related extortion, rich countries and poor countries exhibit both high and low levels of corruption. The results also indicate that countries with more press freedom (measured by newspaper circulation) have less corruption, which is consistent with findings from prior research (Mauro, 1995; Treisman, 2000; Montinola and Jackman, 2002). Experts perceive a country as being less corrupt when there is more press freedom, though again Treisman (2007) attributes this result to the subjectivity of experts' beliefs when responding to corruption surveys. Lastly, countries with higher levels of FCPA violations in the non-energy sector have higher levels of perceived corruption, which corroborates with the moderate correlation between the TI-CPI scores and the FCPA data (see Figure 3.2 above).

One aspect of the results that is puzzling is that countries with higher levels of oil income have higher perceptions of corruption scores but not higher levels of FCPA penalties. This is likely due to the restricted sample size of only major oil producers. With a larger sample which includes non-oil producers, I find a positive and significant relationship between oil income and non-normalized FCPA penalties. These results are presented in Figure 3.8 in the Appendix.[35]

Results from the measurement model — where both measures are theorized to be observed values of some latent level of corruption — can be considered as

[35]Models with interaction terms between regulatory structure and oil income show support for a mediating effect of regulatory structure on the relationship between oil income and TI-CPI scores, but not between oil income and the FCPA measures. These results are presented in Table 3.10 in the Appendix.

a robustness check for modeling FCPA measures and CPI scores separately using the SUR model. The results, presented in Appendix 2, similarly show a positive relationship between regulatory NOCs and corruption, though the estimated coefficient for regulatory structure is relatively smaller (though still positive) in the measurement model.[36]

Lastly, both the SUR and measurement models provide correlation estimates between the FCPA measure and CPI scores once country-level covariates have been accounted for. The results from the SUR model indicate that the posterior mean residual correlation is relatively low at 0.332 with a 95% credible interval of 0.049 to 0.570 (a plot comparing the estimated residuals from both dependent variables is shown in Figure 3.10 in the Appendix). That the unexplained variance in both measures is positively correlated implies that the processes should be modeled jointly instead of estimating separate OLS regressions.[37] This result also suggests that both measures are potentially capturing the same latent levels of corruption once observable factors are controlled for. The correlation in unexplained variance estimated using the measurement model offers some empirical support for this notion. The estimated correlation in variances between the FCPA and CPI measures is nearly zero at -0.012, with a 95% credible interval of -0.040 to 0.015. In other words, there is little unexplained covariance between both measures of corruption once observable factors are accounted for and latent corruption levels are estimated for each country.

[36]This is likely due to the control variables capturing more variance in the latent measure through the perceptions-based CPI than through the FCPA measure, where the relationship between regulatory structure and CPI scores is weaker than the relationship with FCPA violations. Indeed, the relative weight parameter is estimated with a posterior mean of 2, implying that the ratio of how much the country-level covariates predict CPI scores relative to how much they predict FCPA violations is roughly 2:1.

[37]Interestingly, the standard deviation of residuals from the model where CPI scores are the outcome (0.46) is considerably lower than the residual standard deviation from the model where the outcome is the FCPA measure (0.81). This implies that the given covariates are better at predicting corruption when it is measured by CPI scores than when it is measured by FCPA penalties, but also that our notion of what predicts corruption may only be good at predicting *perceptions* of corruption.

3.6 Discussion

What alternatives could explain these results? In particular, how can we rule out the possibility of a spurious correlation between regulatory structure and corruption? In this section, I explore both possibilities in turn.

3.6.1 Is there evidence of spurious correlation?

If there were evidence that countries with pre-existing corruption were more likely to adopt the regulatory NOC framework, then the correlation between regulatory NOCs and corruption could simply be driven by the effects of pre-existing corruption on both outcomes. Testing for this possibility is difficult given that most nationalizers adopted their regulatory framework in the 1970s and earlier, whereas reliable cross-national data on perceptions-based corruption only exists after 1980 and the number of oil-related FCPA cases in the pre-1997 period is too low ($n = 3$) to allow for reasonable comparative analysis.

For this reason, I try two approaches to test whether pre-existing corruption determines a regulatory NOC structure. The first is to analyze the few post-1980 nationalization cases where a new NOC was formed with or without regulatory authority.[38] The second approach is to instrument for pre-existing corruption using long-term economic development, which is an established instrumental variable for perceptions-based corruption measures (Treisman, 2007). Here, historical income levels play the role of a proxy variable for pre-existing corruption, akin to using instrumental variables methods for missing data (Bhattacharya and Bhattacharyya, 1993).

[38] There are 16 such cases, which include the following countries with years of nationalization in parentheses: Argentina (2012), Azerbaijan (1992), Brunei (2007), Cameroon (1980), Republic of Congo (1998), Dem. Republic of Congo (1999), Denmark (1984), Gabon (1979), Ghana (1983), Eq. Guinea (2001), Jordan (1995), Kazakhstan (1996), Sudan (1996), Turkmenistan (1991), Uganda (2012), and Uzbekistan (1992). Regulatory NOCs were established in nine of these cases, with the remaining seven opting for the non-regulatory NOC framework.

In Table 3.3, I present an analysis of corruption levels for the post-1980 nationalizers prior to nationalization by modeling the determinants of adopting a regulatory NOC framework (conditional on having nationalized). Here, pre-existing corruption is measured using two sources. For the pre-1996 nationalizers, the Business International corruption scores are used; for post-1996 nationalizers, the World Bank "KKZ" scores are used. For each country, I measure the corruption score for at least one year prior to nationalization. However, since scores are not comparable across time nor across data sources, I operationalize pre-existing corruption as the percentile rank of a country's score in that year compared to all countries for which there is data. This results in a pre-existing corruption rank score which ranges from 0 (relatively most corrupt) to 1 (relatively least corrupt).

Across four different modeling specifications (among several others) there is no statistical difference in pre-existing corruption levels across both non-regulatory and regulatory frameworks. In a model to predict the probability of choosing a regulatory NOC institution without controls (model 1), there is a negative relationship but with high statistical uncertainty. In all models including controls there is a positive relationship — indicating that countries with lower levels of pre-existing corruption tend to choose regulatory NOCs — though none of the results is statistically significantly different from zero.

What does predict the regulatory NOC choice is a long production history (as discussed in section 3.1 above). Though estimated with higher uncertainty, relatively non-democratic institutions — such as weak executive constraints and low political competition — predict choosing a regulatory NOC structure over the non-regulatory NOC structure. In concurrence with what I find in chapter two, previous scholarly research on NOC establishment also finds that both production history and weak executive constraints are strong predictive factors of oil nationalization (Luong and Weinthal, 2010; Warshaw, 2012). While the sample size is too small ($n = 16$) to allow for strong statistical inference, these results suggest

Table 3.3: Pre-existing corruption levels and the establishment of regulatory NOC structures

	Logistic			*OLS (LPM)*
	(1)	(2)	(3)	(4)
Corruption (pct rank)	−2.401	0.290	4.410	0.266
high = less corrupt	(2.104)	(2.853)	(4.802)	(0.547)
Polity score		−0.221	−0.573	−0.051*
high = more democratic		(0.170)	(0.365)	(0.025)
Num. years producing			1.892*	0.197**
(logged)			(1.002)	(0.074)
Observations	16	16	16	16
AIC	24.541	24.320	18.600	
Log Likelihood	−10.271	−9.160	−5.300	
R^2				0.498
Adj. R^2				0.373

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Pre-existing corruption levels and the establishment of regulatory NOC structure for 16 countries with nationalization occurring after 1980. Pre-existing corruption measured using Business International and World Bank corruption indices. See text for further details on coding and case selection. LPM stands for the linear probability model.

that (at least in the post-1980 cases) there is no evidence that the establishment of regulatory NOCs is determined by factors related to pre-existing corruption.

A second approach is to model whether pre-existing corruption determines institutional choice across all oil-producing countries by instrumenting corruption with long-term economic development. Development is measured using income levels and income per capita estimates for the year 1950 (the earliest year available for nearly all countries in the sample) from the Maddison (2007) global incomes dataset. This increases the sample size from 16 to 53 countries (covariate data are missing for 12 oil-producing cases), with 20 countries opting for the regulatory NOC structure and 33 opting for the non-regulatory NOC structure. The results from this analysis are presented in Table 3.4, where the dependent variable is a binary choice between regulatory NOC (1) versus non-regulatory NOC (0), as in Table 3.3.

When considering the probability of choosing a regulatory NOC upon nationalization, I find no statistical association between pre-existing corruption and choice of regulatory structure, implying that regulatory NOCs were established in countries with both high and low pre-existing corruption levels. This is the case when pre-existing corruption is instrumented either by historical income per capita (model 1) or by historical income levels (model 2); in addition, I present results from a regression without a corruption variable (model 3). Putting aside statistical significance, the magnitude of the relationship between pre-existing corruption and NOC regulatory choice is close to zero: results from model 2 imply that a one standard deviation increase in pre-corruption levels[39] is associated with a modest 0.6 percentage-point decrease in the probability of establishing a regulatory NOC.

The strongest predictors of regulatory structure across all three specifications are production history and the value of oil production the year prior to national-

[39]Both instruments for pre-existing corruption levels in model 1 and model 2 have been standardized for ease of interpretation.

Table 3.4: Pre-existing corruption levels and the establishment of regulatory NOC structures: Instrumental variables analysis

	(1)	(2)	(3)
Corruption (instrumented)	−0.011	−0.006	
high = less corrupt	(0.007)	(0.005)	
Polity score	−0.013	−0.017*	−0.022**
high = more democratic	(0.011)	(0.010)	(0.009)
Offshore dummy	0.228	0.138	0.028
1 = production offshore	(0.187)	(0.159)	(0.132)
Num. years producing	0.202***	0.157***	0.101***
(logged)	(0.072)	(0.055)	(0.030)
Oil income per capita	−0.256***	−0.221***	−0.177**
(logged)	(0.086)	(0.076)	(0.067)
R^2	0.136	0.223	0.488
Adj. R^2	0.064	0.158	0.447
Num. obs.	53	53	53

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Instrumental variables analysis (two-stage least squares) of pre-existing corruption levels and the establishment of regulatory NOC structure. Pre-existing corruption instrumented by long-term economic development as measured by Angus Maddison's 1950 income per capita estimates (model 1) and 1950 income levels estimates (model 2).

ization. There is no evidence that having offshore production matters, and there is weak evidence (in terms of magnitude[40]) that having non-democratic institutions predicts choosing a regulatory NOC. As in Table 3.3, countries that have been producing oil for a longer period of time tend to opt for the regulatory NOC structure, while those with shorter production histories opt for non-regulatory NOCs. This finding lends support to the discussion in section 3.1 that geology and exploration risks drive a leader's institutional choice when nationalizing the country's oil industry. Having a nascent oil industry forces nationalizing governments to rely on foreign operators for their technical expertise, as was the case in the nationalization of oil and gas in the United Arab Emirates in 1971. On the other hand, a longer production history allows the host state time to develop a domestic workforce skilled in petroleum engineering to properly maintain a NOC with regulatory authority. Nationalizations in countries such as Kuwait, Mexico, and India are illustrative of this pattern.

There is also evidence for a negative relationship between regulatory NOC structure and a country's oil income per capita, which is a combination of production levels per capita and the global oil price in the year prior to nationalization. Countries with larger oil production and in years with higher oil prices are less likely to opt for a regulatory NOC structure. This finding is somewhat unexpected — if anything, higher production levels and higher prices should work to outweigh production risks in favor of the regulatory NOC option[41] — though it is difficult to make inferences on exploration risks without more refined measures of the quality of oil produced, location and depth of wells, and other geological factors. For example, at the time of nationalization Brunei (2007) and Gabon (1979) had similar levels of oil production (ten million tonnes per year) but with

[40]A three standard deviation increase in a country's Polity score, akin to moving from full autocracy (-10) to consolidated democracy (10) corresponds to a 5.1 percentage-point decrease in the probability of choosing a regulatory NOC.

[41]The relationship holds even when interacting with other production variables, such the offshore dummy and time since first production, as well as using different measures such as overall oil production levels or oil production per capita.

vastly different geological characteristics: whereas oil produced in Brunei is "light and sweet" — reflective of its high viscosity and low sulfur content that make it easy to refine into gasoline — oil in Gabon during the 1970s was mostly "sour" and trapped in reserves with low pressure, making for higher extraction costs (United States Geological Survey, 1932-2010). However, historical cross-national data on oil quality and characteristics is needed to test this possibility with more empirical precision.

Though it is difficult to fully disqualify the existence of endogeneity and spurious correlations with observational data, the analysis I have presented here offers suggestive evidence that institutional choice is not correlated with levels of pre-existing corruption. Both small-N regression and a two-stage least squares model show no support for claims that more corrupt leaders opt for one institutional choice over the other when it comes to oil nationalization.

3.6.2 Alternative explanations

Beyond spurious correlations, what alternative explanations exist for the relationship between corruption and institutional choice? I have argued above that the primary mechanism driving this relationship is that contract-awarding authority vested in opaque institutions such as NOCs incentivizes corrupt behavior.

An alternative reason for the proposed institutional argument relies on the centralization of contract-awarding decisions. When NOCs have the unchecked power to manage the contract bidding process, NOC officials wield considerable authority over highly lucrative concessions, for which private operators (and even NOCs from other countries) are willing to pay large sums of money to secure. This regulatory structure places the awarding authority of scarce contracts in the hands of a select group of officials, as opposed to allowing this decision-making authority across a diffuse range of government actors, each with little power over

delivering a contract to the successful bidder.

Firms seeking to win state contracts without relying solely on the formal channels of selection thus have to bribe a small number of recipients, increasing the probability of a successful bid when a bribe is paid (Bardhan, 1997; Freeland, 2000). In addition, with a smaller number of high-level government officials to bribe, firms do not face the same worries of "not bribing the right people" in order to win a contract as they would when the number of officials deciding on contract awards is sufficiently large (Basu, Bhattacharya and Mishra, 1992).[42] The literature on market structures of natural resource sectors has tested these hypotheses, finding that market centralization — often through creation of state-owned enterprises and the erosion of local-level competition — leads to corruption and inefficiency in the management of resources such as forestry (Robbins, 2000), minerals (Petermann, Guzmán and Tilton, 2007), and petroleum (Ascher, 1999; Arezki and Brückner, 2012).

Yet there remain doubts on the robustness of the relationship between government centralization and corruption. There is no strong evidence, for instance, of a systematic relationship between corruption and political decentralization in the form of federalism, subnational fiscal autonomy, or polycentrism (Treisman, 2007; Fan, Lin and Treisman, 2009).[43] Further, while fiscal decentralization — as measured by the share of subnational revenues as a percentage of GDP — may reduce the *frequency* of bribery by increasing the costs of paying bribes, there is no evidence that decentralization reduces the overall *level* of bribery (Fan, Lin and Treisman, 2009).

[42] This line of reasoning will be familiar to students of the industrial organization of corruption, whereby the more separate, uncoordinated bureaucrats one must bribe, the greater will be the aggregate costs (including transactions costs) in bribes, and so the fewer firms will want to bribe (see Shleifer and Vishny, 1993).

[43] Bardhan and Mookherjee (2006) attribute the lack of a "federalism effect" by arguing that the mechanisms are conditional and not linear. In analyzing subnational governance in the Indian states, the authors' findings imply that corruption will be greater when the actors involved in decision making are more restricted in number and when the decisions are less subject to public scrutiny.

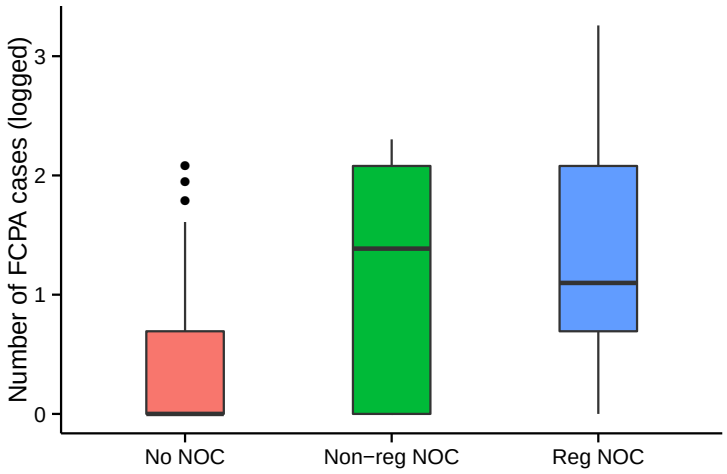
Even if there were a strong effect of decentralization on reducing corruption, it is not entirely clear that the regulatory NOC framework is any more centralized than the non-regulatory NOC framework. There is no evidence that would suggest that the number of decision-makers in granting contracts is different across regulatory structures. In Saudi Arabia, for example, the authority to grant licenses is vested in the Supreme Petroleum Council and not the NOC. Here, decisions on contracts are made by the members of the council, an independent arm of the state with almost no overlap in management with the NOC, Saudi Aramco. In Malaysia, where the NOC has contract-awarding authority, contract-awarding decisions are similarly made by a small group of individuals, specifically the board of directors and select licensing managers within the NOC.[44]

A second alternative explanation for the relationship between regulatory NOCs and corruption rests on the process of anti-corruption prosecutions. It could be the case that U.S. prosecution of corrupt behavior is politically easier when the bribe-recipient is not a foreign government official, as is the case when NOC managers receive bribes instead of petroleum ministry officials. The DoJ and SEC may find it more difficult to prosecute FCPA violations against government ministers for fear of political backlash against U.S. economic interests in oil-producing countries, while prosecuting NOC directors bears no such risk of retaliation given their non-governmental affiliations.

If true, this explanation would suggest that the number of prosecuted cases should be greatest in countries with regulatory NOCs, irrespective of the magnitude of bribes and penalties associated with each case. The data on FCPA prosecutions do not show this pattern. As shown in Figure 3.6, there is no statistical difference in the median number of FCPA cases between countries with the non-regulatory NOC structure versus those with the regulatory NOC structure

[44]See Petroleum Development Act of 1974 and the Petronas Licensing and General Guidelines of 2012.

Figure 3.6: Distribution of FCPA cases by regulatory structure



Distribution of the number of FCPA cases (logged) filed by the Department of Justice or Securities and Exchange Commission, disaggregated by regulatory structure.

(if anything, the median is lower in countries with regulatory NOCs).[45] There is, however, a noticeable drop in the number of FCPA cases in countries without NOCs, though this is due to the inclusion of OECD countries in the sample with minimal levels of oil production such as Belgium, Germany, and South Korea. Overall, there appears to be no support for the argument that the relationship between NOC structure and corruption is driven by politically-motivated probabilities of prosecution as measured by the raw count of FCPA cases pursued by the DoJ and SEC.

3.7 Conclusion

I have been able to show evidence in this chapter that supports the hypothesized relationship between regulatory institutions and oil-related corruption. Concep-

[45] A t-test of the difference in means similarly shows no statistical difference between the two groups.

tually, I find that state intervention through nationalization by itself is not a principal determinant of corruption. Rather it is only when countries decide to establish regulatory NOCs that I find an increased association with corruption. The data and statistical results show that non-regulatory NOCs, such as Petrobras (Brazil) and Saudi Aramco, foster lower levels of corruption than regulatory NOCs, such as Ecopetrol (Ecuador) and KPC (Kuwait).

This chapter's findings lend support to claims about corruption as a consequence of public officials' opportunities for corrupt behavior. State officials within regulatory NOCs are in the position to solicit bribes given their power to grant lucrative contracts with very little oversight and public disclosure, unlike their counterparts in non-regulatory NOCs or regulatory ministries (in the absence of a NOC). One implication for reform is to decentralize the regulatory structure of the oil industry such that the NOC competes with other government agencies in the allocation of contracts. This is in line with policy reforms for NOCs to adopt the "Norwegian Model" of separation of powers in the oil sector, whereby independent agencies monitor both private operators and the NOC, and to obtain concessions, the NOC must compete with other firms for bids to explore and produce oil fields (Thurber, Hults and Heller, 2011).

In the next chapter I consider two other aspects of political development: government revenues and regime survival. As in this chapter, I show that states can go down one of several institutional paths when it comes to natural resource extraction but that these choices have substantive and lasting effects on governance. In this chapter I focused on the institutional differences between not establishing a NOC, having a NOC but without regulatory powers, and having a regulatory NOC, and how this choice can affect transnational corruption at the highest levels of government. In the next chapter I turn to a different institutional comparison by analyzing how government revenues and survival are affected by the choice of not having a NOC, having a NOC but without production capacity, or having a

NOC that actually produces oil and therefore collects revenues directly from the sale of oil – revenues which I will argue can be used to keep regimes in power.

3.8 Appendix 1: Additional figures & tables

Table 3.5: Variation in institutional pathways, 2012

		Regulatory Authority	
		No	**Yes**
Production Capacity (any)	**No**	3	6
	Yes	21	20

		Regulatory Authority	
		No	**Yes**
Production Capacity (major)	**No**	13	11
	Yes	11	15

Disaggregation of 50 countries with NOCs with respect to production and regulatory capacity. The top table shows production capacity as defined as the ability of the NOC to physically extract and produce crude oil. The bottom table shows production capacity as defined more conservatively as a NOC which produces the majority of a country's oil production. See Table 3.2 for list of countries with NOCs; the table shown here also includes three countries with NOCs but without major commercial oil production: Chile, Poland, and South Africa.

Table 3.6: Case descriptions of prosecuted FCPA violations in the oil and gas sectors

Defendant	Year	Countries Involved	Description	Origin
ABB Vetco	2004	Nigeria	Bribes paid to NNPC subsidiaries	S
Applied PPO	1983	Mexico	Bribes paid to Pemex	W
Baker Hughes Inc.	2007	Kazakhstan, Uzbekistan	Bribes paid to Kazakhoil	W
C.E. Miller Corp	1982	Mexico	Bribes paid to Pemex	W
Chevron Corp.	2007	Iraq	Connected to Oil-for-Food Program (OFP)	J
Control Components	2009	Brazil, China, Indonesia, South Korea, Malaysia, United Arab Emirates	Bribes paid to multiple NOCs including CNOOC, KHNP, Petronas, NPCC, and Petrobras	P
Crawford Enterprises	1982	Mexico	Bribes paid to Pemex	W
Daniel Ray Rothrock	2001	Russia	Bribes paid to RVO Nesco (former USSR)	?
El Paso Corp.	2007	Iraq	Bribes connected to OFP	J
Fiat S.p.A.	2008	Iraq	Bribes connected to OFP	J
Flowserve Corp.	2008	Iraq	Bribes connected to OFP	J
GlobalSanteFe Corp.	2010	Angola, Equatorial Guinea, Gabon, Nigeria	Bribes paid to Sonangol and NNPC, and customs officials in Gabon & Eq. Guinea	J
Helmerich & Payne Inc.	2009	Argentina, Venezuela	Bribes to customs officials for oil rig imports	S
Innospec	2010	Iraq	Bribes paid to Oil Ministry, part of OFP	W
International Harvester	1982	Mexico	Bribes paid to Pemex	W
JGC Corporation	2011	Nigeria	Bribes paid to NNPC and Petroleum Ministry	P
Kellogg Brown & Root	2009	Nigeria	Halliburton subsidiary. Bribes paid to NNPC and Petroleum Ministry	W
Marubeni Corporation	2012	Nigeria	Bribes paid to NNPC and Nigeria-LNG	P
Mercator Corporation	2010	Kazakhstan	Bribes paid to Kazakh president and PM, former Mobil CEO was involved	W
Misao Hioki	2008	Argentina, Brazil, Ecuador, Mexico, Venezuela	Bribes to various (unidentified) NOC officials	J
Noble Corp.	2010	Nigeria	Bribes paid to Nigerian customs officials	J
Paradigm B.V.	2007	China, Indonesia, Mexico, Kazakhstan Venezuela	Bribes paid to multiple NOCs including CNOOC, KazMunaiGaz, NNPC, Pemex, Pertamina	S
Parker Drilling Co.	2013	Nigeria	Bribes paid to Ministry of Finance	J
Pride International	2010	India, Kazakhstan, Mexico, Venezuela	Bribes paid to PDVSA, Indian judges, and Mexican & Kazakh customs agents	J
Royal Dutch/Shell	2010	Nigeria	Bribes paid to NNPC and Ministry of Finance	J
Ruston Gas Turbines	1982	Mexico	Bribes paid to Pemex	W
Siemens	2008	Iraq	Bribes paid to Oil Ministry, part of OFP	P
Snamprogetti	2011	Nigeria	Bribes paid to NNPC and Petroleum Ministry	P
Statoil ASA	2009	Iran	Bribes paid to NIOC officials	W
Technip S.A.	2010	Nigeria	Bribes paid to NNPC and Petroleum Ministry	P
Tidewater	2010	Azerbaijan, Nigeria, United Arab Emirates	Bribes paid to various (unidentified) Ministry of Finance officials	J
Total S.A	2013	Iran	Bribes paid to NIOC officials	P
Transocean Inc.	2010	Nigeria	Bribes paid to Nigerian customs officials	J
Triton Energy	1997	Indonesia	Bribes paid to Pertamina officials	J
Tyco International	2012	Congo, Egypt, Laos, Libya, Madagascar, Mauritania, Niger, Syria, Thailand, Turkey, Vietnam	Over $26 mn in bribes paid to state officials to secure contracts for piping & flow control (note: this case also included non-oil contracts which are omitted from the data)	S
Tyco VCME	2012	Iran, Saudi Arabia, United Arab Emirates	Bribes paid to various (unidentified) NOC officials	S
Vetco Gray Controls	2007	Nigeria	Bribes paid to Ministry of Finance	P
Viktor Kozeny	2005	Azerbaijan	Bribes paid to SOCAR officials	W
Weatherford Int'l	2013	Algeria, Angola, Congo, Iraq, United Arab Emirates	Bribes through agents to Sonangol, Iraqi oil ministers, ADNOC officials, and various (unidentified) parties	W
Willbros Group	2008	Ecuador, Nigeria	Bribes to NNPC and PetroEcuador officials	W
Williams, James Bryan	2003	Kazakhstan	Executive at Mobil; Bribes to Kazakh officials	W

Information collected from case documents publicly available from DoJ and SEC websites. Origin column indicates the reason for initial investigation: ***J*** *(initiated by DoJ or SEC),* ***P*** *(suspicion based on information revealed in a* ***p****rior FCPA case),* ***S*** *(voluntary* ***s****elf-disclosure),* ***W*** *(****w****histle-blower).*

Table 3.7: Determinants of corruption in oil states: Additional model results (1)

	Dependent variable:				
	Logged FCPA violation penalties (dollars)				
	(1)	(2)	(3)	(4)	(5)
Regulatory NOC	0.895***	0.790**	0.862**	1.003**	0.859**
	(0.289)	(0.352)	(0.389)	(0.404)	(0.394)
GDP (logged)		−0.095	−0.005	0.159	0.033
		(0.178)	(0.278)	(0.308)	(0.292)
Oil income (logged)			0.104	0.027	0.113
			(0.244)	(0.251)	(0.248)
Non-energy Corruption (FCPA)			0.382**	0.322*	0.377**
			(0.158)	(0.165)	(0.160)
Regime (Polity)			0.026	0.125	0.079
			(0.174)	(0.192)	(0.210)
Democratic stability				−0.718	
				(0.599)	
Newspaper circulation					−0.102
					(0.216)
Constant	−0.459**	−0.405*	−0.442*	−0.422*	−0.440*
	(0.207)	(0.232)	(0.244)	(0.243)	(0.247)
Observations	39	39	39	39	39
R^2	0.205	0.212	0.331	0.360	0.336
Adjusted R^2	0.184	0.168	0.230	0.240	0.211
Note:					*p<0.1; **p<0.05; ***p<0.01

OLS cross-sectional regression of energy-sector FCPA corruption violations and ownership structure in only the oil-producing states, disaggregated into two groups: no NOC or non-regulatory NOC, and regulatory NOC. The no NOC or non-regulatory NOC case is captured by the constant term. Model 1 includes no control variables. Model 2 includes income (GDP). Model 3 includes income (GDP) and adds oil income, non-energy FCPA violations in logged dollars, and regime type (Polity index). Model 4 adds democratic stability (democracy since 1950). Model 5 substitutes democratic stability with newspaper circulation.

Table 3.8: Determinants of corruption in oil states: Additional model results, continued (2)

	Dependent variable:				
	Logged oil-related FCPA violation penalties (dollars)				
	(1)	(2)	(3)	(4)	(5)
Regulatory NOC	0.894***	0.870***	0.802***	0.801**	0.805**
	(0.240)	(0.246)	(0.301)	(0.303)	(0.304)
GDP (logged)		−0.053	0.008	0.016	−0.016
		(0.114)	(0.150)	(0.154)	(0.183)
Oil income (logged)			−0.061	−0.056	−0.057
			(0.161)	(0.164)	(0.164)
Non-energy Corruption (FCPA)			0.052	0.048	0.053
			(0.116)	(0.118)	(0.117)
Regime (Polity)			−0.143	−0.127	−0.157
			(0.145)	(0.156)	(0.158)
Democratic stability				−0.109	
				(0.378)	
Newspaper circulation					0.042
					(0.177)
Constant	−0.272**	−0.265*	−0.244*	−0.228	−0.245*
	(0.132)	(0.134)	(0.145)	(0.156)	(0.146)
Observations	69	69	69	69	69
R^2	0.172	0.174	0.188	0.190	0.189
Adjusted R^2	0.159	0.149	0.124	0.111	0.111
Note:					*p<0.1; **p<0.05; ***p<0.01

Replicating the analysis in Table 3.7 but with all states, including non-oil-producing countries.

Table 3.9: Determinants of corruption in oil states: Additional model results, continued (3)

	CPI	FCPA
Intercept	−0.119	−0.467*
	(0.140)	(0.252)
Regulatory NOC	0.233	0.911**
	(0.223)	(0.402)
GDP (logged)	−0.744***	0.001
	(0.165)	(0.298)
Oil income (logged)	0.551***	0.051
	(0.140)	(0.253)
Non-energy Corruption (FCPA)	0.223**	0.260
	(0.090)	(0.164)
Regime (Polity)	0.187	0.083
	(0.118)	(0.214)
Newspaper circulation	−0.401***	−0.090
	(0.122)	(0.220)
R^2	0.788	0.307
Adj. R^2	0.748	0.177
Num. obs.	39	39
Estimated Residual Covariance		
CPI residuals (σ_1)	0.252	0.148
FCPA residuals (σ_2)	0.148	0.789
Note:	*p<0.1; **p<0.05; ***p<0.01	

Bivariate outcome (SUR) model of corruption as measured by Transparency International's CPI scores and the FCPA penalties per thousand barrels of oil production measure. Estimated using maximum likelihood Seemingly Unrelated Regression/Simultaneous Linear Equations Modeling with the `systemfit` *package in* `R`*. The results corroborate with the findings in Figure 3.4 in the text that the relationship between regulatory NOC structure and corruption is stronger when the dependent variable is oil-specific incidence of corruption as opposed to broad-sector perceptions of corruption (as measured by CPI scores). Note the estimated covariance between residuals is 0.148, which is equivalent to a correlation of 0.332.*

Table 3.10: Determinants of corruption in oil states: Additional model results, continued (4)

	CPI	FCPA
Intercept	−0.118	−0.441*
	(0.133)	(0.250)
Regulatory NOC	0.269	0.844**
	(0.213)	(0.400)
Oil income (logged)	0.415***	0.168
	(0.148)	(0.280)
Reg. NOC × Oil income	0.377**	−0.152
	(0.181)	(0.341)
GDP (logged)	−0.723***	0.024
	(0.157)	(0.296)
Non-energy Corruption (FCPA)	0.241***	0.369**
	(0.087)	(0.163)
Regime (Polity)	0.135	0.100
	(0.115)	(0.217)
Newspaper circulation	−0.347***	−0.124
	(0.119)	(0.224)
R^2	0.814	0.340
Adj. R^2	0.772	0.191
Num. obs.	39	39
Estimated Residual Covariance		
CPI residuals (σ_1)	0.228	0.166
FCPA residuals (σ_2)	0.166	0.809
Note:	*p<0.1; **p<0.05; ***p<0.01	

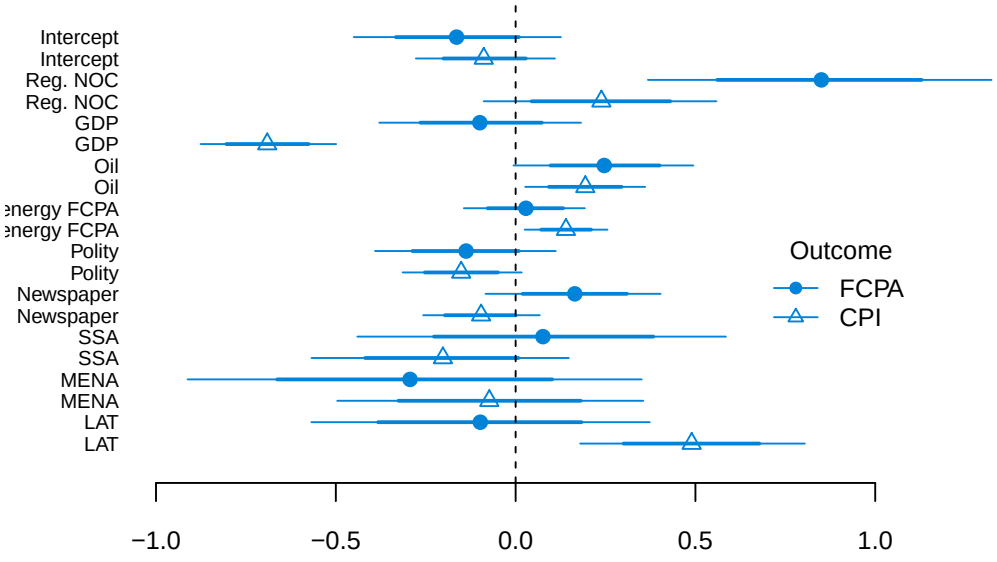
Bivariate outcome (SUR) model of corruption as measured by Transparency International's CPI scores and the FCPA penalties measure, with added interaction term between regulatory NOC structure and oil income per capita (logged). Note the estimated covariance between residuals is 0.166, which is equivalent to a correlation of 0.385.

Table 3.11: Determinants of corruption in oil states: Additional model results, continued (5)

	CPI	FCPA
Intercept	−0.119	−0.440*
	(0.140)	(0.247)
Regulatory NOC	0.233	0.859**
	(0.223)	(0.394)
GDP (logged)	−0.744***	0.033
	(0.165)	(0.292)
Oil income (logged)	0.551***	0.113
	(0.140)	(0.248)
Non-energy Corruption (FCPA)	0.223**	0.377**
	(0.090)	(0.160)
Regime (Polity)	0.187	0.079
	(0.118)	(0.210)
Newspaper circulation	−0.401***	−0.102
	(0.122)	(0.216)
R^2	0.788	0.336
Adj. R^2	0.748	0.211
Num. obs.	39	39
Estimated Residual Covariance		
CPI residuals (σ_1)	0.252	0.148
FCPA residuals (σ_2)	0.148	0.789
Note:	*p<0.1; **p<0.05; ***p<0.01	

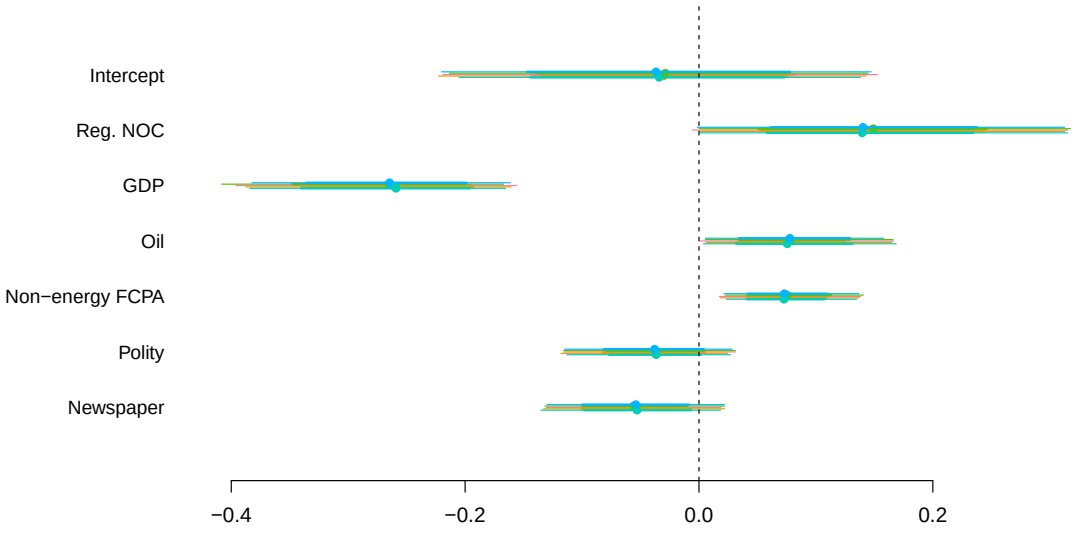
Bivariate outcome (SUR) model of corruption as measured by Transparency International's CPI scores and the FCPA penalties measure (non-normalized). Note the estimated covariance between residuals is 0.148, which is equivalent to a correlation of 0.332.

Figure 3.7: Determinants of corruption in oil states: Model results from Bayesian bivariate outcomes (SUR) analysis – posterior distributions



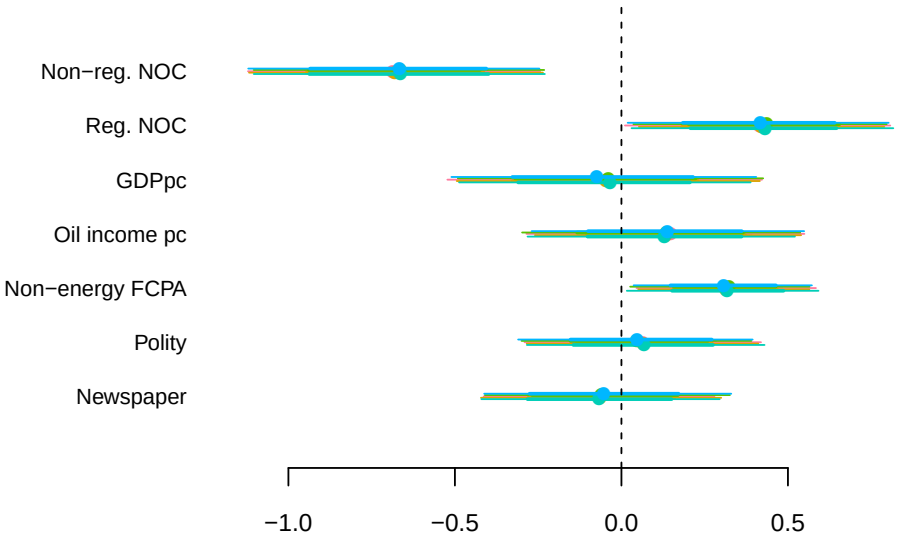
Posterior distributions of coefficients from the seemingly unrelated regressions (SUR) model, including regional fixed effects dummies for Sub-Saharan Africa (SSA), Middle East and North Africa (MENA), and Latin America (LAT). Results for both outcomes are plotted (FCPA and CPI scores). In both cases, there is little evidence for regional effects on corruption not already captured by existing covariates, with the exception of a positive Latin America effect on the CPI scores. This specific result suggests that controlling for other factors, Latin American countries are more corrupt when compared not only to the baseline (Europe and Asia), but also compared to MENA and SSA countries.

Figure 3.8: Determinants of corruption in oil states: Additional model results from Bayesian bivariate outcomes (SUR) analysis – posterior distributions, continued (2)



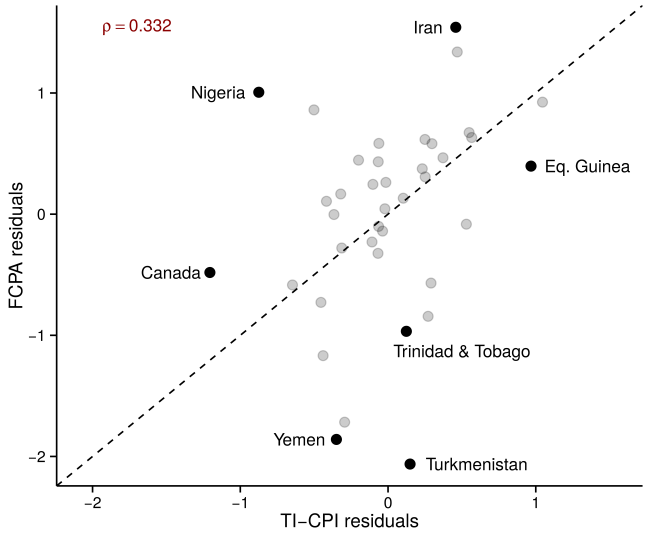
Posterior distributions of coefficients from the SUR model using FCPA penalties per thousand barrels of oil production as the dependent variable, including all countries (not only major oil producers) where data on FCPA measures is available ($n = 88$). The overlapping distributions reflect results from five chains of MCMC sampling. The results, when compared to Figure 3.4, are substantively similar and illustrate the robustness of the regulatory structure relationship with corruption when expanding the sample size to include non-oil producers.

Figure 3.9: Determinants of corruption in oil states: Additional model results from Bayesian bivariate outcomes (SUR) analysis – posterior distributions, continued (3)



Posterior distributions of coefficients from the SUR model with separate dummy variables for both non-regulatory and regulatory NOCs. The dependent variable is FCPA penalties per thousand barrels of oil production as the dependent variable, as in Figure 3.4. The overlapping distributions reflect results from five chains of MCMC sampling. The results show the difference in corruption levels across countries with regulatory vs. non-regulatory NOCs, captured by the non-overlapping distributions in the first two rows of the plot. Countries with the "No NOC" structure represent the baseline, implying that countries with regulatory NOCs have higher levels of corruption than countries with no NOC, while countries with non-regulatory NOCs have lower levels of corruption than countries with no NOC.

Figure 3.10: Determinants of corruption in oil states: Residual analysis of Bayesian bivariate outcomes (SUR) model results



Residual plot for the bivariate outcome model with standardized dependent variables. Residuals from the first model, where Transparency International scores (TI-CPI) is the dependent variable, are plotted on the x-axis. Residuals from the second model, where the dependent variable is FCPA penalties per thousand barrels of oil production, are plotted on the y-axis. A 45-degree line is plotted for illustrative purposes: points around the line are fitted equally-well by both models, while points away from the line are fitted better by one of the two models. For example, the TI-CPI model fits Turkmenistan with low error (the residual is close to zero) whereas the FCPA model under-predicts corruption levels in Turkmensitan (the residual is highly negative).

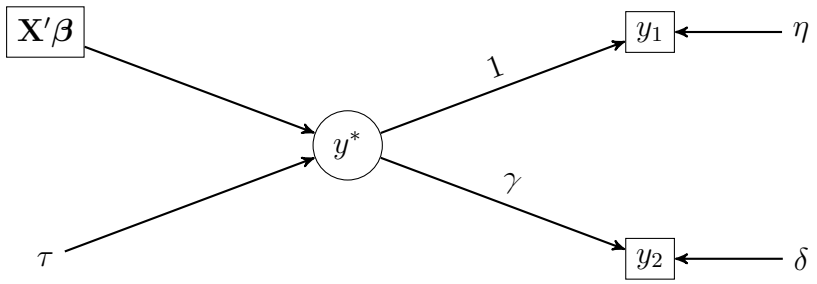
3.9 Appendix 2: Combining FCPA and CPI scores using a measurement model

In this Appendix, I combine information on corruption from both the TI-CPI measure and the FCPA penalties measure, using an applied measurement technique (McCutcheon, 1987; Jackman, 2009). The result is a latent measure of oil-related corruption that incorporates knowledge gleaned about corrupt activities both from prosecuted cases of bribing foreign officials and from surveys completed by expert analysts on how corrupt a country is perceived to be within the business community. This approach has been applied in political science to measuring latent democracy scores (Treier and Jackman, 2008) and latent levels of human rights violations (Fariss, 2014; Fariss and Schnakenberg, 2013), though it has not been utilized thus far to estimate a latent outcome by combining perceptions- and incidence-based measures together. Further, I build on the conventional item-response theory (IRT) approach used in estimating ideal points of legislators (Poole, 2005; Desposato, 2006) to measure latent outcomes from continuous responses as opposed to binary and ordinal responses.

This approach assumes that both the perceptions-based CPI scores and incidence-based FCPA violations are potentially measuring the same unobserved concept of corruption. If a given country fosters a high culture of corruption, for instance, it is likely not only to be perceived as corrupt but also to harbor corrupt government officials caught violating (or soliciting violations of) the FCPA. Here, we can conceptualize some latent, unobserved level of corruption in a given country that is predicted by country-level characteristics plus stochastic noise, that in turn predicts the two outcome measures of corruption that are observed. This specification is often called a measurement model (Jackman, 2009) or a latent Gaussian model (Gelman et al., 2013).

The process is visualized in Figure 3.11, where y^* denotes latent corruption

Figure 3.11: Measurement model specification visualized



Measurement model specification where y^* is the unobserved latent level of corruption, y_1 is the observed FCPA measure of corruption, and y_2 is the observed perceptions-based CPI measure.

that informs the observed corruption measures y_1 and y_2. In this framework the country-level covariates $\mathbf{X}$ serve as predictors of the latent measure with estimated coefficients $\boldsymbol{\beta}$, and $\tau, \eta,$ and δ are error terms with hyperparameters $\sigma_1, \sigma_2, \sigma_3$.[46] A new parameter, γ, captures the relative weight of how much the latent measure predicts one outcome versus the other (when both outcomes are standardized), where the weight on y_1 (the FCPA measure) is normalized to 1 to allow for easier interpretation. This approach is effectively restricting the coefficient estimates of both outcomes obtained by running the SUR model in a way that coerces the estimates of $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ to be linearly proportional as a function of γ.[47]

For example, if the FCPA measure and the CPI score evenly captured the latent level of corruption across countries in the sample, then γ would be equal to 1, and $\boldsymbol{\beta}_1 = \boldsymbol{\beta}_2$. In this case, estimating a measurement model would give the same substantive results as if we simply averaged the two measures together with equal weight: one part FCPA measure, one part CPI measure. Otherwise, values of γ greater (less) than 1 would indicate that the predictors of the latent measure

[46] In this parameterization, there is no strict assumption that the covariance of the error terms $\sigma_{i\in1,2,3}$ is zero, and the covariance matrix of errors can be modeled as a parameter to be estimated.

[47] Note that the measurement model is treating the common variance between the two outcomes as a function of what can be predicted by the covariates $\mathbf{X_j}$ and may not necessarily be minimizing the variance of y^*.

y^* are predicting y_2 more (less) than they are predicting y_1.

One important caveat about this approach is that the common factors between both measures that are being picked up by the latent measure may not necessarily be of substantive interest. In particular, if what both the FCPA and CPI measures are jointly capturing is not latent corruption but biases about corrupt activity in a given country, then the estimated latent measure y_j^* will conceptually be representing the level of biased perceptions of corruption for country j. This is entirely likely given the many problems of the CPI measures of corruption: when the CPI is combined with an FCPA measure intended to alleviate the CPI's mismeasurements, the resulting latent variable only captures the mismeasurements of corruption, leaving out the more objective and quantifiable acts of corruption measured by the FCPA violations but not by the CPI scores.[48] On the other hand, this specification has a substantively interpretable baseline with which to compare model estimates — that what is gleaned from perceptions-based measures of corruption is equally as informative as that which is captured by incidence-based corruption outcomes. Importantly, this approach allows us to use the data to make informed statements about the relative importance or weight of each measure, as well as to estimate the effect of regulatory structure on corruption in the process.

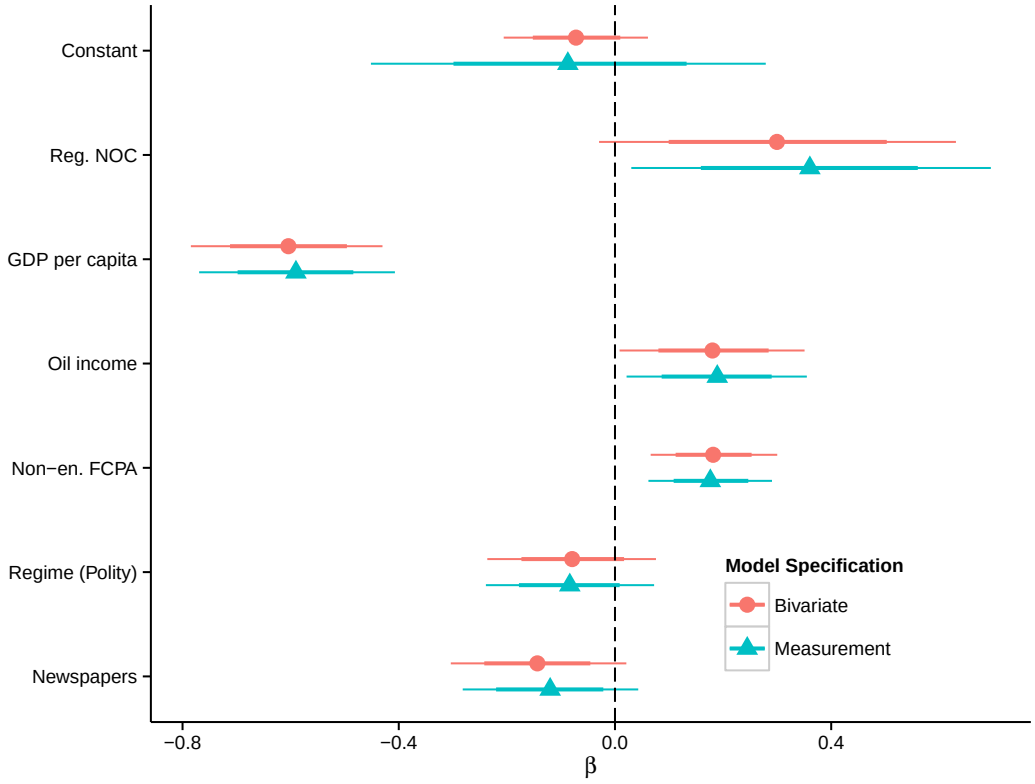
The results of the measurement model are shown in Figures 3.13 and 3.12 for the FCPA penalties and TI-CPI scores, respectively. The posterior distributions of the estimates from the SUR model are plotted as well to allow for comparison of results across models.

What can we say about the latent measure of corruption? One of the advantages of the Bayesian measurement model is that we can compute this for each country in the sample, along with credible measures of uncertainty. Further, we can compute a rank ordering of countries using this latent measure, which

[48] I thank Daniel Treisman for clarifying this point.

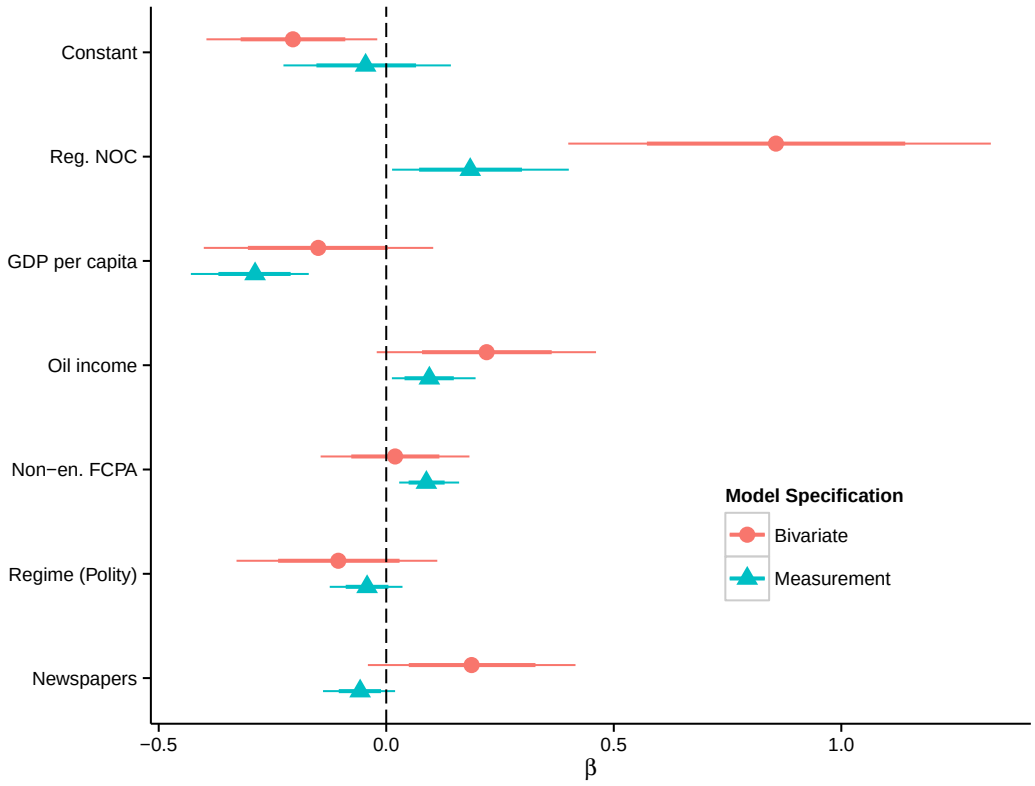
in some ways is more informative given that the latent score has no fixed interpretable value. Both of these estimates — the latent corruption score for each country and its relative rank compared to other countries — are plotted in Figures 3.14 and 3.15. Both plots provide some validation of our prior beliefs about oil-related corruption: for instance, with 100% probability we can say that Iraq is more corrupt than the Netherlands, which is to be expected. In addition, the rank ordering estimates provide credibility intervals for how a country ranks in latent corruption levels. For example, with 95% probability, we can say that Germany ranks in the top 10 least corrupt countries in the sample, and similarly that Nigeria ranks in the top 15 most corrupt countries.

Figure 3.12: Determinants of corruption in the oil states: Results from Bayesian measurement model (1)



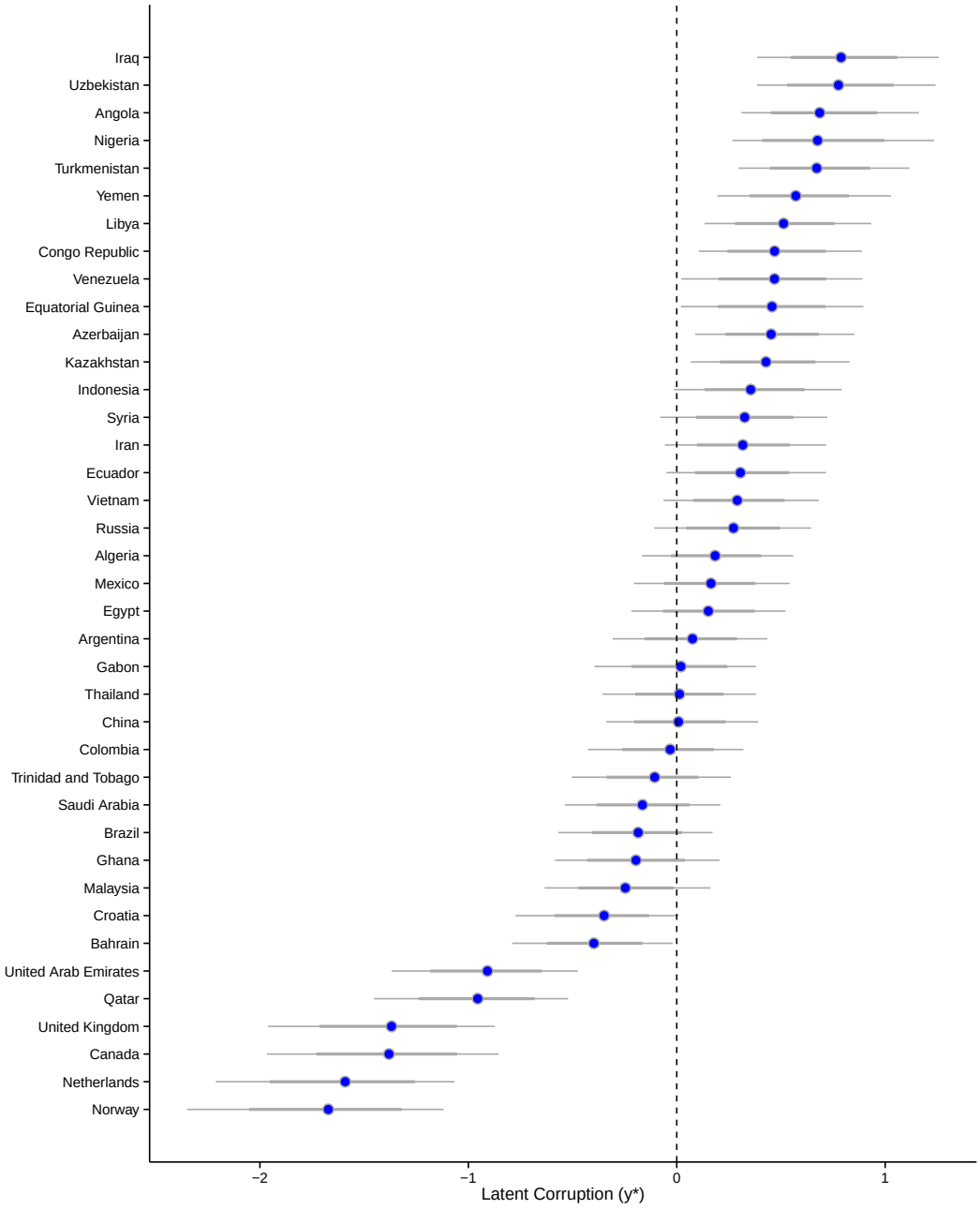
Posterior distributions of coefficients for two model specifications, with Transparency International's CPI scores as the dependent variable. "SUR" refers to the bivariate outcome/SUR model specified in equation (1). "Measurement" refers to the measurement model outlined in Figure 3.11. All variables except the Regulatory NOC indicator are standardized to allow for ease of comparison. Compare to Figure 3.4 in the main text, where the dependent variable is the FCPA penalties measure.

Figure 3.13: Determinants of corruption in the oil states: Results from Bayesian measurement model (2)



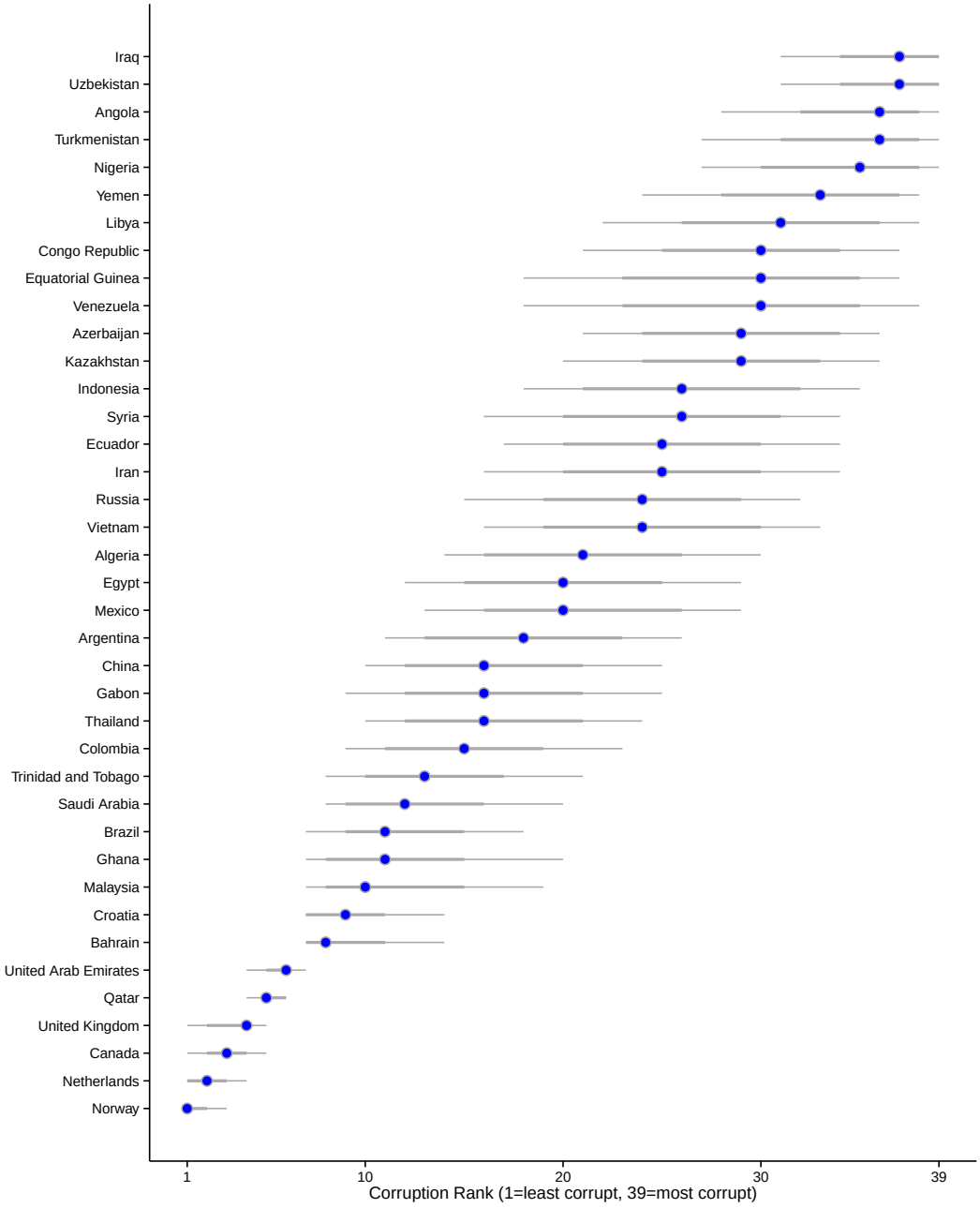
Posterior distributions of coefficients for two model specifications. "SUR" refers to the bivariate outcome/SUR model specified in equation (1). "Measurement" refers to the measurement model outlined in Figure 3.11. All variables except the Regulatory NOC indicator are standardized to allow for ease of comparison.

Figure 3.14: Latent corruption scores by country (1)



Posterior distributions of the latent corruption measure, y^*. Bolded points mark the posterior median of each country's estimated latent corruption measure, with 67% probability intervals shown by thick horizontal lines, and 95% probability intervals shown by thin lines. The vertical dotted line is plotted at the mean (0), where countries to the right of the line are relatively more corrupt, and countries to left can be considered relatively less corrupt.

Figure 3.15: Latent corruption scores by country (2)



Country rankings based on posterior distributions of the latent corruption measure, y^*. Bolded points mark the posterior median of each country's corruption rank, with 67% probability intervals shown by thick horizontal lines, and 95% probability intervals shown by thin lines. For example, the Netherlands typically ranks 2nd least corrupt, with 95% probability that it ranks in the top 5 across 500,000 simulations.

CHAPTER 4

Revenues and regime stability: Do NOCs prolong regimes?

4.1 Introduction

In chapters two and three, I have shown that resource nationalism and high commodity prices determine the timing of oil nationalization, and that nationalization of a particular kind – when NOCs have contract-awarding authority – breeds corruption. This chapter turns to examining two further consequences of oil nationalizations: greater government revenues from the sale of oil, and therefore, greater regime stability.

While the second finding of this chapter will seem intuitive to the reader – higher government revenues translate to more stability – the first finding will seem paradoxical, particularly to readers familiar with the classical economics literature on the consequences of state intervention (Stigler, 1971; Buchanan, Tollison and Tullock, 1980; Hartley and Medlock, 2008). That is, nationalization should lead to lower revenues, especially in the long run, given the operational inefficiencies of state-owned enterprises. Yes, the share of revenue captured by the state should increase upon nationalization, but the overall amount of revenues collected should gradually decline.

I argue here that this is not the case for oil-nationalizing countries, particularly those states which have established what I have called in chapter one producing NOCs (which include both producer NOCs without regulatory authority and in-

tegrated NOCs). These NOCs have operational capacities which enable them to produce crude oil without relying solely on other companies, be they foreign or domestic. States with these oil-related institutions, as I will show in this chapter, increase both the share and overall levels of oil revenues (and slighly increase production levels as well) when compared to the period prior to nationalization.[1]

To assess the validity of this argument, I continue the methodological approach taken in the previous chapters by using evidence in the form of cross-national statistical analysis of observational data. Here I again apply the NOC dataset developed in chapter one, combined with new data on government collection of oil revenue that is assembled from data on government revenues (Prichard, Cobham and Goodall, 2014) and data on oil income per capita (Ross, 2012). To show that governments are more durable after nationalizing oil assets, I then analyze data on regime stability from the Geddes, Wright and Frantz (2014) and Marshall, Jaggers and Gurr (2011) (Polity IV) databases on political regimes.

This pathway sheds light on one of the frontier research questions on the so-called resource curse: if the effects of oil on politics are conditional, what are the conditions that matter? This chapter provides one answer to this question: oil promotes regime stability conditional on the nationalization of resources.

4.2 Government revenue and regime stability

In this section, I expand on the theories presented in chapter one explaining the relationship between regime stability and changes in government revenue, be it from the sale of natural resources or otherwise. Broadly speaking, scholars have provided one general view for why we might link revenues to stability – which as shorthand I call the spending mechanism.

[1]Or in some cases where institutions have changed since nationalization, revenues are compared before and after this institutional reform.

Proponents of this view argue that regimes survive through direct spending of government revenues on dissatisfied groups in society, such as members of the opposition and citizens living in poverty, or through general spending of revenues on public goods such as infrastructure, education, and healthcare. Yet the source of this spending matters: if spending increases simply by raising income taxes – which typically will be met with stern public opposition – then the net effects on stability will be null or perhaps even negative. Therefore what matters for stability is balancing the precarious ratio between income taxes and spending. So how then to increase spending without increasing income taxes? I contribute to this debate by providing a new answer: regimes survive by increasing government revenue through political intervention in the economy.

4.2.1 Stability through spending

The canonical work of Lipset (1959) set the stage for studies and theories trying to explain political stability, and perhaps "has generated the largest body of research on any topic of comparative politics" (Przeworski, 2000, 78–79). Lipset's view is that economic development leads to regime survival, particularly within democracies. Stronger economies – in the form of increasing income growth and levels – should lead to stronger and thus more stable regimes.[2] On the other hand, economic crisis threatens the survival of the regime because of the state's failure to satisfy popular demands (Diamond, Linz and Lipset, 1989; Przeworski, 2000). Yet the evidence remains mixed: some show that economic growth increases regime duration (Haggard and Kaufman, 1995; Feng, 1997), while others find no such relationship in the data (Kohli, 1986), or one that diminishes in the

[2]This holds unless the initial regime is one of autocratic rule, such that increasing growth will shift a country from relatively poor to rich, sparking modernization pressures for a transition to democracy (see Przeworski (2000) for a review of these studies). At higher levels of income, strong economic performance will increase regime survival, regardless of being in a democratic or authoritarian state. Treisman (2015) shows that rapid economic growth in particular helps dictators survive, though this stabilizing effect wears off in the long run (after 20 years).

long run (Treisman, 2015). But how does development translate into stability for the state?

The answer with the most consensus is spending – more economic growth leads to more income tax revenues which in turn leads to stability. Levi (1989, 2) provides one of the foundational studies establishing the second part of this link:

> The greater the revenue of the state, the more possible it is to extend rule. Revenue enhances the ability of rulers to elaborate the institutions of the state, to bring more people within the domain of those institutions, and to increase the number and variety of the collective goods provided through the state.

Indeed, in theories of regime stability based on clientelism (Arriola, 2009; Magaloni, 2006; Stokes, 2005; Stokes et al., 2013), selectorate satisfaction (Bueno de Mesquita et al., 2003; Bueno De Mesquita and Smith, 2010), and *rentier*-ism (Ross, 2001), one method for state survival is direct spending on disgruntled groups of society, be they elites in general, members of the opposition, or poor voters. Leaders who spend on these constituents – elites in autocracies and voters in democracies – with public goods and patronage are rewarded with support for the regime and thus decrease their chances of ouster.

Within this view there is the theory that state spending increases the odds of survival by alleviating income inequality. Acemoglu and Robinson (2005) and Boix (2003) argue that income inequity within a country can prompt citizen demands for regime transition – especially from autocracy to democracy – but elites can ward off revolutions by redistributing government revenue to the lower and middle classes dissatisfied with the regime. Naturally, any increase in the government's coffers will help elites alleviate demands for regime change through redistribution of newfound revenues.

Morrison (2009, 2015) has applied this theory in the context of non-tax revenue

– primarily generated by either natural resources or foreign aid – to find that indeed, "higher levels of non-tax revenue are associated with less regime transition and less leadership turnover" (Morrison, 2015, 56). In the case of Mexico's single-party dictatorship, increases in government revenues from the oil boom of the late 1970s and early 1980s allowed the ruling Partido Revolucionario Institucional (PRI) to placate redistributional demands enough to remain in power, until the collapse of nontax revenue in the late 1980s and 1990s led to democratic transition in 2000 (Greene, 2008).[3]

In the political economy literature on natural resources, Ross (2001, 2012), Smith (2004), and Ulfelder (2007) have shown that natural resource wealth prolongs regimes in part due to increased government spending allowed by the collection of resource rents. This "allocative strategy" of resource wealth spending is in many ways the theoretical foundation of the political economy of natural resources (Luciani, 1990). Robinson, Torvik and Verdier (2006), for instance, find that in democracies government revenue from natural resources is spent on providing jobs, thereby persuading voters to reelect the incumbent government. The same is true in dictatorships: Wright, Frantz and Geddes (2015) argue that oil wealth increases the survival of autocracies by reducing pressures to democratize and by decreasing the probability of coups through military spending. Similarly, Cuaresma, Oberhofer and Raschky (2011) show theoretically and empirically how revenue from oil production increases the duration of autocratic regimes through increasing payments to elites and "kingmakers." In general, we should expect that any increase in government revenues should positively affect the survival chances of a regime, be it democratic or otherwise. Though importantly this change should come without having to resort to increasing taxation.

[3]See, however, Garrido de Sierra (2012) and Magaloni (2006) for alternative accounts for the collapse of the PRI.

4.2.2 Politics in the economy: state intervention

Yet some scholars have challenged this claim, particularly when these revenues come from the sale of natural resources. Recall from earlier chapters that Haber and Menaldo (2011) find increasing revenues from oil have little effect on regime survival (and even a small positive effect on democratization) but that Andersen and Ross (2013) point out this "null effect" finding is present only in the pre-1980 period. Since 1980, Andersen and Ross (2013) show evidence of a positive relationship between oil revenues and survival, using both the data and model specification from Haber and Menaldo (2011). In the introductory chapter, I discussed how the "post-1980 resource curse" is in part due to the timing of state intervention in the petroleum industry, drawing on the work of Luong and Weinthal (2010), Ross (2012), and Albertus and Menaldo (2012). Here, I expand on this discussion and restate my argument that state intervention – in particular, oil nationalization – prolongs regimes through its impact on government revenue.

The argument is as follows. A shift from private ownership of natural resources to state ownership generates an increase in government revenues from the sale of these resources; this increased revenue is used by the regime to remain in power. During the period of private ownership, the host government – that is, the government of a country with natural resource production within its borders – relies on various tax and royalty mechanisms to collect resource revenues. These are collected from operating companies unaffiliated with the host state, including major multinationals such as ExxonMobil and BP, independent contractors such as Baker Hughes and Halliburton, smaller domestic operators such as Cairn in India or Sinclair Oil in the US, and even international state-owned enterprises such as Norway's Statoil and China's CNOOC.[4] The rate of taxation is set by an initial contract between the host government and operating company, typically prior to resource exploration. I define the "effective tax rate" as the net percentage of

[4]On the internationalization of national oil companies, see Luong and Sera (2013).

all oil revenues collected by the state inclusive of corporate income taxes (that is, taxes on the net incomes of private firms), royalties, dividends, and "special taxes." I define "net income" as gross income minus costs, and "net profits" as gross income minus costs and taxes.

After oil is discovered and companies begin producing at commercial quantities, the government may decide the initial effective tax rate is too low. As I argued in chapter two, this change of heart could be due to increasing production, increasing prices, or changes in public opinion. The initial tax rate can either be renegotiated while maintaining a market structure of private ownership, or renegotiated forcibly through nationalization and expropriation of operating companies' assets. Recall from chapter two that the Saudi government of the 1940s opted for the former option and renegotiated a higher tax rate with Standard Oil, while the Iranian government pursued nationalization of AIOC and increased its effective tax rate from 27% to nearly 100% (of net income, not gross income).

Yet the civil renegotiation of tax rates typically does not last for long. Nationalization is in many ways inevitable as a means to increase government revenues. Even in Saudi Arabia, the state eventually nationalized all assets during the 1974–1980 period. Consider for a moment the case of the Libyan nationalization. In January 1970, newly minted Libyan dictator Muammar Qaddafi pressured Italian, British, French and American oil companies to increase the posted price[5] of Libyan oil by 43 cents-a-barrel along with an increase in the state's take from 50 percent to 55 percent. Qaddafi knew he had leverage over the firms' home countries – by 1970, Libyan oil provided 30 percent of Europe's total crude imports – and used this bargaining position to bully the twenty-one oil companies operating in the country to accept his terms or else be forced to shutdown all

[5]Before the advent of the spot market for oil sales, the posted price was the agreed-upon price of a barrel of a producing country's oil (sometimes referred to as the shadow price). This price was the primary factor in determining how much revenue would be collected by the producing government versus how much would be collected by the operator(s).

production. Qaddafi's message to the Western oil firms was to give the state a bigger share of oil revenues or risk losing the entire pie: "People who have lived without oil for 5,000 years can live without it for a few years in order to attain their legitimate rights" (Yergin, 1991, 578). The companies initially resisted but by November 1970, faced with the threat of nationalization, acquiesced and increased the posted price by 30 cents-a-barrel and gave the Libyan state a 5 percent increase of the profits, bringing the total to a 55 percent stake in the consortium (i.e. the twenty-one operating companies) profits from the sale of Libyan oil. But this did not quench Qaddafi's thirst for a greater share in oil rents. Three years later, on September 1, 1973 – the fourth anniversary of the military coup – Qaddafi nationalized 51 percent of all foreign-owned oil operations (Waddams, 1980). The motive was clear: by taking a controlling interest in operations and by increasing the overall state percentage take of oil profits, Qaddafi's government could increase state revenues in a way that was not possible by simply raising the tax rate on the consortium companies.

The increase in effective tax rate from private ownership to state ownership is the result of three factors, all undergirded by the existence of a national oil company (NOC) under state ownership. First, nationalization can be thought of as what the economist James Meade (1955) has termed a "second-best option" where Pareto optimality – wherein it is impossible to make one party better off without making another worse off – is unattainable. Imagine a context where the government cannot credibly commit to an expropriation-free marketplace, that is, the state cannot commit not to expropriate private firms. In such a place, private firms will not invest in the country's oil sector at an optimal rate. The sector will suffer from under-investment and tax revenue will either be zero (in the event of no firms entering the market) or some sub-optimal level. But by nationalizing the oil sector and setting up a NOC, private firms will enter the market given that there is already high certainty surrounding expropriation risks. With this

added investment where little to none had existed prior to NOC establishment, government revenues from oil will be higher, even if the effective tax rate on firms remains unchanged.

Second, a shift from private to state ownership in theory decreases the information asymmetry between government and producer regarding the true level of gross revenues (Victor, Hults and Thurber, 2012). During the period of private ownership, the government must rely on proper reporting of revenues by the operating companies, which have strong incentives to under-report production and sales as the effective tax rate increases. This is particularly problematic since taxes on operating companies are on net income or profit, making it relatively easy for a firm to inflate costs so as to recover a greater share of pre-tax revenues. As such the government must choose an optimal tax rate that reduces the likelihood of misreporting. After nationalization, the knowledge gap between government and NOC is substantially smaller[6] so the government is able to tax directly on revenues instead of having to tax on reported income.

Third, a government can set the optimal effective tax rate on a NOC at 100% without concern for market flight. Specifically the state can force the NOC to take a negative rate of return (RoR) if the state takes revenues before allowing for the NOC to repay its operational costs. Under private ownership, no firm will enter the market for a negative RoR, meaning zero production and revenues for the host government. The optimal RoR under private ownership must be non-negative (or greater than some value ϵ) for the government to earn any revenues. Indeed the optimal tax rate on gross revenues is much closer to 5-30% in practice (Johnston, 2001). In the United Kingdom, for example, the effective tax rate is 31% since the 1999 amendment to the Finance Act, and in the United States the effective tax rate is 16.7% for shallow-water oil fields in the Gulf of Mexico. These are taxes

[6]In theory there is no knowledge gap, but in practice some gaps still exist. See Heller (2012) for a discussion of the information asymmetry regarding revenues between the Angolan government and its NOC, Sonangol.

on net income (gross income minus costs but not taxes) and thus are much lower in gross income terms.

In principle, all three factors will work to increase the effective tax rate upon nationalization. A higher acceptable optimal tax rate combined with lower information asymmetry should enable the government to extract as much revenue as desired from its NOC, with the only constraint being the amount to consider reinvesting in the NOC for future exploration and production. Within the range of different NOCs discussed in the previous chapters – with differing NOC characteristics such as production capacity, regulatory framework, and percentage government ownership – information asymmetry between government and operators (including the NOC) should be lowest when the NOC has production capacity and is actively involved in on-the-ground operations. States establishing these "producing NOCs" should thus have the highest levels of revenue after nationalization compared to the period of private ownership.

4.3 Research design & methods

4.3.1 Overview

This increased level of resource revenues will enable regimes in states with NOCs to endure, based on the redistribution and spending mechanisms linking revenues to regime stability. To assess the validity of this argument, I consider three observable implications which serve as testable hypotheses:

H_1 *States with NOCs will have higher resource revenues than states without NOCs.*

H_{1a} *State revenue from oil – both in terms of total resource revenues collected and in terms of revenues 'captured' by the government – will be higher post-nationalization than in the years preceding NOC establishment.*

H_2 *More revenue from oil leads to increased regime stability.*

H_3 *States with NOCs are more likely to survive (lower likelihood of regime failure) than states without NOCs.*

In addition, I test related versions of hypotheses 1 and 3 looking at the differences in revenues and stability for states with producing NOCs versus states without producing NOCs.

I now turn to a discussion of how I test these hypotheses using the data on NOCs and NOC characteristics used throughout this dissertation, combined with cross-national data on natural resource revenues collected by the government and regime survival. I begin by describing these data and continue by discussing the statistical techniques used to analyze each of the three hypotheses.

4.3.2 Data

4.3.2.1 Measuring oil revenue: levels and capture

To identify government revenue from oil, I focus on two related measurement concepts. The first is the overall level of oil revenues collected by the state, measured as percentage of GDP for comparability across countries of differing size.[7] By "collected by the state," I mean that these revenues are actually processed by a treasury department or similar agency such that oil revenues are included in any government accounts. In some extreme cases, such as Kuwait, these revenues are then returned to the oil company (in this case, Kuwait Petroleum) that is responsible for production in the form of reinvestment for future exploration and production. Still, since this money is at some point held in the government's

[7] I also use the same measure in per capita terms to ensure that the results are not driven by any endogeneity introduced by having GDP in the denominator. Results using this measure are presented in the Appendix.

coffers, it is still counted as collected by the state.[8]

The second concept for measuring revenue is what is referred to as "state capture" of oil revenues. This refers to the percentage of revenues collected by the state compared with the total amount of oil revenues. A state collecting the entire share of oil revenues would have 100% capture – akin to having a 100% tax on revenues – while a state getting absolutely no oil revenue from production within its borders would have 0% capture.[9] As I described in the previous section, states with NOCs should have higher capture almost by definition given that nationalization of oil companies can be seen as simply a higher tax on oil revenues. However, recall from chapters two and three that NOCs have different institutional characteristics across countries; it should come as no surprise that NOCs are also taxed differently across countries. This variance accounts for why my argument that "states with NOCs also have higher rates of capture" is not tautological, thus allowing for the empirical exercise below to verify or reject this claim.

I calculate both measures of oil revenue collected by the state using data from the International Centre for Tax and Development *Government Revenue Dataset* (ICTD GRD) (Prichard, Cobham and Goodall, 2014). This dataset was developed to build upon the quality of existing IMF data by identifying consistent government sources of revenues and the various tax and non-tax components of state revenues. This team of researchers, led by Wilson Prichard, have greatly improved the quantitative measure of government revenues, which for some time have been prone to temporal inconsistencies, reporting errors, and other measurement errors. The focus of my analysis is on one variable in particular, the amount of government revenues collected from the sale of natural resources either through

[8]In terms of what is counted as costs, I do not consider the issue of fuel subsidies that are provided directly by a NOC. In some countries' central bank reports, these subsidies are included as non-operating costs while in others they are excluded and considered instead as state expenditures. In future research, I will investigate the cost ramifications of fuel subsidies as they vary across NOCs.

[9]States without any oil production are thus excluded from this measure since the calculation of capture would be mathematically undefined.

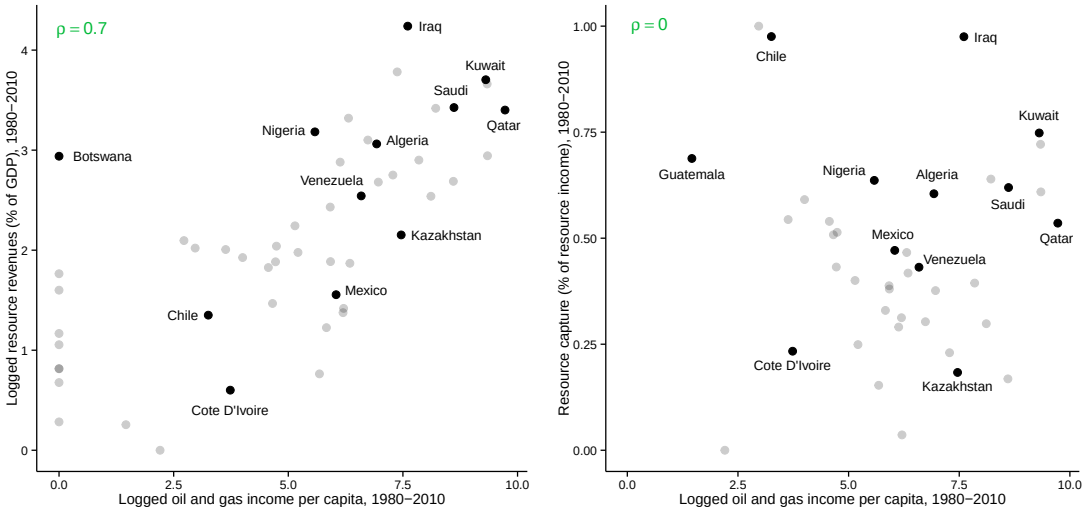
taxes or non-tax tools, in percentage of GDP to allow for comparability across states. I refer to this measure as "total resource revenues" or sometimes simply "resource revenues."

Measures of state capture, as I discuss more in the results section below, are unfortunately scarce. Out of a possible 3,348 country-years for states with any oil and gas production in the 1980–2010 period (108 states, 31 years), data on state capture of resource revenues is only available for 512 country-years or roughly 15% of the sample. As such, while this is a more accurate measure for the concept of state collection of resource revenues, I rely more heavily in the analysis on the other two measures – oil and gas income per capita (data for nearly 100% of the sample) and total resource revenues as a percentage of GDP (data for 30% of the sample).

While the oil income data are more complete, I still use resource revenues data as an additional measure. Nearly all analyses of the relationship between resources and stability have employed measures of government revenue from the IMF, which problematically do not allow the researcher to distinguish between tax and non-tax revenue that is derived from the sale of natural resources (see Prichard, Salardi and Segal (2014) for a thorough review of these studies). As such, scholars such as Morrison (2009) and Wright, Frantz and Geddes (2015) have equated non-tax revenue with natural resource revenue, without accounting for the fact that much of a country's resource revenues can come from direct taxation of oil companies. Further, non-tax revenue may include other forms of revenue aside from resource revenue, such as foreign aid, interest earned on loans, and revenue from non-resource state-owned enterprises (Morrison (2015) accounts for these distinctions). By using the ICTD GRD, I avoid this pitfall and can measure the full amount of government revenue from natural resources, both taxed and not taxed – not accounting for missingness or misreporting, of course.

In Figure 4.1, I visualize the distribution of these measures and how they relate

Figure 4.1: Petroleum income per capita, resource revenues, and state capture

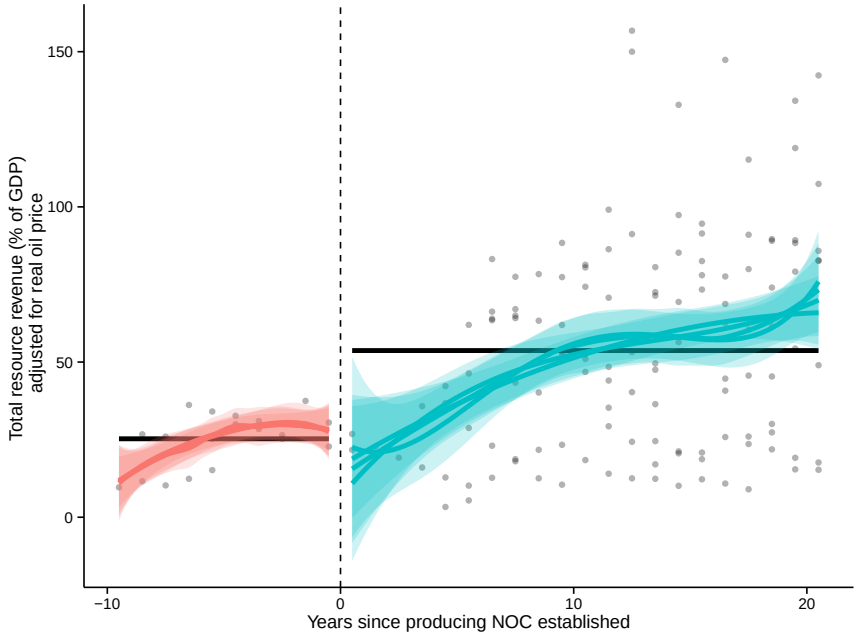


Country averages over the 1980–2010 period are plotted for 51 oil-producing countries, defined as having greater than $100 oil and gas income per capita on average during the entire period. Selected countries are highlighted for illustrative purposes only. Pearson correlations are included in the top left corner of each plot.

to a more conventional measure of resource wealth – oil income per capita (production times price divided by population) – used in previous analysis by Ross (2012) and Prichard, Salardi and Segal (2014). In the scatterplot on the left, I plot countries' oil incomes against their total resource revenues as a percentage of GDP, averaged across the 1980–2010 period. Both are in log units to account for the skewed distribution of these measures, given that the majority of countries has little by way of natural resource wealth. Overall, there is a strong relationship between oil income and resource revenues, as expected. The fact that the relationship is not perfect is simply a reflection of differing importance of natural resources within a country's economy (as measured by GDP) as well as natural resource income earned not due to oil and gas – the "block" of countries with almost no petroleum wealth but some resource revenues is made up mostly of Sub-Saharan African states with mineral wealth such as Botswana.

The plot on the right, however, shows almost no relationship between petroleum

Figure 4.2: Resource revenues (adjusted for real oil price) before and after establishing a producing NOC



Average resource revenues before and after a producing NOC is established are shown by the solid horizontal lines. I overlay four additional metrics to capture temporal changes in revenues, with 95% confidence bands: (1) loess smoother, (2) quadratic smoother, (3) cubic smoother, and (4) a fourth-order polynomial smoother. These are colored red before a producing NOC is established and blue afterwards. Total number of countries in the sample is 36. Note: "producing NOC" refers here to a NOC which produces the majority of the country's oil and gas. Revenues/GDP are adjusted for a constant oil price index (price in 2011 = 100), hence values above 100%. Refer to Figure 4.7 in the Appendix for the same plot without price adjustment.

wealth and state capture of natural resource wealth. Consider Mexico and Kazakhstan, for example: two countries with similar petroleum income per capita, but different resource revenue and capture. Kazakhstan, despite having slightly more petroleum income and higher resource revenues as a percentage of GDP, has a much lower rate of state capture than Mexico. Indeed, state capture of natural resource revenue in Kazakhstan is among the lowest in the sample, averaging 18% for the period, whereas state capture in Mexico averages 47%[10] – quite close to the sample mean of 40.6%. One notable difference between these two countries is ownership structure: PEMEX, Mexico's NOC, is practically the only producer in the country with a near 100% share of production; Kazakh Oil, on the other hand, is only a small player in production with a minority share (between 20% and 30%) in all major petroleum fields in the country (Olcott, 2007).

This simple comparison offers a glimpse at testing the first part of my argument that ownership structure affects resource revenues. In Figure 4.2, I make this same comparison across all countries in the sample with data on total resource revenues, adjusted using an oil price index (2011 = 100) to look at changes in revenues not due to price increases. What this plot shows – again, absent any multivariate statistical analysis – is the average levels of resource revenues for countries before and after establishing a NOC which has majority production capacity, that is, the NOC produces more than 50% of all oil and gas in the country. As such, years are relative to when a given country sets up a majority-producing NOC (for each country, this is marked year zero). Note that the plot is not balanced: because of data limitations, countries which established majority-producing NOCs prior to 1980 (the first year of resource revenue data) are only counted in the "after" stage. I also plot various ways to show the pre- and post-NOC levels of revenues, including a simple average represented by the solid horizontal black line and multiple local regression and polynomial smoothers represented by the red

[10]This is slightly lower than the reported royalty rate on PEMEX's production, which stands at a 60.8% tax on gross revenues (Johnston, 2001, 74).

and blue lines with 95% confidence bands. Recall that I constructed a similar plot (Figure 1.3 in chapter one) for changes in oil production levels before and after establishing a producing NOC, where the data show that production levels are slightly higher after establishing a producing NOC but only after roughly 10 years.

Two clear patterns emerge from the data: (1) immediately after the shift to a majority-producing NOC there is a slight decline in total resource revenues collected by the state, but (2) after roughly five years there is a marked increase in collected revenues, with higher levels thereafter than prior to establishing a majority-producing NOC. The second pattern supports my argument that nationalization increases revenues, and though the first pattern seems counter-intuitive, the initial decline is in many ways expected. In cases where no NOC existed at all, establishing a majority-producing NOC carries with it the initial costs of nationalization discussed at length in chapter two. And in cases where the transition is from a non-producing or minority-producing NOC to a majority-producing NOC, the inefficiency of "young NOCs" results in lower production levels and therefore lower resource revenue captured by the state when compared to taxing more efficient private operators (Wolf, 2009). Taken together, this initial piece of evidence offers support for H_{1a}.

4.3.2.2 Measuring political stability: regime change and leadership turnover

To identify instances of political stability, scholars have used a number of different measures, such as the frequency of political protest (Lipsky, 1968; Tarrow, 1994), revolutions (Skocpol, 1979), and the onset and duration of civil conflict (Fearon and Laitin, 2003). My focus in this dissertation, as also explained in the opening chapter, is on the durability of the rules and structure of government. As such, I rely on existing political science measures of regime change. The most prominent

among these changes is a shift from autocratic government to democracy, or vice versa.[11]

The two sources of regime change measures I use in my analysis are the Geddes, Wright and Frantz (2014) database of political regimes (GWF) and the Marshall, Jaggers and Gurr (2011) Polity IV project on regime characteristics and transitions. I focus both on transitions to and from democracy and on transitions to and from different non-democratic regimes. For the GWF database, the definition of regimes "emphasizes the rules that identify the group from which leaders can come and determine who influences leadership choice and policy," meaning that a transition from one ruling group to another counts as a "regime change." Such is the case, for example, when the Pahlavi monarchy in Iran was replaced by an Islamic theocracy ruled by clerics. The Polity measure would not necessarily count such a shift as regime change if the level of electoral competition, executive constraints, and openness of executive recruitment all remained the same. On the other hand, this measure would record a regime change of having occurred if these levels changed without changes in the general rules of the regime. Going back to the example of Iran, there were slight changes in electoral competition in 1997 when President Khatami was first elected, but the Islamic theocracy remained unchanged, with Supreme Leader Khamenei still in power as head of government. The GWF measure would not count this as regime change, while the Polity measure would (indeed, Polity records three regime changes since the 1979-1980 revolution).

These measurement variations account for the differences between both the GWF and Polity measures of regime change, as visualized in Figure 4.3. Despite the moderate correlation of 0.6 between both measures, clearly the Polity measure

[11]In future work, I will consider less extreme changes as well, such as leadership turnover within authoritarian systems and democratic consolidation within so-called transition states. These latter governments share certain features with advanced democracies, for example the election of executive leaders and legislative representatives, but lack characteristics such as universal suffrage, press freedom, and strong property rights.

Figure 4.3: Comparing measures of regime change, 1980–2010

GWF stands for the Geddes, Wright and Frantz (2014) measure of regime change; Polity refers to the measure of regime change based on the "durable" variable from the Marshall, Jaggers and Gurr (2011) "Polity IV" project. The Pearson correlation between the two measures during this time period is 0.6.

perceives regimes as changing much more often than the GWF score. Nonetheless, I use both measures given the prevalence of Polity in particular in prior studies of natural resources and regime change (Haber and Menaldo, 2011; Ross, 2001; Morrison, 2009; Ulfelder, 2007).

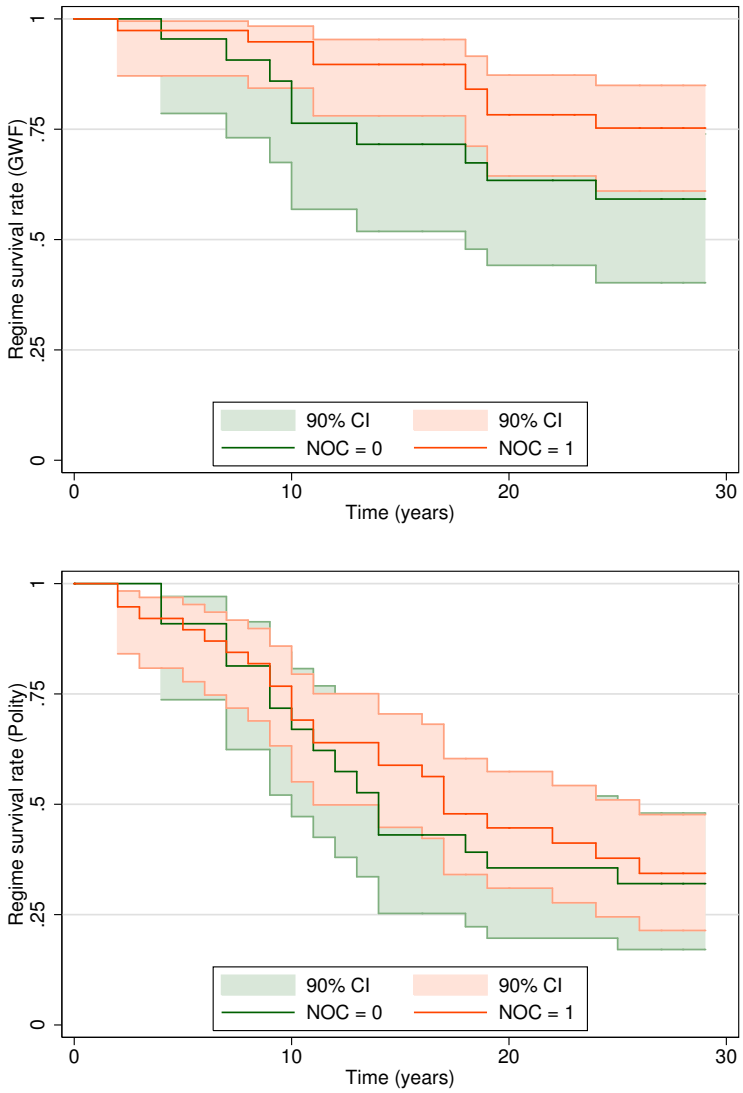
Before turning to the modeling and statistical analysis of my argument, it is worth visualizing the broader pattern of NOC establishment and regime stability. In Figure 4.4, I plot the survival rates of regimes in oil-producing states[12] with and without NOCs during the period of data analysis discussed below (1980–2010) using both the GWF and Polity measures of stability. These survival rates can be thought of in terms of how likely it is in a given year that the average regime will endure; plotting these rates shows the proportion of regimes in the sample that did not fail as time goes on. For instance, in the year 2000 the survival rate for regimes with NOCs was roughly 80% using the GWF measure, meaning that in the year 2000 about 20% of the regimes in existence as of 1980 have failed. Keep in mind that these plots contain data only for the 75 oil-producing countries as opposed to the 155 countries in the complete sample.[13]

In both plots in Figure 4.4, states with NOCs are more stable (they fail less often) than states without NOCs. There is less certainty in the differences between the two types of states when using the Polity measure given the degree of overlap in 90% confidence intervals. Further, the lower survival rate when using the Polity measure highlights their looser definition of regime change/failure as described at

[12]Here defined as any state with greater than $100 oil and gas income per capita in any year in the period 1980–2010.

[13]Countries defined as oil-producers, using the $100 oil and gas income per capita threshold for producer: Albania, Algeria, Angola, Argentina, Australia, Austria, Azerbaijan, Bahrain, Barbados, Belarus, Belize, Bolivia, Brazil, Brunei, Cameroon, Canada, Chad, Chile, China, Colombia, Congo-Brazzaville, Congo-Kinshasa, Cote d'Ivoire, Croatia, Cuba, Denmark, East Timor, Ecuador, Egypt, Equatorial Guinea, Gabon, Ghana, Hungary, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Kazakhstan, Kuwait, Libya, Lithuania, Malaysia, Mauritania, Mexico, Netherlands, New Zealand, Nigeria, Norway, Oman, Papua New Guinea, Peru, Qatar, Romania, Russia, Saudi Arabia, Senegal, Sudan, Suriname, Syria, Thailand, Trinidad and Tobago, Tunisia, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom, United States, Uzbekistan, Venezuela, Vietnam, Yemen, and Yugoslavia/Serbia.

Figure 4.4: Regime survival and state ownership of oil, 1980–2010



Regime stability in oil-producing states with NOCs (red) vs. states without NOCs (green). Using the GWF measure, 13 regimes failed in states with NOCs (out of a total 54 regimes in 43 countries) compared to 20 regimes failed in states without NOCs (total: 48 regimes, 28 countries). Using the Polity measure, 82 regimes failed in states with NOCs (total: 136 regimes, 43 countries) compared to 56 regimes failed in states without NOCs (total: 94 regimes, 28 countries).

length by Geddes, Wright and Frantz (2014). Nonetheless, the data in both plots support the general argument that differences in state ownership of petroleum affect regime survival.

4.3.3 Testing and modeling: verifying the argument that NOCs increase stability

My argument that NOCs increase regime stability through increased government revenue can be thought of as a single model of stability in two parts: (1) NOCs increase revenues which then (2) increase the likelihood of regime survival. As such, I consider a two-step modeling approach that captures both parts of the argument together. This allows not only a unified framework for assessing the validity of my argument, but also allows me to relax the assumption that the two parts are independent. The simultaneous model I employ estimates each part separately, but allows for the residuals from each regression to be correlated (and estimates these correlations). In addition, I use this model for both measures of government revenue discussed above: total resource revenues and state capture.

The first part (or "step") of the model tests whether a country's establishment of a NOC corresponds with changes in resource revenues and state capture. Both dependent variables are additive functions of several factors (revenues and capture are purely functions of prices, production, institutions, and noise) and so can be modeled using standard OLS assumptions. A simple model of total resource revenues is then a linear function of institutional type (NOC or not), petroleum prices, petroleum production, and other country-specific characteristics captured using country fixed-effects. The same is the case for state capture.

The second step of the model is more subject to debate, as there are numerous approaches to modeling regime stability as it is affected by government revenue. Prichard, Salardi and Segal (2014) provides a thorough review of different econo-

metric techniques, including the following: pooled OLS regression, fixed-effects OLS regression, random-effects logistic regression, General Method of Moments (GMM), Difference-GMM, Sys-GMM, Mean Group-Common Correlated Effects (CCE-MG), and panel Error-Correction Models (ECM). The relationship between regime stability and government revenues – in particular, non-tax revenues – is consistently positive (more non-tax revenue, less likelihood of change) across all specifications except fixed-effects OLS and Diff-GMM models. The authors attribute these exceptions to the poor fit of these models to large-N and large-T dynamic panel data, a concern shared by Andersen and Ross (2013) as well.

Given the stability of model specification, I choose to analyze the revenue and stability hypothesis using a simple, interpretable approach in logistic regression.[14] To account for country-level heterogeneity, I use a mixed-effects logit model with country random intercepts (sometimes referred to as "random-effects logit"). Due to the difficulty in computing mixed-effects logit models using maximum likelihood methods, particularly for data where the count of zeroes is much higher than ones (as is the case for regime failures), I employ Bayesian methods for computation (Gelman et al., 2013; Weiss, 2012). Nonetheless, alternative specifications are tried, with results presented in the appendix.

In modeling regime change as a function of resource revenues, I incorporate the results from the first-step model using fitted values of resource revenue as predicted by nationalization, production, prices and country-fixed factors. I add a limited set of covariates to prevent over-fitting, considering that the first-step regressions already include country fixed-effects. These include the following: (1) year-to-year growth in GDP per capita, to account for the effects of economic crises on instability (Haggard and Kaufman, 1995; Przeworski, 2000), (2) logged popu-

[14]Regarding proportional hazard models, which are not included in the Prichard, Salardi and Segal (2014) analysis: Wright, Frantz and Geddes (2015) find that results are consistent between conditional logit models and Cox-proportional hazard models, and further, find that the hazard assumption is not violated following a stratified (by country) test of non-proportional hazards in a Cox model.

lation, to account for theories of state size and stability (Fearon and Laitin, 2003; Herbst, 2000), and (3) a continuous time trend, to account for various temporal effects such as "waves of democracy" (Huntington, 1993). I explicitly avoid using GDP levels as a control because of colinearity with total resource revenues, though in regressions using the state capture variable, I include logged GDP per capita. All covariates are lagged by one year and, to assist in computation as well as interpretability, all continuous variables are standardized (de-meaned and divided by one standard deviation). In addition to this two-step approach, I use one-shot models that incorporate an interaction between resources and nationalization, as well as models using resource revenues variables absent the nationalizations variable.

Given that I am using observational data, there is the ever-present and thorny issue of reverse causality. As I discuss at length in chapter two, regimes matter in the establishment of NOCs: states with strong executive constraints are less likely to nationalize and form a NOC whereas states with weak executive constraints have higher nationalization probabilities. There is likely a connection between executive constraints and regime durability – indeed, when using the Polity measure of regime change, any change in executive constraints by definition results in a regime change. It is thus essential to include lagged executive constraints in both parts of the simultaneous model, though this will not completely alleviate the problem.

Beyond executive constraints, there is also the possibility that more stable regimes are the most likely to establish NOCs. This would make my argument tautological: regimes are made stronger by NOCs which are established by strong, stable regimes. However, this is not supported by the data: neither regime age nor regime type (democracy or non-democracy) predict the establishment of NOCs, or of producing NOCs in particular.[15] Many of the producing NOCs in the Mid-

[15]Refer to the appendix following chapter two for tables showing the results from these re-

dle East, for example, were established during turbulent political times or new regimes: NIOC in Iran during the brief democratic regime of Mossadegh in 1951 (Mahdavi, 2012); LNOC in Libya following Qaddafi's coup over King Idris in 1968 (Waddams, 1980); INOC in Iraq in 1961 only three years after the "Free Officers" coup ousting King Faisal II and only two years prior to the "Ramadan Revolution" of 1963 ousting Faisal's ouster Abd al-Karim Qasim (Alnasrawi, 2002); and the NOCs of Qatar and UAE immediately following independence in 1974 and 1971, respectively (Crystal, 1989; Zahlan, 1998).

These concerns cannot be definitively ruled out and thus hinder my ability to make causal claims using this research design. Nonetheless, I am able to make strong claims about the validity of my argument by showing empirical support for three observable implications: resource revenues are higher in states with NOCs than in states without NOCs, regime survival is more likely as resource revenues increase, and thus the probability of survival increases with resource revenues conditional on nationalization.

4.4 Results

4.4.1 Nationalization increases natural resource revenue and government capture

In Table 4.1, I present the results of five regressions where the outcome is total resource revenue collected by the government, in percentage of GDP.[16] The first regression, in column 1, shows a trivial but necessary baseline result that indeed total resource revenues are predicted by petroleum production levels and prices. This result provides some support for the assumption that the omission of metals and other non-oil minerals, while not ideal, is not detrimental to the analysis.

gressions.

[16]Results using total resource revenues per capita are presented in Table 4.3 in the Appendix and show similar results both in terms of statistical significance and magnitude.

The second and third columns of Table 4.1 include the "general NOC" measure that captures the presence of a NOC – regardless of production, regulatory, or fiscal capacities – both on its own and interacted with production. Both results show support for the first hypothesis that states with NOCs have higher resource revenues collected by the government than states without NOCs. Specifically, the presence of a NOC increases total resource revenues by 3.21 percentage points (0.23 standard deviations). The interaction with production levels – which proxies in some ways for having a producing NOC – indicates that a state with a NOC and production levels 0.5 standard deviation above the mean (13,000,000 metric tonnes per year, roughly what Equatorial Guinea produced in 2008) has higher resource revenues than a state with a NOC and production levels at the mean (350,000 metric tonnes per year, roughly what Ghana produced in 2008), with a difference in revenues of 22.6 percentage points (1.64 standard deviations).[17]

The model results from columns four and five show similar results. Bear in mind that the interaction between producing NOC and production is interpreted differently than the general NOC and production interaction. Here the interaction term results show that high-production (0.5 standard deviations above the mean) states with producing NOCs have higher resource revenues than average-production states with producing NOCs, with a difference in revenues of 21.07 percentage points (1.53 standard deviations).

When it comes to state capture, the substantive results are similar but with higher uncertainty given the smaller sample size (662 country-years and 40 countries compared to 871 country-years and 51 countries). The results in Table 4.2 show that having a NOC means higher revenue capture, though the only results that cross the threshold of statistical significance are the models with NOC-

[17]This is calculated by multiplying the sum of the coefficients for production and the interaction term by the difference in production levels, all in standard deviation terms given that these variables are demeaned and standardized: $(0.5 - 0) \times (0.386 + 2.901) = 1.644$. Then I back-convert to percentage points of resource revenues by multiplying 1.644 by the standard deviation of the total resources revenue, 13.776, to get 22.643 percentage points.

Table 4.1: Nationalization increases resource revenues collected by the government

	Model 1	Model 2	Model 3	Model 4	Model 5
Petroleum production (tonnes/year) (logged)	0.467*** (0.061)	0.453*** (0.062)	0.386*** (0.060)	0.457*** (0.061)	0.424*** (0.060)
Oil price (US$)	0.186*** (0.019)	0.184*** (0.019)	0.179*** (0.018)	0.194*** (0.019)	0.189*** (0.019)
NOC indicator		0.233** (0.111)	−1.168*** (0.223)		
NOC × production			2.901*** (0.405)		
Producing-NOC indicator				0.306*** (0.116)	−1.581*** (0.343)
Producing-NOC × production					2.841*** (0.487)
R^2	0.792	0.794	0.806	0.794	0.802
Adj. R^2	0.779	0.780	0.793	0.781	0.789
Num. observations	871	871	871	871	871
Num. countries	51	51	51	51	51

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

All variables are lagged one year and, except for the national oil company (NOC) variables, all variables are standardized with mean zero and variance one. All models include country fixed effects, the estimates of which are omitted from this table.

Table 4.2: Nationalization increases state capture of natural resource revenues

	Model 1	Model 2	Model 3	Model 4	Model 5
Petroleum production (tonnes/year) (logged)	0.106** (0.045)	0.105** (0.045)	0.065 (0.046)	0.101** (0.045)	0.084* (0.045)
Oil price (US$)	0.147*** (0.027)	0.147*** (0.027)	0.143*** (0.027)	0.154*** (0.027)	0.151*** (0.027)
NOC indicator		0.023 (0.141)	0.108 (0.143)		
NOC × production			0.519*** (0.170)		
Producing-NOC indicator				0.210 (0.147)	0.038 (0.169)
Producing-NOC × production					0.406** (0.198)
R^2	0.674	0.674	0.679	0.675	0.678
Adj. R^2	0.652	0.652	0.656	0.653	0.655
Num. observations	662	662	662	662	662
Num. countries	40	40	40	40	40

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

All variables are lagged one year and, except for the national oil company (NOC) variables, all variables are standardized with mean zero and variance one. All models include country fixed effects, the estimates of which are omitted from this table.

production interaction terms. For a sense of the magnitude of these results, a 1 standard deviation increase in production from the mean corresponds to a 11.48 percentage point increase in state capture for a state with a producing NOC, but only a 1.96 percentage point increase for a state without a producing NOC.[18]

Both sets of regressions show results that are consistent with the first hypothesis that states with NOCs have higher resource revenues collected by the government. Interestingly, the results are not strongly supportive of the argument that states with producing NOCs have the highest levels of revenue given the comparable estimates from models with the NOC indicator and the producing NOC indicator.

[18]Note that these first-step analysis do not include the oil and gas income variable given that this measure is deterministic: it is simply a product of price and production.

4.4.2 Increased revenues and regime stability

To test H_2 and H_3, I analyze predictors of regime change using a mixed-effects Bayesian logistic regression model.[19] The model is run with three different outcomes to differentiate between the types of regime change: transition to democracy, autocratic failure, and democratic failure. For the latter two, I use both the GWF and Polity measures,[20] which makes for five different outcome variables in total. The explanatory variable of interest is natural resource revenues, which I measure using the three resources variables, including the oil and gas income per capita measure.[21] To incorporate the two-step modeling procedure, I use fitted values of these resources variables but I also use their original values in a one-step approach. The fitted values are predicted revenues using the model specification in column 4 of Table 4.1 and Table 4.2 (the same model is used for the oil income variable). Controls for these models include GDP per capita growth (lagged), logged population (lagged), and a time trend. For models using the capture and oil income variables, logged GDP per capita (lagged one year) is also included as a control. Country-level random intercepts are also included in the models.

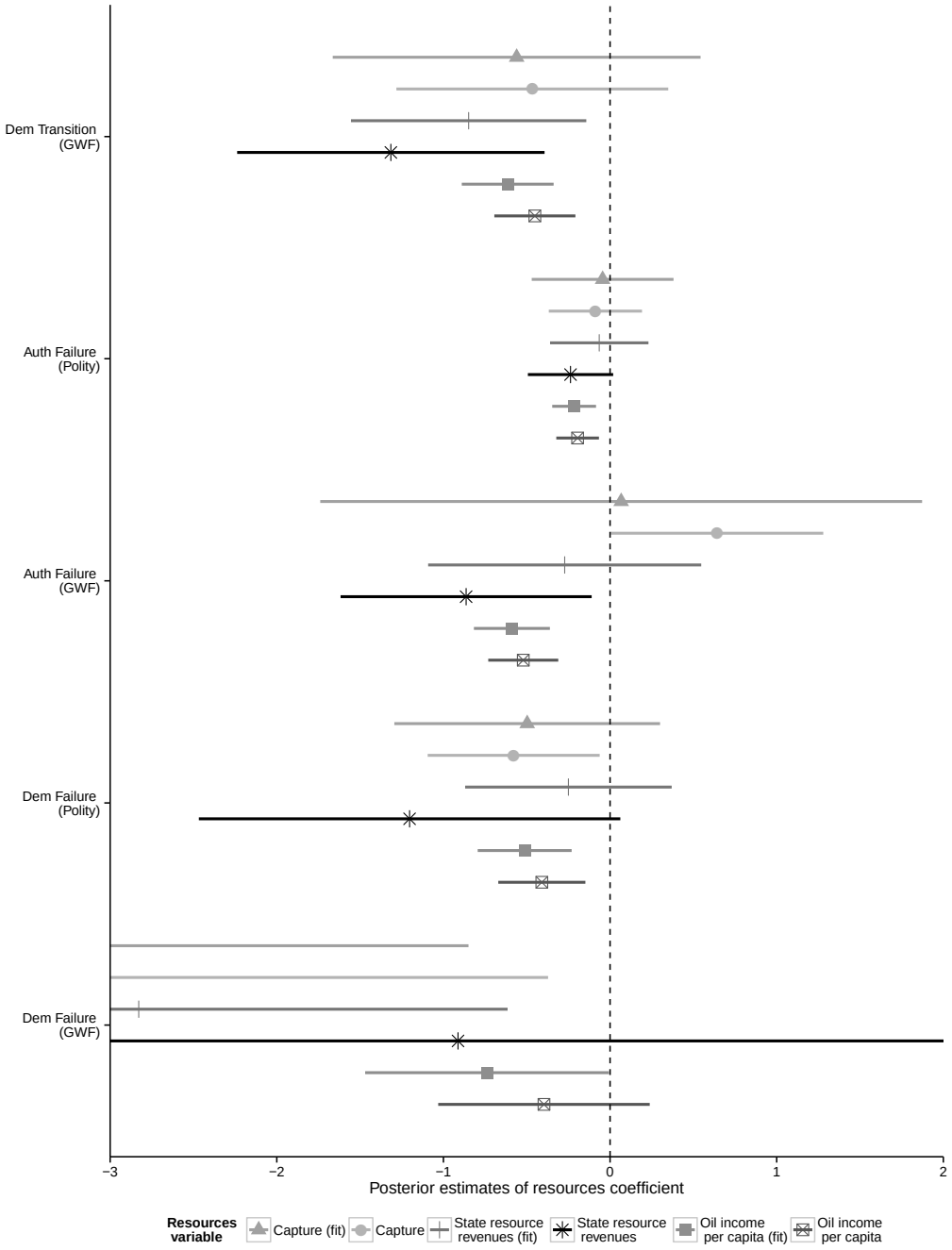
In Figure 4.5, I present the results of these models focusing only on the coefficient estimates of the natural resources variable. Specifically, I plot the posterior median (roughly equivalent to the $\hat{\beta}$ from non-Bayesian models) and 90% credible intervals for each resources variable and for each model outcome. The top six posterior estimates, for instance, are the coefficient estimates from the six different resources measures (three are fitted values, three are original values) for models where the outcome is a transition from an authoritarian regime to democracy. The two sets of estimates below show the same results but for models of auto-

[19]Non-Bayesian (Maximum Likelihood Estimation) results using conventional logit model are presented in the Appendix in Tables 3-8.

[20]I do not use the Polity definition of transition to democracy since it greatly overlaps with the Polity measure of autocratic failure.

[21]Results using the logged resource revenues per capita measure are presented in Table 4.4 in the Appendix.

Figure 4.5: Bayesian posterior estimates of natural resource revenues with five different regime change outcomes



cratic regime failure of any kind, either to democracy or to another autocracy. The last two sets of estimates are for democratic regime failures (transition to autocracy). Similar models are run using a more conventional approach in ordinary least squares (i.e., the linear probability model) with country fixed effects, with results shown in Figure 4.8 in the Appendix.

The strongest results supporting H_2 and H_3 are from models estimating the likelihood of transitions to democracy. The total resource revenues and oil income per capita measures are both negatively correlated with democratic transition with greater than 90%, or even 97.5%, probability of a negative correlation. The capture variable is also negatively correlated with democratic transition, though the 90% credible intervals cross zero (in a one-tailed test, however, the probability of being less than zero is 91.9%). In terms of magnitude, a 1 standard deviation increase in revenues corresponds to a drop in transition probability between 37% to 45% using the oil income variables, between 58% to 75% using the resource revenues variables, and between 38% to 43% using the capture variables.[22] Remember, however, that these transitions are rare and so the predicted probability of any transition is around 1-2% for these models. A 75% decrease in the likelihood, then, is equivalent to a decrease in the probability of democratic transition from 1% to 0.25%.

As for authoritarian failure in general, the results are similar with some notable exceptions. Estimates of the capture variable again are not credibly different from zero, and paradoxically, are positive for predicting authoritarian failure when using the GWF measure. Using the Polity measure of failure, the results are smaller in magnitude with more probability that the correlations are zero or close to zero, particularly for the capture and total resource revenues. For the oil and gas income per capita variables, however, these results are credibly different from zero across

[22]These are calculated using the log-odds of the posterior medians of the resources variables, in fitted and original values.

all models of regime failure, with the exception of democratic failure using the GWF measure.

Still, the results are encouraging for transitions to democracy and authoritarian failure, particularly when focusing on the resource revenues and oil income per capita measures. Interestingly the results show relatively high uncertainty of estimates for models of democratic failure. This is likely due to two factors. First, since democratic failure is quite rare – only 1% or 26 cases out of 1989 possible country-years during the 1980-2010 period – it is reasonable to expect high uncertainty from these model estimates. The second factor is some agreement among scholars of regime change that the predictors and causes of democratic failure are quite different in theory than the causes of non-democratic failure. Ulfelder (2007), for instance, shows that resource wealth may be expected to *increase* democratic failure because of an incumbent's means and desires to remain in power beyond his/her democratically-mandated term, but also *decrease* failure by alleviating economic challenges to democratic survival, particularly in low-income, young democracies.[23] Ross (2012) similarly stresses that executive constraints within democracies limit what incumbent leaders can do with higher resource revenues. This can diminish any stability-increasing effects of oil wealth, but only in the advanced democracies of the developed world where executive constraints are effective.[24] While resource revenues do seem to negatively correlate with democratic failure in my analysis, there is much more doubt as to the magnitude of this relationship and the median posterior estimates, particularly using the GWF measure of democratic failure as an outcome, are questionable.[25]

[23] Smith (2007) and Morrison (2009) offer empirical evidence for the latter, showing that oil wealth helps democratic regimes survive irrespective of income levels.

[24] Jensen and Wantchekon (2004), for instance, show that resource wealth decreases democratic failure in sub-Saharan Africa, where both incomes and executive constraints are low.

[25] Consider that the posterior coefficient estimates of the capture variables on democratic failure using the GWF measure are literally off the charts, with a 90% credible interval between -14 and -0.4. As a rule, logit coefficients greater than 2 (or less than -2) are extremely unlikely and signal more information about model mis-specification than about actual relationships between variables (Weiss, 2005).

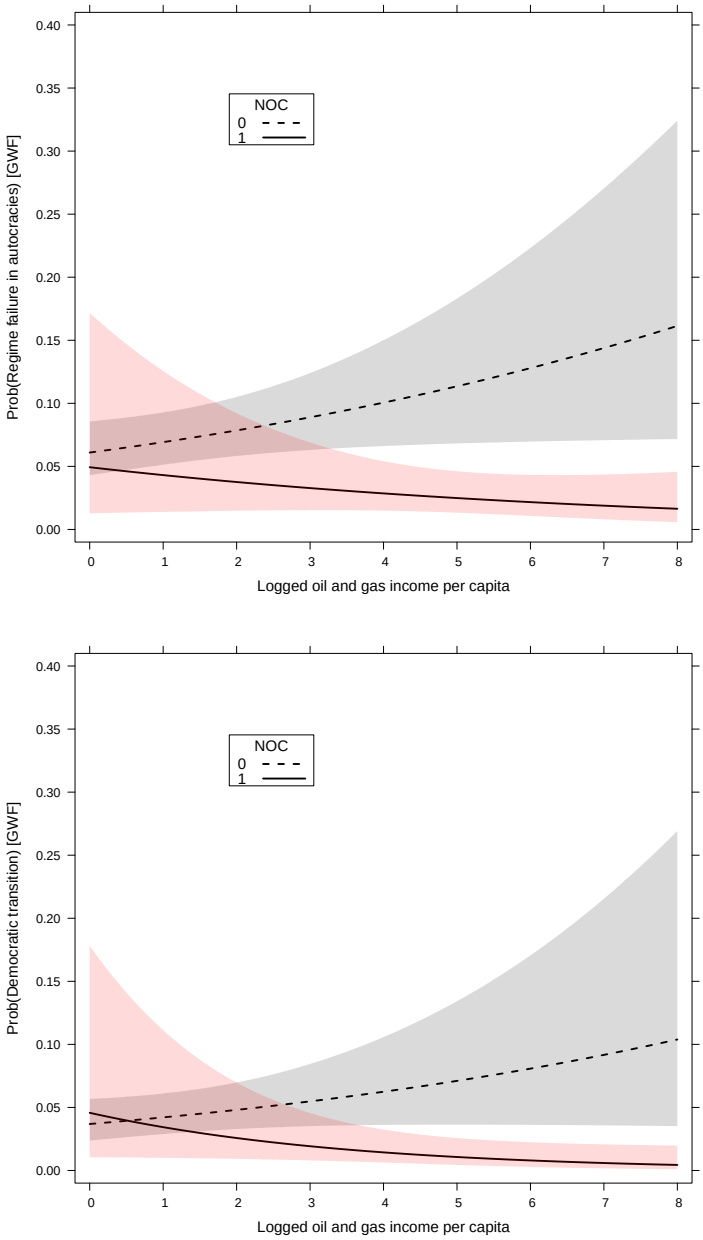
Overall I find weak and unreliable evidence that natural resources improve democratic stability. Further, there is inconsistent evidence supporting (and in some cases disputing) the relationship between stability and revenues as they are measured in terms of "capture." Yet the results offer convincing support for the argument that not only does nationalization increase revenues (and capture) but these revenues increase autocratic stability. These results are consistent when the outcome, autocratic stability, is measured both in terms of probability of any kind of autocratic regime change or in terms of the probability of a transition to democracy. Indeed, the strongest findings come from models of democratic transition: both the two-step fitted approach and the single-model approach show that oil income and government resource revenues hinder democratization.

4.4.3 Stability through revenues and nationalization

Another approach is to model the two mechanisms – NOCs increase revenues and revenues increase stability – together using interactions between nationalization and resource revenues. In this section I only use the general oil and gas income per capita variable to measure resource revenues. I make this choice because interacting the NOC variable and income is itself a proxy for resource revenues, while interacting the NOC variable with capture or collected revenues is conceptually redundant. My argument is that NOCs increase revenues and capture directly so that an interaction between the two tells nothing more than each variable by itself (if there is a NOC then there should be higher revenues). On the other hand, if there is a NOC there will not necessarily be higher oil income – and indeed could very well result in lower income due to inefficiencies (Wolf, 2009) – but if my argument is correct then states with NOCs and higher oil income will also have higher rates of regime survival because those governments will be able to capture a larger portion of the income.

The data offer convincing support for this claim, but only for autocracies

Figure 4.6: Predicted probability of autocratic failure and transitions to democracy



Estimates obtained from logistic regression controlling for GDP per capita growth, logged GDP per capita levels, logged population, and polynomial temporal trends. The dotted curve in each graph shows the predicted probability of regime failure for states without NOCs, while the solid curve shows the same for states with NOCs (producing or otherwise).

and otherwise non-democratic regimes. In Figure 4.6, I plot the results from logit models of regime survival with an interaction between NOCs and petroleum income per capita, controlling for growth in GDP per capita, logged population, logged GDP per capita, and polynomial temporal trends (following Wright, Frantz and Geddes (2015)).[26] Results from a model where the outcome is autocratic failure of any kind (including regime change from one autocracy to another) are plotted in the top graph, while results from a model where the outcome is a transition to democracy are plotted in the bottom graph. In both cases, more oil income corresponds to lower regime failure but only in states with national oil companies. Indeed among the non-NOC states, regimes with high levels of oil income per capita have higher chances of failure than those with lower levels of oil income. Though not plotted here, the same is true for autocratic failure using the Polity measure of regime change.[27]

Much like the results in Figure 4.5, there is weaker evidence that nationalization strengthens democracies through increased revenues. Predicted democratic failure using the same NOC-oil income interaction model does show less likelihood of a non-democratic transition for states with NOCs, but with high uncertainty especially at moderate to high levels of oil income capita (e.g., above 4.6 logged units or $100 oil and gas income per capita).[28]

4.5 Discussion

All of these results suggest that the correlations between nationalization, revenues, and stability are robust to different modeling specifications and approaches: from testing the determinants of resource revenues, to a two-step procedure, to an interaction-term modeling approach, using multiple different measures of resource

[26] Full model results are presented in the Appendix.

[27] See Figure 4.6 in the Appendix.

[28] See Figure 4.6 in the Appendix. Figure 4.6 shows similarly null results for democratic failure using the Polity measure of regime change.

revenues and regime change. Even absent any multivariate modeling, as in Figure 4.2 and Figure 4.4, the general patterns predicted by my argument are reflected in the data. Nationalization of resources helps to increase resource revenues that are collected by the state, and these increases help regimes survive.

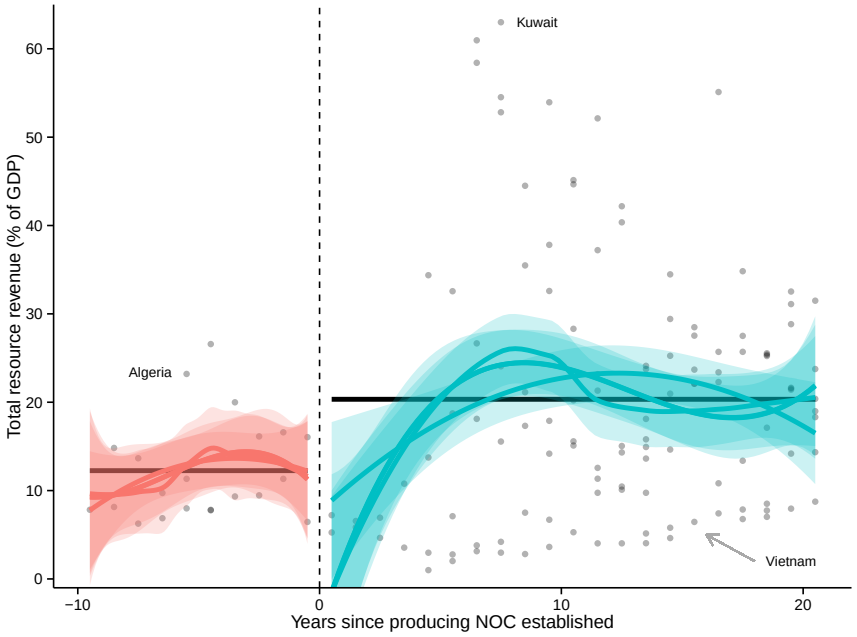
In addition to the data and results I have presented so far in this chapter, there are two additional sets of evidence that would offer more support for the argument. The first is a case study analysis of actual instances of regime survival through the spending of natural resource revenues collected by the government. The two cases of Qatar and the UAE in particular offer an interesting look at how natural resource revenues and spending changed before and after nationalization. Both Qatar and the UAE are Gulf monarchies which nationalized in the early 1970s, but while Qatar immediately established a majority-producing NOC upon nationalization in 1974, the UAE opted for a NOC with minimal production capacity after nationalization in 1971 and relied instead on foreign companies to handle operations. To this day, while the Abu Dhabi NOC has considerable production capacity, it operates only 60% of the country's fields, while Qatar Petroleum, the country's NOC, operates close to 100%. By examining these temporal and institutional differences in greater detail, I can not only test the general argument that nationalization increases regime stability through increased revenues, but also the corollary that producing NOCs should have higher revenues and capture than other NOCs.

The second is to extend the analysis to leadership turnover. The theories of regime and leader survival are distinct despite sharing many similarities – for example, that economic development promotes leader survival just as it does regime survival – but the two are different in that personalistic factors play a stronger role in determining leadership change. A future chapter will not only test the revenues-stability hypothesis discussed here, but also analyze how leadership survival is affected by corruption as well as the clientelistic behavior used by leaders

to stay in office. This would continue the discussion in chapter three of oil-related corruption in particular, highlighting another mechanism through which nationalization can affect political stability.

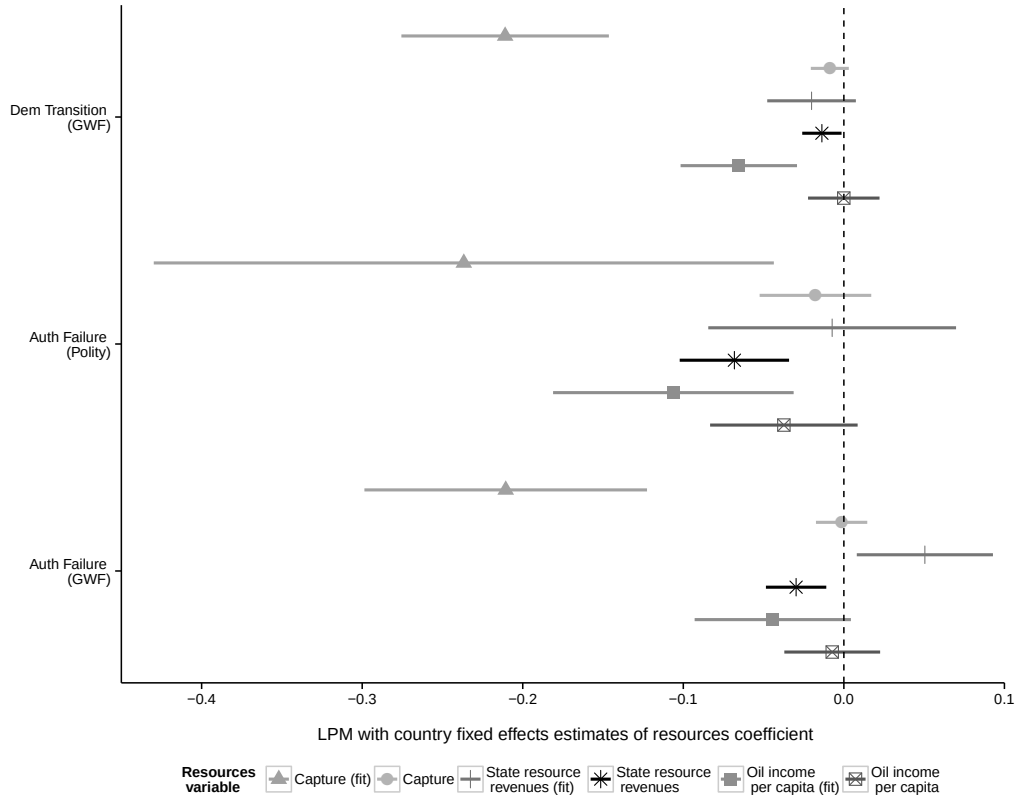
4.6 Appendix: Additional figures and tables

Figure 4.7: Resource revenues before and after establishing a producing NOC



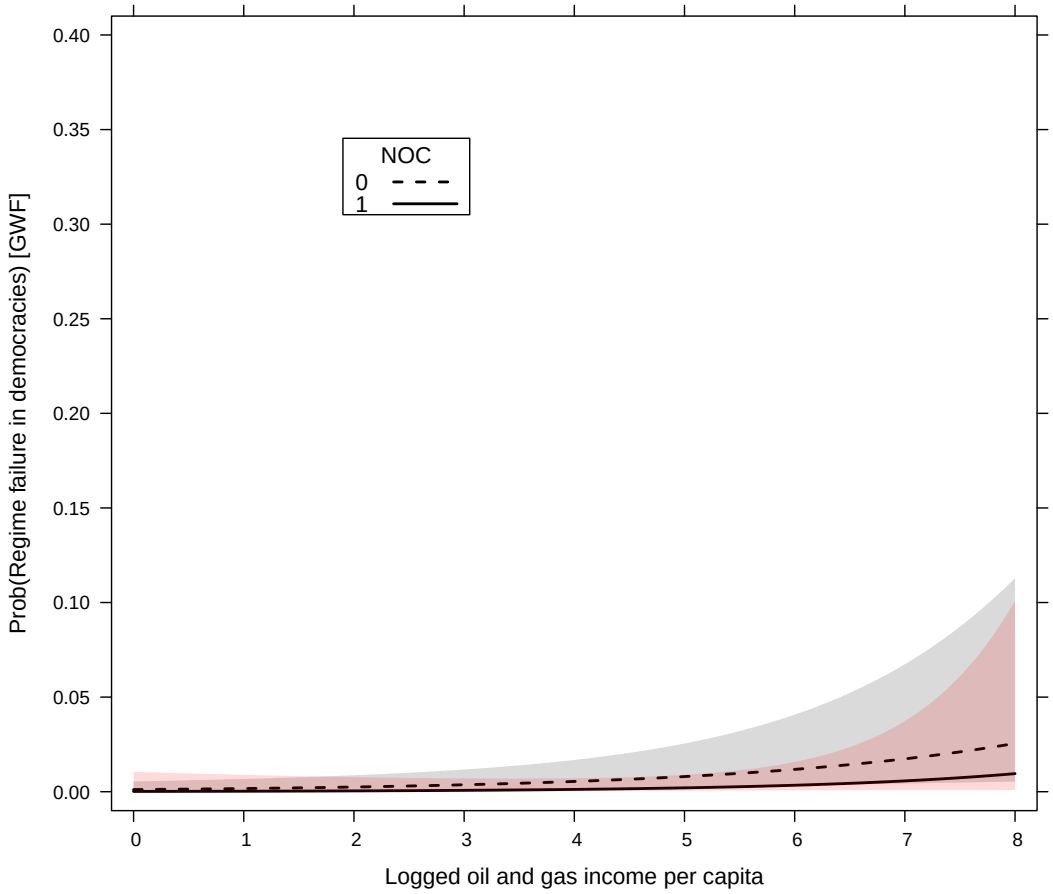
Average resource revenues before and after a producing NOC is established are shown by the solid horizontal lines. I overlay four additional metrics to capture temporal changes in revenues, with 95% confidence bands: (1) loess smoother, (2) quadratic smoother, (3) cubic smoother, and (4) a fourth-order polynomial smoother. These are colored red before a producing NOC is established and blue afterwards. Total number of countries in the sample is 36. Note: "producing NOC" refers here to a NOC which produces the majority of the country's oil and gas.

Figure 4.8: Estimates of natural resource revenues with three different regime change outcomes using OLS with country fixed effects



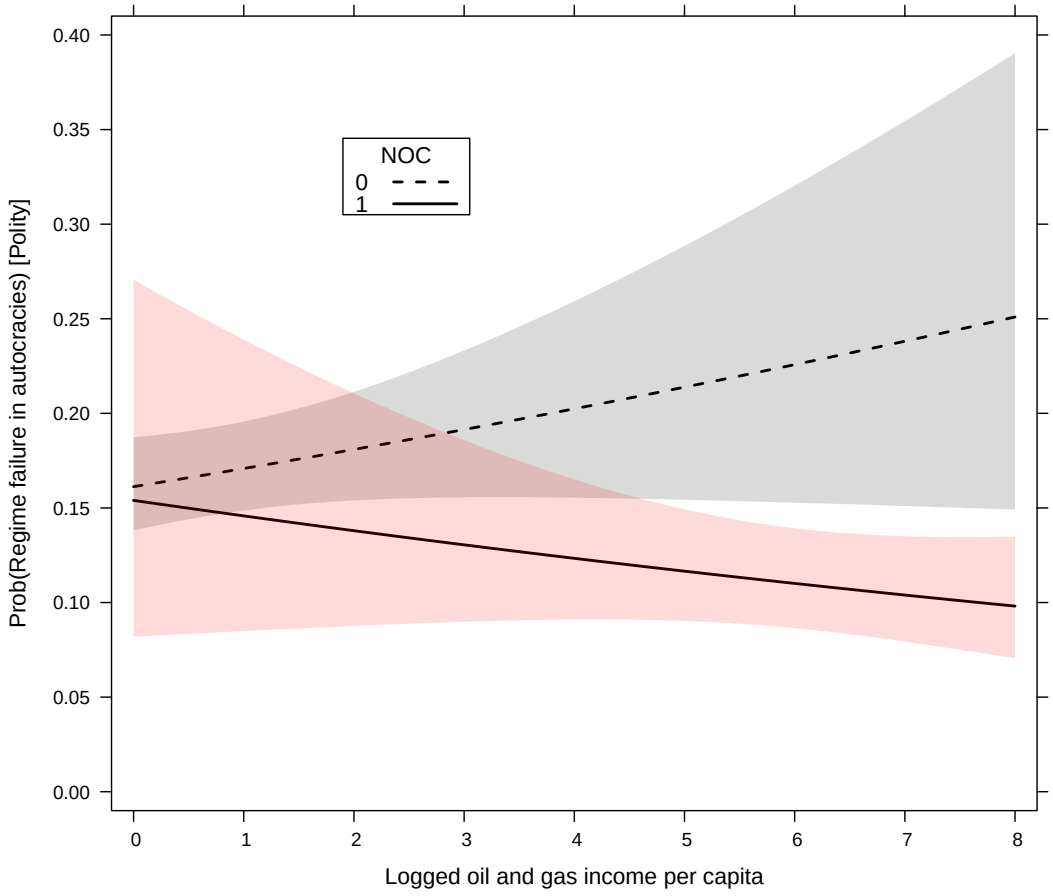
Coefficient estimates with 95% confidence intervals for different measures of resource revenues. Binary dependent variables included: transition to democracy (GWF), autocratic failure (GWF) and autocratic failure (polity). Democratic failures are not plotted given high uncertainty of results: the confidence intervals of all coefficients cross zero. All results are substantively similar to the Bayesian mixed-effect logit models without country fixed effects with one exception: the positive and significant coefficient of fitted state resource revenues where the outcome is autocratic failure (GWF). Upon further examination of this model, it appears that Mauritania – which had three regime failures in 2005-2008 (the last one resulted in a transition to democracy) just as it began oil production in 2006 – has extremely high leverage on the results; removing it from the sample returns a negative coefficient.

Figure 4.9: Predicted probability of democratic failure (GWF)



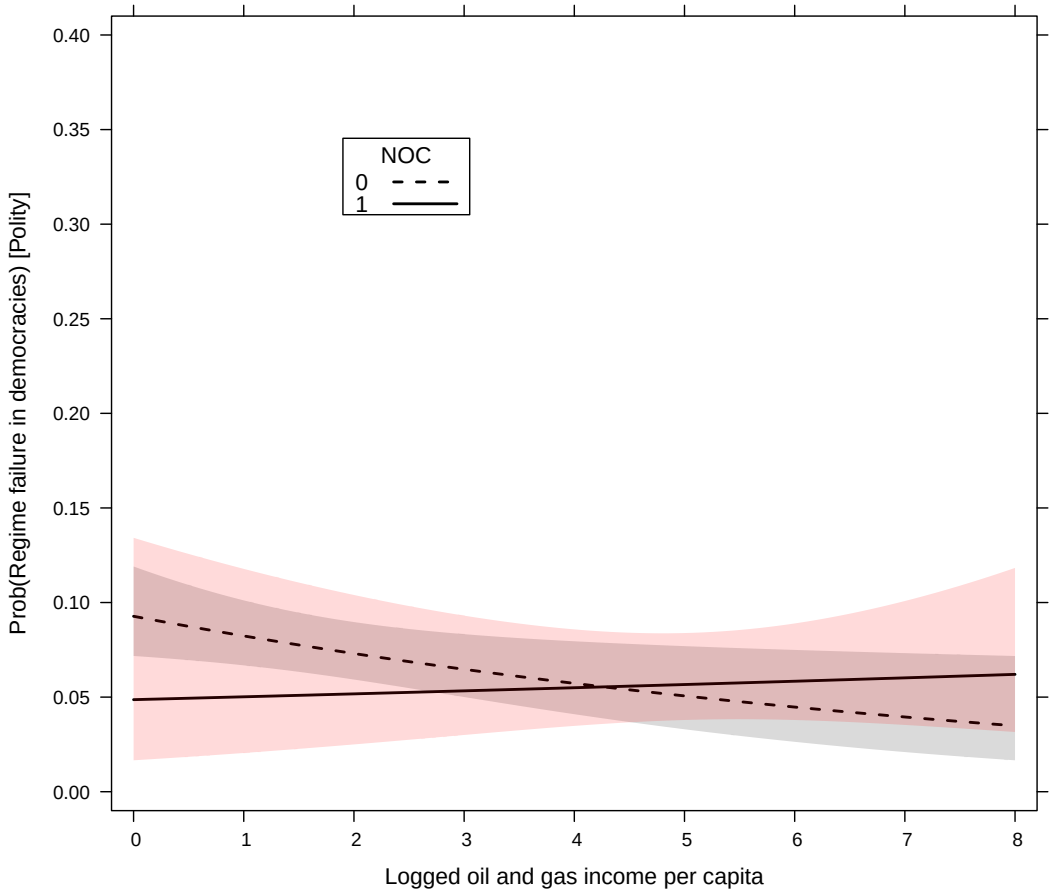
Estimates obtained from logistic regression controlling for GDP per capita growth, logged GDP per capita levels, logged population, and polynomial temporal trends. The dotted curve in each graph shows the predicted probability of regime failure for states without NOCs, while the solid curve shows the same for states with NOCs (producing or otherwise).

Figure 4.10: Predicted probability of autocratic failure (Polity)



Estimates obtained from logistic regression controlling for GDP per capita growth, logged GDP per capita levels, logged population, and polynomial temporal trends. The dotted curve in each graph shows the predicted probability of regime failure for states without NOCs, while the solid curve shows the same for states with NOCs (producing or otherwise).

Figure 4.11: Predicted probability of democratic failure (Polity)



Estimates obtained from logistic regression controlling for GDP per capita growth, logged GDP per capita levels, logged population, and polynomial temporal trends. The dotted curve in each graph shows the predicted probability of regime failure for states without NOCs, while the solid curve shows the same for states with NOCs (producing or otherwise).

Table 4.3: Nationalization increases resource revenues (per capita) collected by the government

	Model 1	Model 2	Model 3	Model 4	Model 5
Petroleum production (tonnes/year) (logged)	0.505*** (0.040)	0.480*** (0.039)	0.411*** (0.037)	0.501*** (0.040)	0.471*** (0.038)
Oil price (US$)	0.205*** (0.012)	0.201*** (0.011)	0.196*** (0.011)	0.209*** (0.012)	0.204*** (0.011)
NOC indicator		0.382*** (0.067)	−0.879*** (0.126)		
NOC × production			2.675*** (0.232)		
Producing-NOC indicator				0.142** (0.071)	−1.329*** (0.204)
Producing-NOC × production					2.247*** (0.293)
R^2	0.922	0.925	0.935	0.922	0.927
Adj. R^2	0.917	0.920	0.931	0.917	0.923
Num. observations	857	857	857	857	857
Num. countries	49	49	49	49	49

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

All variables are lagged one year and, except for the national oil company (NOC) variables, all variables are standardized with mean zero and variance one. All models include country fixed effects, the estimates of which are omitted from this table.

Table 4.4: Resource revenues per capita and regime stability

	$E(\beta\|Y)$	Std. Dev.	2.5 %ile	97.5 %ile	$Pr(\|\beta\| > 0)$
Resource revenues per capita (logged)					
Transition to Democracy (GWF)	-1.35	0.73	-3.17	-0.13	0.02
Autocratic failure (GWF)	-1.33	0.67	-2.73	-0.23	0.01
Autocratic failure (Polity)	-0.35	0.22	-0.77	0.05	0.05
Democratic failure (GWF)	-5.86	3.36	-13.61	-0.35	0.01
Democratic failure (Polity)	-0.45	0.59	-1.61	0.65	0.20
Fitted resource revenues per capita (logged)					
Transition to Democracy (GWF)	-2.04	1.21	-4.85	-0.02	0.02
Autocratic failure (GWF)	-0.80	0.61	-2.06	0.47	0.08
Autocratic failure (Polity)	-0.26	0.22	-0.71	0.19	0.12
Democratic failure (GWF)	-7.79	3.96	-16.21	-1.34	0.01
Democratic failure (Polity)	-0.50	0.69	-1.97	0.73	0.22

Coefficient estimates for logged resource revenues per capita from Bayesian mixed-effect logit models with non-informative priors. The first column indicates the dependent variable in each analysis; the second column provides the posterior mean (expected a posteriori) of the coefficient for resource revenues per capita; the third and fourth columns provide the values at the 2.5th and 97.5th percentiles, respectively, of the posterior distribution; the fifth column shows the probability that the coefficient estimate is less than zero (similar to a one-tailed p value in the frequentist literature).

Table 4.5: MLE logistic regression models of regime change, using oil and gas income per capita as a measure of natural resource revenues.

	Dem Fail (GWF)	Aut Fail (GWF)	TTD (GWF)	Dem Fail (Polity)	Aut Fail (Polity)
Intercept	-5.53^{***}	-3.13^{***}	-3.64^{***}	-3.04^{***}	-1.80^{***}
	(0.73)	(0.25)	(0.32)	(0.27)	(0.15)
GDP growth	0.18^{***}	-0.32^{**}	-0.30^{*}	-0.02	0.06
	(0.06)	(0.14)	(0.18)	(0.10)	(0.08)
Oil income per capita	-0.31	-0.43^{***}	-0.39^{**}	-0.26^{**}	-0.15^{**}
	(0.30)	(0.13)	(0.17)	(0.12)	(0.07)
Population	0.35	0.02	0.17	0.14	0.02
	(0.22)	(0.12)	(0.15)	(0.10)	(0.07)
Time trend	0.05	0.01	0.01	0.03^{*}	0.00
	(0.03)	(0.01)	(0.02)	(0.01)	(0.01)
AIC	233.36	737.62	471.70	899.29	1425.67
BIC	260.58	764.79	498.88	926.51	1452.84
Log Likelihood	-111.68	-363.81	-230.85	-444.64	-707.84
Deviance	223.36	727.62	461.70	889.29	1415.67
Num. obs.	1709	1693	1693	1709	1693

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4.6: MLE logistic regression models of regime change, using fitted oil and gas income per capita as a measure of natural resource revenues.

	Dem Fail (GWF)	Aut Fail (GWF)	TTD (GWF)	Dem Fail (Polity)	Aut Fail (Polity)
Intercept	-5.54^{***}	-3.12^{***}	-3.66^{***}	-3.03^{***}	-1.79^{***}
	(0.74)	(0.25)	(0.33)	(0.27)	(0.15)
GDP growth	0.18^{***}	-0.32^{**}	-0.30^{*}	-0.02	0.06
	(0.06)	(0.14)	(0.18)	(0.10)	(0.08)
Oil income per capita (fitted)	-0.45	-0.47^{***}	-0.51^{***}	-0.29^{**}	-0.16^{**}
	(0.32)	(0.13)	(0.18)	(0.12)	(0.07)
Population	0.39^{*}	0.03	0.20	0.14	0.02
	(0.22)	(0.12)	(0.16)	(0.10)	(0.07)
Time trend	0.05	0.01	0.01	0.02^{*}	0.00
	(0.03)	(0.01)	(0.02)	(0.01)	(0.01)
AIC	232.30	735.65	468.29	898.29	1424.99
BIC	259.52	762.82	495.46	925.51	1452.16
Log Likelihood	-111.15	-362.82	-229.14	-444.15	-707.49
Deviance	222.30	725.65	458.29	888.29	1414.99
Num. obs.	1709	1693	1693	1709	1693

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4.7: MLE logistic regression models of regime change, using ICTD total resource revenues as percentage of GDP as a measure of natural resource revenues.

	Dem Fail (GWF)	Aut Fail (GWF)	TTD (GWF)	Dem Fail (Polity)	Aut Fail (Polity)
Intercept	−0.89	−4.80***	−4.82***	−1.19	−2.16***
	(1.79)	(0.78)	(1.03)	(0.98)	(0.33)
GDP growth	2.60	−0.22	−0.31	0.20	−0.02
	(2.58)	(0.22)	(0.32)	(0.36)	(0.13)
Resource revenues	−1.15	−0.51**	−0.66*	−0.20	−0.11
	(1.65)	(0.22)	(0.36)	(0.32)	(0.13)
Population	−3.18	0.09	0.34	−0.56*	0.16
	(2.78)	(0.25)	(0.36)	(0.33)	(0.13)
Time trend	−0.29	0.08**	0.02	−0.02	0.01
	(0.23)	(0.04)	(0.05)	(0.05)	(0.02)
AIC	23.49	186.81	97.32	100.12	455.08
BIC	36.62	208.67	119.18	113.25	476.95
Log Likelihood	−6.75	−88.40	−43.66	−45.06	−222.54
Deviance	13.49	176.81	87.32	90.12	445.08
Num. obs.	102	586	586	102	586

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4.8: MLE logistic regression models of regime change, using fitted ICTD total resource revenues as percentage of GDP as a measure of natural resource revenues.

	Dem Fail (GWF)	Aut Fail (GWF)	TTD (GWF)	Dem Fail (Polity)	Aut Fail (Polity)
Intercept	−0.12	−4.77***	−4.87***	−1.16	−2.16***
	(2.21)	(0.77)	(1.04)	(0.99)	(0.33)
GDP growth	3.17	−0.25	−0.35	0.18	−0.03
	(2.95)	(0.22)	(0.32)	(0.35)	(0.13)
Resource revenues (fitted)	−2.03	−0.42*	−0.66*	−0.22	−0.05
	(2.21)	(0.24)	(0.39)	(0.34)	(0.14)
Population	−4.49	0.10	0.35	−0.58*	0.16
	(4.13)	(0.24)	(0.36)	(0.33)	(0.13)
Time trend	−0.41	0.08**	0.03	−0.02	0.01
	(0.34)	(0.04)	(0.05)	(0.05)	(0.02)
AIC	22.85	188.96	97.76	100.13	455.65
BIC	35.98	210.82	119.62	113.26	477.51
Log Likelihood	−6.43	−89.48	−43.88	−45.07	−222.82
Deviance	12.85	178.96	87.76	90.13	445.65
Num. obs.	102	586	586	102	586

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4.9: MLE logistic regression models of regime change, using state capture as a measure of natural resource revenues.

	Dem Fail (GWF)	Aut Fail (GWF)	TTD (GWF)	Dem Fail (Polity)	Aut Fail (Polity)
Intercept	−337.61	−5.48***	−5.07***	−1.62	−2.30***
	(71982.54)	(1.04)	(1.32)	(1.10)	(0.40)
GDP growth	92.69	−0.41	−0.26	0.07	−0.04
	(13830.02)	(0.26)	(0.35)	(0.42)	(0.14)
Revenue capture	−120.19	0.51	−0.41	−0.46	−0.12
	(18009.35)	(0.32)	(0.56)	(0.29)	(0.17)
GDP per capita	652.15	−1.16**	−0.82	0.69	−0.42*
	(88583.69)	(0.49)	(0.70)	(0.81)	(0.22)
Population	−1222.55	0.72*	0.86	−1.49	0.36*
	(148480.61)	(0.41)	(0.65)	(1.15)	(0.20)
Time trend	−2.29	0.09**	0.02	0.00	0.02
	(3486.50)	(0.05)	(0.06)	(0.05)	(0.02)
AIC	12.00	117.55	70.34	70.15	344.79
BIC	26.29	141.96	94.75	84.45	369.20
Log Likelihood	0.00	-52.77	-29.17	-29.08	-166.39
Deviance	0.00	105.55	58.34	58.15	332.79
Num. obs.	80	432	432	80	432

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4.10: MLE logistic regression models of regime change, using fitted state capture as a measure of natural resource revenues.

	Dem Fail (GWF)	Aut Fail (GWF)	TTD (GWF)	Dem Fail (Polity)	Aut Fail (Polity)
Intercept	−298.71	−5.31***	−5.13***	−1.66	−2.31***
	(121050.07)	(1.01)	(1.32)	(1.12)	(0.40)
GDP growth	117.57	−0.35	−0.29	0.04	−0.04
	(53879.62)	(0.26)	(0.36)	(0.41)	(0.14)
Revenue capture (fitted)	−113.88	0.59	−0.35	−0.41	−0.09
	(27218.08)	(0.44)	(0.70)	(0.32)	(0.24)
GDP per capita	356.91	−1.15**	−0.89	0.65	−0.44*
	(83645.78)	(0.50)	(0.71)	(0.82)	(0.23)
Population	−627.13	0.66*	0.93	−1.48	0.37*
	(140231.73)	(0.39)	(0.66)	(1.20)	(0.20)
Time trend	3.72	0.08*	0.03	0.00	0.02
	(4373.79)	(0.04)	(0.06)	(0.05)	(0.02)
AIC	12.00	118.21	70.62	71.10	344.76
BIC	26.29	142.61	95.02	85.39	369.16
Log Likelihood	0.00	-53.11	-29.31	-29.55	-166.38
Deviance	0.00	106.21	58.62	59.10	332.76
Num. obs.	80	431	431	80	431

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

CHAPTER 5

Conclusion and the road ahead

5.1 Introduction

I began this dissertation in the introductory chapter with two goals in mind: to show that oil's consequences for political development are conditional on what institutions states create to manage their resources, and to explain why some institutions are worse than others. The key concept connecting these two goals is the role of NOCs in the oil sector and how and why this process differs across countries.

In this final chapter I summarize the argument from chapter one and supporting evidence provided in chapters two through four, discuss theoretical and empirical implications of the argument and evidence, and provide a map of future research and remaining questions based on these findings.

5.2 Summary of the argument and evidence

To restate my argument from chapter one: oil-related institutions that maximize government capture of oil wealth will increase the likelihood of durable regimes with more sustainable expenditures and low corruption. These institutions incentivize high efficiency and thus high take-home revenues and are represented in my analysis by NOCs with production capacity, which I refer to as producer NOCs. Alternatively, institutions which incentivize graft, corruption, and/or operational

inefficiency will lead to worse outcomes. These are exemplified by hollow NOCs and regulator NOCs which play almost no role in production or operations.

As with any institutional arrangement, there are designs which combine what I suggest are positive and negative characteristics. One such arrangement is the integrated NOC, which is actively involved in production and typically achieves higher revenues than non-producing NOCs, but also has regulatory authorities that increase opportunities for corrupt behavior. The choice of having no NOC at all similarly presents a mixed set of outcomes. While the "no NOC" institutional design means there is less opportunity for corruption it also means potentially lower levels of optimal investment, lower levels of fiscal capture, and therefore lower levels of government revenue from the sale of oil.

So how, then, is the government's capture of oil revenue the mechanism explaining the relationship between NOC institutional design and development outcomes? Recall from chapters one and four that what I consider the optimal NOC design – the producer NOC – increases government revenues from oil in three ways. First, setting up a NOC can be thought of as a "second-best" option when the government cannot credibly commit *not* to expropriate private firms. Without NOC establishment, private firms may be wary of investing in the country's oil sector given there is high uncertainty about the risk of expropriation. Afterwards, however, this uncertainty diminishes as firms know the government has already committed to a nationalized sector and further expropriation of assets is unlikely (after a transition period, that is). With more investment in the sector than before NOC establishment, government revenues will be higher since overall oil revenues will be higher, even if effective tax rates remain unchanged.

This connects with the second mechanism through which NOCs – particularly those which produce oil – can lead to higher government revenues. Setting up a NOC allows the government to set the effective tax rate at a higher level than under a system of solely private ownership. Specifically, the government can force

the NOC to take a negative rate of return (RoR) if the government collects gross revenues, prior to letting the NOC repay its production and management costs. In the absence of a NOC, no private firm will enter the sector for a negative RoR; in theory, this translates to zero production and thus no revenues for the host government. Here, the optimal RoR must be non-negative for the state to earn any revenues, but with a producer NOC the state can earn revenues by setting a negative RoR and fully taxing the NOC. In the case of a NOC without production, however, the state must still rely on private firms for operations; as such, it must similarly set a non-negative RoR to entice companies to enter the sector and produce the country's oil.

Third, by establishing a NOC that directly operates in the sector helps to reduce information asymmetries between state and operator. Under private ownership, it is difficult for the state to discern the "true" cost and output of oil produced by private firms. The state typically must rely on firms' honest reporting of costs and production levels in order to capture their proper share of revenues. Under state ownership, however, this information gap is narrowed as there is direct control over a NOC's finances. Again, this mechanism primarily works for states with producer NOCs, since a hollow NOC will still face the same asymmetries when dealing with private firms. The NOC as regulator design similarly faces asymmetries with private firms, though its active involvement in the oil sector helps to increase the NOC's technical capacity and thus its ability to identify inaccurate information provided by firms.

From these three mechanisms it follows that states with producer NOCs will have a greater rate of revenue collection, or capture, than states with alternative institutional designs. Still, having a NOC of any kind increases revenues compared to the framework of private ownership. In chapter two I showed why states would want to set up NOCs (instead of relying solely on private firms for operations) based on a general revenue-maximization framework. I found that the timing

of NOC establishment depended on the international price of oil as well as the international cost of retaliation, here conceptualized by how many other states had set up NOCs in previous years. I also found evidence that suggested resource nationalism matters in the timing and location of NOC establishment. States where the perceived gap between government and operator revenue was high were more likely to set up NOCs. Recall, however, that this finding was based on an in-depth comparison of two cases – 1940s Iran and Saudi Arabia – given the lack of information on state vs. operator revenue shares for a more thorough cross-national analysis.

The findings from chapter two primarily serve to show that indeed governments are revenue-maximizers when it comes to oil revenues – certainly not an earth-shattering revelation in political science – but importantly also to show that the establishment of NOCs is perceived (by leaders) to help increase their take-home share of oil revenues. These findings, then, are consistent with the argument that NOCs are institutionally relevant because they increase government revenues.

It is not until chapter four that I tested this implication directly with a focus not only on NOCs in general but producer NOCs in particular. There I showed with data from the ICTD *Government Revenue Dataset* (Prichard, Cobham and Goodall, 2014) that resource revenues are higher after producer NOCs are established than beforehand; the same is true of NOCs in general, though to a much smaller degree. A simple non-parametric analysis showed that while revenues initially drop after setting up a producer NOC, there are sustained increases in revenues after 5-10 years.

In chapter three I examined the consequences of NOCs for corruption in the oil sector. Using originally collected data on bribery of foreign officials from prosecutions of the U.S. Foreign Corrupt Practices Act, I showed firstly that more oil wealth does not necessarily lead to corruption and secondly that one institutional arrangement in particular – the regulatory NOC – led to higher levels

of corruption compared to alternative institutional frameworks. This chapter characterized the importance of institutional variation within the oil states and illustrated the conditionality of one aspect of the resource curse, corruption, by highlighting the specific institutions that influence positive or negative outcomes.

In chapter four, in addition to the finding that producer NOCs generate higher government revenues, I found that this oil revenue led to increased regime stability. The cross-national evidence showed that this relationship was strongest for authoritarian regimes, with increased oil revenues from producer NOCs decreasing both authoritarian failure in general and democratic transition in particular. These findings were robust to different measures of regime change and measures of oil revenues, as well as different methodological specifications. This chapter tied together the argument from chapter one with the findings in chapters two and three to suggest that the institutions states choose to manage their oil wealth ultimately matter for the survival of the regime. Importantly, I provided evidence for increased revenues as one mechanism for why different institutions – not just NOCs in general but their varying characteristics – have different outcomes for regime stability.

5.3 Theoretical implications

Taken together, the evidence I provided in this dissertation gives a specific answer to the question, why are some countries seemingly blessed by oil while others are cursed? Or as I stated in the introductory chapter, why do we sometimes get outcomes like those in Angola – a stable regime, relatively middling corruption, and high oil revenue capture by the state – while we also get outcomes like those in Nigeria – instability, high corruption, and relatively low revenue capture?

The conditionality of the oil curse is certainly not a revolutionary finding. But it is one that has eluded prior scholars due to the inherent difficulties and

complexities of measuring the conditions that seem to matter. As Michael Ross (2015, 253) writes in his review of the state of the resource curse literature,

> Many studies [of the resource curse] offer theories about the processes that link resources to different outcomes, or the conditions under which they are most likely to occur. Yet few have tried to distinguish among these mechanisms and conditions to see which are valid. Distinguishing among these conditions and mechanisms is empirically challenging because they often have similar observable implications.

What I have been able to show in this dissertation is that there *are* particular conditions which provide the foundation for better political outcomes. I identify conditions more specific than broad claims that consolidated democracies with oil "tend to do better" or even that ownership structure matters. As Luong and Weinthal (2010, 322) rightly point out, the variation in ownership structure of natural resources helps to explain the divergence in development trajectories of the resource-producing states. I show here not only why ownership structure matters for development, but how and why ownership structures differ in important ways. I closely analyze whether all forms of state ownership lead to the same political outcomes to find interesting and complex variations. When there is state involvement in production – through the producer NOC framework – the level of oil revenues captured by the state is higher than when there is no state involvement in production but only in regulation or when there is no state involvement at all. When the state places regulatory authority – specifically the power to award contracts – in the hands of a NOC, there are higher levels of corruption than when the NOC has no regulatory powers or when there is no NOC in the sector.

These diverging outcomes show that it is not enough to argue that state ownership in general or that weak fiscal institutions explain the conditionality of the resource curse. I have shown that there are specific qualities of oil-related insti-

tutions that promote better outcomes, or at the very least, do not promote bad outcomes. National oil companies which are oil companies in the truest sense – not regulators or managers or tax collectors – provide their governments with lower corruption, and lower inefficiency, and therefore higher revenues from oil.

Beyond my argument's implications for the conditionality of the oil curse, my findings suggest four additional implications. The first of these is that oil has different development outcomes than minerals (such as copper or gold) because of the degree to which oil is managed by the state. This addresses a separate point made by Ross (2015, 253) about future directions of the resource curse literature:

> Because minerals vary in many potentially consequential ways – for example, in their physical characteristics, the revenues they generate, the volatility of their markets, the degree to which they are controlled by state-owned companies, and the labor intensity of their extraction processes – these comparisons could help researchers develop more general theories that explain why different types of resources, with different characteristics, lead to different outcomes.

Consider again the statistic I referenced in the first page of this dissertation – that 61% of global oil production in 2008 was controlled by NOCs in some form or another. Now consider what this figure is for various minerals in 2008: bauxite, 0.4%; copper, 4.5%; diamonds, 36.5%; gold, 2.6%; iron, 11.1%; nickel, 1.0%; and zinc, 1.6% (World Bank, 2011). The only mineral remotely close to oil in terms of state involvement is the diamond industry at just under 37% state share in global production. But this figure is largely driven by state ownership in just one country, Botswana, which represents 13% of the world's diamond production; the state also has a 15% direct interest in one of the DeBeers group's holding companies.

Still, there is some consensus that besides oil, diamonds can also have "curse-

like" effects on political outcomes. Andersen and Aslaksen (2013) find that kimberlite diamonds in particular have regime-prolonging effects, while Ross (2006) and Lujala, Rod and Thieme (2007) find that conflict appears to last longer when taking place near alluvial diamond mines. While these effects are largely attributed to the lootability of diamonds, my research here suggests an alternative explanation to be explored in future research, that perhaps state ownership plays a role in how diamond wealth affects political stability.

Second, my findings speak to the larger economics literature on the consequences of state intervention for efficiency (Buchanan, Tollison and Tullock, 1980; Hartley and Medlock, 2008). As I showed in chapters one and four, not all NOCs lead to production inefficiencies. Producer NOCs that have no role in regulation tend to avoid the "interventionist pitfalls" of declining production and revenues, implying that state intervention in general is not necessarily detrimental to efficiency. There are a number of possible reasons why producer NOCs are more efficient than non-producer NOCs, including the relative autonomy of these NOCs and minimal interference in operations by other arms of the state (Victor, Hults and Thurber, 2012). This latter reason – minimal state interference – includes the idea that management of a producer NOC is relatively independent from the state. That is, these NOCs tend to have independent board members who are appointed on the basis of merit and not on the basis of patronage or closeness to the political regime. Elsewhere, I have shown that for the case of Nigeria – where the NNPC is not a producer but rather more of a regulator – board appointments are largely made based on political connections (Mahdavi, 2014*a*). Tordo, Tracy and Arfaa (2011) show that this is not the case in contexts which I have defined as producer NOCs, such as Norway, Saudi Arabia, and pre-Chavez Venezuela. While there is much more research needed to be able to make definitive claims about the role of state interference in NOC management, this is one potential reason for why producer NOCs remain efficient while other types of NOCs tend towards less

operational efficacy.

Third, the findings in chapter three speak to a more nuanced implication specific to theories about the political economy of corruption. Within this branch of scholarly work there has been much debate about the use of cross-national measures to capture extortion and graft (Donchev and Ujhelyi, 2014; Escresa and Picci, 2014; Treisman, 2007). I have discussed these issues elsewhere within the context of the institutional determinants of corruption around the world (Golden and Mahdavi, 2015) as well as in chapter three, but a simple framing of the measurement debate is that perceptions of corruption do not equal incidence of corruption.

The use of measures such as the Transparency International Corruption Perceptions Index (CPI) or the World Bank Governance Indicators (Kaufmann, Kraay and Zoido-Lobatón, 1999) – which are based on surveys of experts' perceived levels of corruption in a given country – is primarily useful in studies of how perceived corruption can affect or be affected by factors like investment, intervention, or institutional strength. These measures should not be used, however, when studying the causes or consequences of corruption as it occurs in practice. So far it has been difficult to find the ideal measure of the incidence of corruption for cross-national analysis. This is due to the varying definitions of corruption across cases as well as the inherent challenges of capturing activities which political actors themselves are working tirelessly to conceal from the public. My analysis of FCPA data helps to solve this problem, as I outline in chapter three, because these data are both immediately comparable across cases[1] and incredibly thorough in assessing the specific aspects of bribery at the highest level of government (allowing the researcher to gather information on previously "hidden" activity). Though this measure is not without its faults – notably the endogeneity of which cases are pursued for prosecution – the FCPA-based data on corruption

[1]The definition of a FCPA violation is constant across countries.

can be used to shed light on questions at the forefront of the scholarly debate on the causes and consequences of corruption across the world. These include why some countries are more corrupt than others (Treisman, 2007); where corruption manifests within the political hierarchy (Bussell, 2014); and how governments use corruption as a tool for clientelism and patronage (Stokes et al., 2013).

Lastly, in chapter four I assess the strength of the fiscal theory of democracy (Levi, 1989; Ross, 2004) that governments which spend more on their citizens without resorting to higher income taxes are more likely to stay in power. My findings strongly support this line of argument. Regimes are more likely to survive with higher revenues that come from the sale of oil and natural resources. One important implication from these findings is that the distinction between tax and non-tax revenue (Morrison, 2009, 2015) is largely irrelevant. What matters is not whether this revenue comes from taxes vs. other sources but that this revenue is generated from resources vs. the non-resource economy. Indeed, much of the government's collection of oil revenue can come from taxes on the sale of oil – particularly in countries with either no NOC or with NOCs that manage other firms (regulator NOCs and shell NOCs). Thus, even states with NOCs can still be collecting the bulk of oil revenues through taxes on private firms if their NOCs are not involved directly in production.[2] This makes taxing natural resource wealth similar to extracting resource wealth directly from NOC revenues and different from taxing incomes of individuals and non-oil firms. And in many ways, as I show in chapter three, taxing oil wealth through a regulator NOC or a hollow NOC may be worse for governance than relying on non-tax methods of generating government revenue, as collected through non-regulatory NOCs with production capacity. My findings contribute to the growing debate that the key distinction in revenues – within the context of the fiscal theory of democracy – is

[2]Some revenues are still collected through non-tax means, such as the collection of "profit oil" (direct transfers of crude oil for the government to sell in the market or to be sold on the government's behalf) and dividends from joint ventures.

not necessarily about taxes in general but about taxes that come from the non-oil (or non-resource) economy (Prichard, Salardi and Segal, 2014; Ross, 2015).

To summarize, my findings suggest five general implications for existing theories of the political economy of development: (1) there are specific and observable conditions for when and where oil wealth tends towards negative political outcomes; (2) oil's impact on politics is different than the impact of other minerals and resources (except diamonds) because of the predominance of state intervention (and its different varieties) in the sector; (3) this intervention does not always lead to inefficient outcomes, as some institutional arrangements lead to *increased* production and revenues; (4) perceptions of corruption, not just in the oil industry but in general, are not the same as the incidence of corruption – by studying the cross-national incidence of corruption we may find different results for both the causes and consequences of corrupt behavior; and (5) the role of NOCs within the oil sector highlights the distinction between resource and non-resource revenues as opposed to between tax and non-tax revenues.

5.4 Empirical implications for oil-producing countries

Beyond these five theoretical implications, my findings have empirical implications relevant to oil-producing countries. Importantly, my findings do not suggest privatization as the solution to dealing with negative outcomes associated with many NOCs around the world. Instead, my results highlight possibilities for institutional reform. To reduce corruption and to increase overall revenues – and therefore political stability – states should realize the importance of reforming their NOCs.

My findings in chapter three suggest that corruption is a consequence of public officials' opportunities for corrupt behavior. State officials within a regulatory NOC framework are in an advantaged position to extort bribes given their power

to grant lucrative contracts with very little oversight and public disclosure, unlike their counterparts in non-regulatory NOCs or regulatory ministries (in the absence of a NOC). One implication for reform is to strip the NOC of its regulatory responsibilities and allow the company to focus solely on operations and production.[3]

Based on my results in chapter four, there is another aspect of NOC reform that could help to increase revenues and government capture from the sale of oil. Here I argued that producer NOCs have higher revenues than non-producer NOCs or than having no NOC, and showed this was true even after controlling for prices, production, and other country-specific factors (recall that in these models I controlled for country fixed-effects). One implication from this finding is for states to reform their NOCs to allow for operating capacity, but this may prove more difficult than the previous implication to remove regulatory powers from NOCs. As I discussed in chapter four, states choose producer NOCs when there are favorable conditions for NOCs to build up sufficient technical capacity to operate the country's oil wealth. This is easiest to accomplish when the geology of a country's reserves allows for relatively easy extraction. In tougher conditions, such as in the offshore fields of the Gulf of Guinea, it will take some time for NOCs to gain the technical and logistical capacities to extract commercial quantities without high costs (higher than for private firms, that is). Nonetheless, in the long term it appears this institutional reform will pay off with higher revenues; oil-producing states with non-producing NOCs should consider this potential reform to capture the fullest potential of their countries' resources.

[3]As I pointed out in chapter three, this is similar to reforms that call on states to adopt the "Norwegian Model" with respect to their NOCs. Here the emphasis is on separation of powers in the oil sector, whereby independent agencies monitor both private operators and the NOC, and to obtain concessions, the NOC must compete with other firms for bids to explore and produce oil fields (Thurber, Hults and Heller, 2011).

Table 5.1: Democratization, authoritarian failure, and corruption, 1997–2011.

	States making a democratic transition	*States with no democratic transition*	*Difference*	*p-value*
Oil-related corruption (logged US$)	10.24	6.98	-3.26	0.112
Non-oil-related corruption	11.26	14.33	3.07	0.046
Total (all sectors) corruption	15.29	15.80	0.51	0.716
Number of cases	34	14		
	States with at least one regime failure	*States with no regime failures*	*Difference*	*p-value*
Oil-related corruption	11.63	7.19	-4.44	0.036
Non-oil-related corruption	11.61	13.98	2.36	0.114
Total (all sectors) corruption	15.81	15.89	0.09	0.548
Number of cases	26	18		

Note: p-values from one-sided t-tests are reported in the fourth column. Data on corruption are from the database on FCPA violations, discussed in detail in chapter three, measured as FCPA penalties in logged U.S. dollars. Data on democratic transition and autocratic regime failure are from the Geddes, Wright and Frantz (2014) database on political regimes, discussed in detail in chapter four. Only countries that experienced authoritarianism at any point during the 1997–2011 period are included here.

5.5 Future research and the road ahead

5.5.1 Testing other pathways to regime stability

My analysis of regime stability did not include a discussion of corruption. That is, I have not yet considered the role of corruption in stabilizing (or destabilizing) resource-rich regimes. From chapter three, recall that there is no clear pattern between resource wealth and corruption: some oil-producers tend to be highly corrupt while others are largely free from corruption.

So what role then does corrupt behavior play in keeping the regime alive and strong? Preliminary evidence from an analysis of grand corruption – bribes at the highest levels of government – based on the FCPA data discussed in chapter three indicates an interesting pattern for regime stability in authoritarian states.

A simple cross-tabular analysis of the corruption data and regime outcomes is shown in Table 5.1. While oil-related corruption seems to be positively correlated with democratic transition and authoritarian failure in general, non-oil-related corruption is seemingly negatively correlated with autocratic breakdown. That is, states which made a democratic transition during the same period for which there are FCPA data tended to have higher levels of oil-related corruption when compared to states not making a transition, but relatively lower levels of non-oil-related corruption compared to non-transitioning states. The net correlation appears to be null, as these two patterns cancel each other out: there is no difference in total (across all sectors) corruption levels between states with regime failure(s) and those with surviving regimes.

One reason for this may be that a few cases are driving the results, notably Indonesia, Mexico, and Nigeria, all three of which experienced a democratic transition in 2000-2001. All three cases also had higher than average corruption levels – both measured in terms of FCPA violations and perceptions-based scores such as the CPI – and corruption played a role in the weakening of the regimes and was a determining factor in democratization, albeit relatively smaller than the countries' economic crises and political instability. But these cases could also highlight the weakening effects of oil-related corruption when compared to corruption in other sectors. It could be the case that oil-related corruption creates too many opportunities for leakage, thereby reducing the overall government capture of much-needed (at least for unstable regimes) resource revenues. Graft and extortion in other sectors, on the other hand, could have regime-stabilizing effects, given the ability to use state-sanctioned corruption as a tool for patronage and clientelism. Nonetheless, these are simply initial conjectures and are empirical questions that require a more rigorous analysis to answer.

5.5.2 Determinants of different NOC types

In chapters three and four I discussed the formation of regulatory NOCs and producing NOCs, respectively, and the role of geology and international market conditions in the timing and location of establishing these types of NOCs. Much remains, however, in testing this hypothesis to reach a more definitive conclusion about the determinants of different NOC types – hollow NOCs, regulator NOCs, producer NOCs, and integrated NOCs.[4]

In particular, future work based on my field research in Abu Dhabi, Qatar, and Iran will address the specific determinants of why Abu Dhabi chose the producer NOC framework; why Qatar chose the regulator NOC framework; and why Iran chose the integrated NOC framework after the 1979 revolution (during the 1974-1979 period the National Iranian Oil Company resembled more of a regulator NOC). I will combine this assessment with cross-national data analysis, using as-of-yet unreleased data from WoodMacKenzie and PennWell on the geological qualities of oil produced prior to nationalization in as many of the 60 states with NOCs (at some point in their oil histories) as possible.[5]

5.5.3 Other institutional characteristics

In chapter one I mentioned other NOC characteristics that may matter for governance but were not discussed in detail throughout the dissertation. These included characteristics such as the degree of state ownership of a NOC (on a spectrum of 0% to 100%), the NOC's role in non-commercial activities such as social programs and fuel subsidies, and the NOC's ability to use state capital for reinvestment into

[4]Recall from chapter one that "regulatory NOC" refers to the combination of both regulator NOCs (regulation but no production) and integrated NOCs (regulation and production), and that "producing NOC" refers to the combination of producer NOC (production but no regulation) and integrated NOC.

[5]Refer to Table 3 in chapter one for the full list of countries with NOCs, along with the year of NOC establishment.

exploration. Further research can tell us whether these factors matter for oil's effects on governance outcomes.

For instance, in a state with a NOC heavily involved in non-commercial activities, the regime in power can use the NOC to advance its patronage interests and develop its clientelistic network. Existing single-country research has emphasized the role NOCs play in doling out private and club goods in Angola (Heller, 2012), Iran (Mahdavi, 2012), Mexico (Stojanovski, 2012), Nigeria (Gillies, 2009; Thurber, Emelife and Heller, 2010), and Venezuela (Hults, 2012). Whether this is an effective strategy for regime survival has yet to be tested, but on the surface the evidence appears mixed. States such as Mexico and Nigeria, for example, have experienced regime instability in spite of their patronage-enhancing NOCs, while others like Angola and Iran have used their NOCs effectively in non-commercial activities to maintain loyalty to the regime among the inner elite. An even more extreme example is Chavez's Venezuela: the NOC, PDVSA, was used not only as a tool for patronage within the country through its activities in social programs like the *misiones Bolivarianas*, but also outside the country through its role in the *Petrocaribe* program for international aid to Central American and Caribbean states.

Analyzing these NOC characteristics may reveal interesting patterns in how governments spend their oil revenues and to whom these expenditures are directed. These investigations can shed light on topics that range from the impact of oil-producing states on climate change, through the role of NOCs in fuel subsidies, to the long-term depletion of oil reserves as affected by how NOCs reinvest revenues into new exploration and production activity.

5.6 Conclusion

Natural resource wealth does not have to lead to negative outcomes for political development. Nor does state intervention in natural resource sectors. Some countries have managed to avoid the many pitfalls of the resource curse by establishing institutions that encourage efficiency, transparency, and stability. I have shown that this is the case specifically with reference to the varying characteristics of NOCs and how these seemingly technical institutional choices can have profound impacts on state revenue collection, incentives for corruption, and ultimately the survival of the ruling regime.

In doing so, I have helped to turn the "institutions matter" phrase – common in studies not only of the conditionality of the resource curse, but also the conditionality of political and economic development – from a vague stylized fact into a well-measured, clearly-specified phenomenon. Here I have highlighted the importance of the NOC in the context of a country's political economy. These institutions are quite understudied by political science scholars relative to the major roles NOCs play in the social, economic, and political lives of oil-producing countries. My findings do not suggest abandoning these "jewels of the state" through privatization; on the contrary, my work implies that reforming certain characteristics of NOCs – the capacity to produce oil without having to regulate the sector – can reduce corruption, increase revenues, and increase the likelihood of regime survival. So by simply reforming its institutional structure in the oil industry, an oil-producer like Nigeria with high corruption, low revenue capture, and regime instability is unlikely to become Norway or Canada overnight, but can certainly strive to achieve the relatively low oil-related corruption levels, high oil revenues, and regime stability found in Algeria or Angola.

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