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Why do leaders nationalize the oil industry? The politics of resource expropriation

Paasha Mahdavi

Department of Political Science, University of California, Los Angeles, 4289 Bunche Hall, Box 951472, Los Angeles, CA 90095, USA

HIGHLIGHTS

- I model determinants of oil nationalizations for 65 producing countries 1945–2005.
- I offer a new measure of nationalization using the establishment of NOCs.
- Oil prices, political institutions, cross-country diffusion predict nationalization.
- Nationalization is also likely when revenue is perceived to be shared unfairly.
- Operator-led contract renegotiation can reduce likelihood of nationalization.

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ABSTRACT

Why do leaders nationalize the oil industry? In line with a general utility-maximizing theory, I argue that leaders nationalize to maximize state revenues while minimizing costs. The latter includes international retaliation and domestic political constraints. Using a novel longitudinal dataset on the establishment of national oil companies (NOCs), the empirical evidence presented in this paper lends support to four primary findings. States are most likely to establish NOCs (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, though with weaker empirical support, (4) in political settings marked by resource nationalism. This last factor is proxied by OPEC membership in large-N analysis and, in a two-case comparison, by the difference in retained profits between the host and foreign governments. The theory and empirics presented here offer some clues for policy makers and multinational companies alike as to when to expect leaders to opt for nationalization.

1. Introduction

As of 2012, between 73 and 95 percent of global oil reserves are controlled by national oil companies (NOCs).[1] The majority of these NOCs were established through nationalizations in the 1970s, though several states opted for NOCs in the 1930s and 1990s (see Fig. 1). Though these kinds of nationalization are rare events – occurring only 45 times since the 1930s – the impacts of state expropriation are game-changing in both international markets and the domestic political environment. Scholars working on the political resource curse – that is, the hypothesized relationship between oil and authoritarianism – point to the wave of nationalizations in the 1970s as a turning point for autocrats in gaining control over lucrative resource revenues (Aslaksen, 2010; Dunning, 2008; Haber and Menaldo, 2011; Ross, 2012). I provide insight on the determinants of these events; that is, I aim to answer the question, why do political leaders nationalize the oil industry?

Using both statistical analysis of historical nationalizations and a quantitative case comparison, I show 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 et al., 2010; Guriev et al., 2011), while others expound on domestic political factors in the

E-mail address: paasha@ucla.edu

[1] The variance in figures stems from how reserves are attributed to operating firms. The 95% figure is drawn from Ernst and Young (2013), *Global Oil and Gas Reserves Study*, which assumes that all reserves in a country with a nationalized sector belong to the NOC. The lower bound of 73% is drawn from Victor et al. (2012), who use the classification of reserves based on actual share of production from a given field (also known as "working interest").

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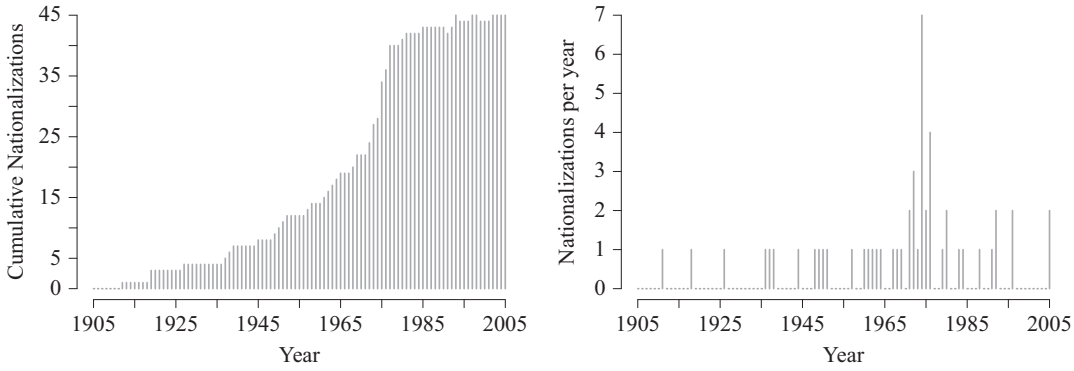

Fig. 1. Plotting cumulative and annual nationalizations for the period 1905–2005. Nationalization is measured as the establishment of a national oil company (NOC) in a given year. Sample includes 61 oil-producing countries.

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.

This study offers 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; Warshaw, 2012). Here, I extend this analysis to a broader time frame 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 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 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, I provide 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 conventional methods to these data is problematic. As such, I operate within a Bayesian estimation framework to mitigate these concerns. As this method requires specification of prior distributions for the parameters to be estimated, I combine expert interviews and previous scholarly findings to estimate informative priors for the analysis.

The findings of this study speak to the complexity of a state'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. My aim is to augment scholarly understanding of such events by providing evidence for 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 and a case comparison of Iran and Saudi Arabia. I conclude with a discussion of policy implications based on these findings.

2. Methods

2.1. Theoretical determinants of 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 et al., 2012; Victor, 2013; Wolf, 2009). 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; Golden and Mahdavi, 2015). By expropriating foreign assets, the

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

[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.

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 profits from the sale of oil via the NOC and decide how best to reinvest profits back to the company, though more often states such as Brazil, Nigeria, and the UAE have chosen to rely on other operators for production that is facilitated through profit-sharing agreements (McPherson, 2010). In the realm of oil nationalizations, this framework is adopted by Guriev et al. (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 et al., 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 et al. (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 et al. (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 et al., 2012). 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.

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. 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 et al. (2011) similarly characterize strong institutions as impediments to expropriation, and find 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 parliaments 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). Further, 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). 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 information asymmetries as one factor in why governments nationalize the oil sector.[4]

2.2. Hypotheses

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 do leaders nationalize the oil industry into statements that capture the likelihood of oil nationalization based on a given factor or set of factors.

First, *oil nationalization is more likely when oil prices are high*. 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.

Second, *oil nationalization is more likely when others nationalize*. 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 in the following year ($t+1$) more than if only two countries nationalize.[5]

Third, *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. 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 operating companies backed by Western governments (Park et al., 1976). Still, the determinants of joining OPEC are likely endogenous 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.

Fourth, *oil nationalization is more likely when institutional quality is weak*. Luong and Weinthal (2010) and Guriev et al. (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 (Tsebelis, 2002; Henisz, 2000). 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

The outcome of interest is the probability of nationalization in a given country in a given year. I measure nationalization as a binary variable according to whether or not a state establishes a majority-state-owned NOC.[8] 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.[9] To create the NOC dataset, I rely on primary and secondary sources to code the timing of the establishment of a NOC and, if applicable, the government's shareholder structure. To this end, I use 25 petroleum laws, 80 United States Geological Survey *Minerals Yearbooks*, and roughly 100 scholarly accounts of individual countries' oil histories. A full list of references, as well as

[4] 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. For a review of principal-agency theory in the context of energy markets, see Nikogosian and Veith (2012).

[5] In Tables 7 and 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 11 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 in fact 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.

[8] 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 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.

[9] 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.

coding decisions for each country, is available as online supplementary material.

Predictors are chosen to reflect the theoretical implications discussed above. 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.[10]

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.[11] 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.[12]

For the resource nationalism hypothesis, in the longitudinal analysis 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 non-democracies and democracies (Marshall and Jaggers, 2006).

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 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.[13]

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 et al. (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. Though the nationalization measure is coded beginning in 1905, 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 six occurred in the period 1905–1944). 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 (Ross, 2012). Defining "oil producer" as a state which 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.[14] To put the figures into context, 1000 metric tonnes of production could supply the Maldives with enough oil for one day.[15]

2.4. 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.[16] Here, I employ Bayesian methods with Markov Chain 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.

[10] Calculated first by Pindyck (1999) and adapted by Guriev et al. (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*.

[11] Results in Appendix Table 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 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.

[12] Results from using this variable instead of the "global" diffusion variable are presented in Table 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.

[13] In Appendix Table 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).

[14] 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 only adds nine cases for a total of 71; changing the threshold to 10,000 tonnes/year drops ten cases for a total of 52.

[15] 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.

[16] 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 et al. (2011) in analyzing the determinants of acts of 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).

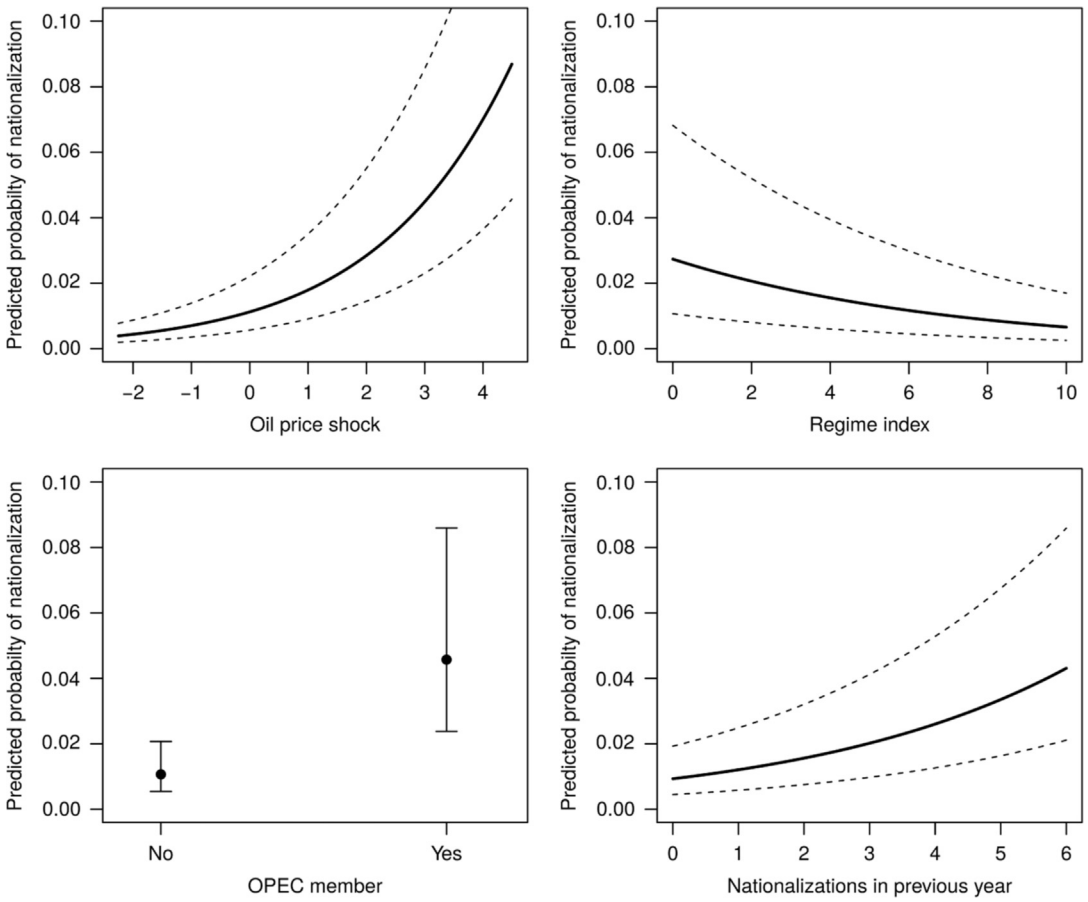

Fig. 2. Added-variable plots for logistic regression coefficients with 95% credible intervals for selected variables. Based on posterior estimates from the Bayesian hierarchical logistic model with informative priors.

3. Results

3.1. 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 4, along with Table 5 which shows results from non-Bayesian regressions.

Added-variable plots are shown in Fig. 2 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 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 Fig. 3 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.[17] 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.[18] Saudi Arabia, on the other hand, despite nearly tripling in probability to nationalize after joining OPEC from 4% to 11%, did not nationalize until much later in 1974.

The second two-year period of interest is 1973–1974, 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

[17] 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).

[18] 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).

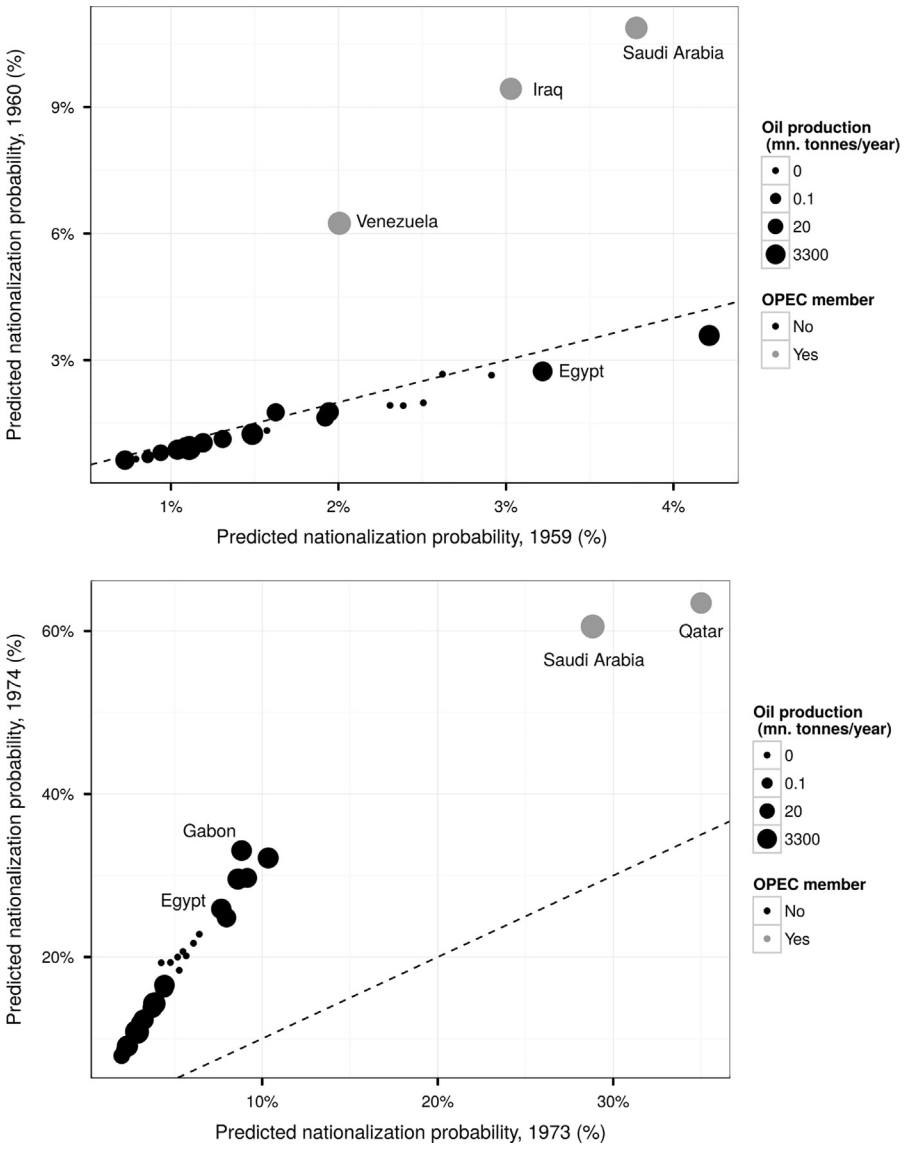

Fig. 3. Year-to-year changes in predicted nationalization probability, based on posterior estimates from the Bayesian hierarchical logistic model including all control variables identified in the text. The dotted line represents the 45-degree line. Countries on the line reflect no year-to-year changes; 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 gray points are OPEC member countries; black points are all others.

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 Fig. 4. 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).[19] These cases represent instances of 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

[19] 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.

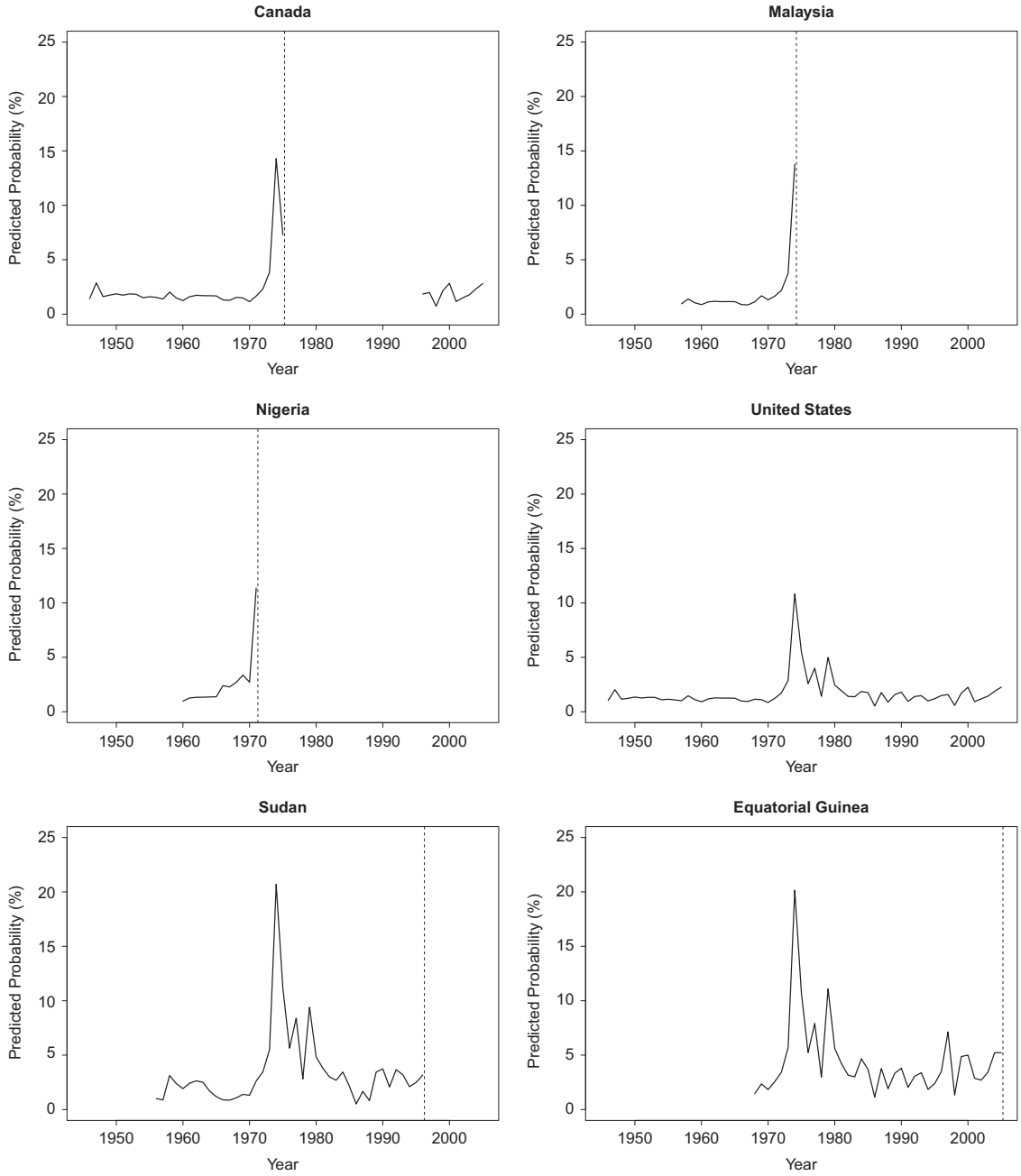

Fig. 4. Predictive probabilities of nationalization for selected countries based on posterior estimates from the Bayesian hierarchical logit model with informative priors. The dashed vertical line indicates actual year of oil nationalization.

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.[20]

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

[20] 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.

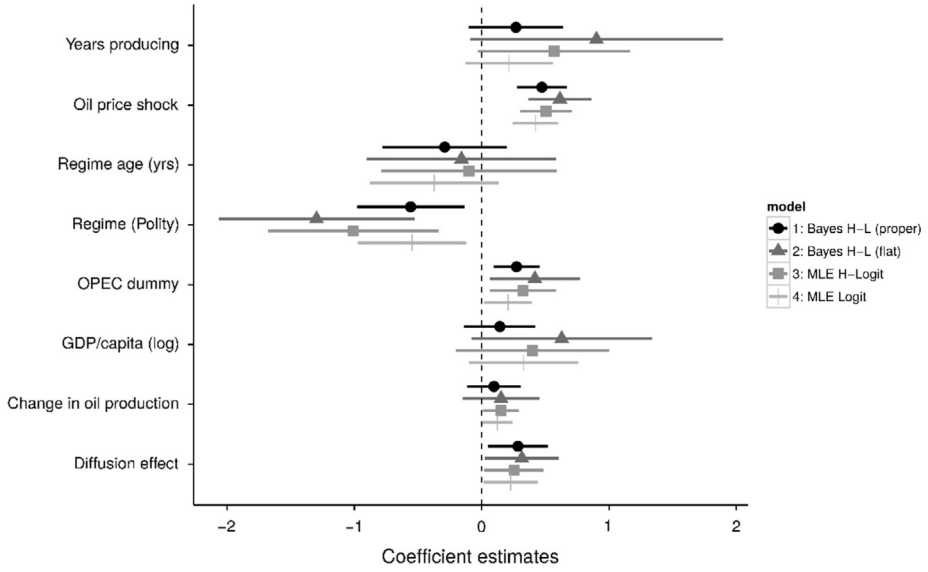

Fig. 5. Logit coefficient estimates with 95% confidence/probability intervals for four model specifications. The top (circle) in each grouping is the Bayesian Hierarchial Logit model with informative or "proper" priors, as discussed in the text. The second (triangle) is the Bayesian Hierarchial Logit 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.

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 et al., 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,[21] the results from three of which are plotted in Fig. 5.

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.[22] The OLS linear probability model with and without unit fixed effects gives the same substantive results (shown in Table 5 in the appendix). The key message from these results, however, is that neither model specification 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.

3.2. 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 Fig. 6 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 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).

3.2.1. 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 Fig. 7. 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.

[21] 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.

[22] 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.

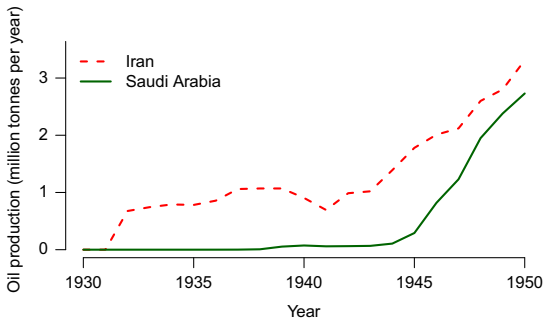

Fig. 6. Oil production in the 1930–1950 period, Iran compared to Saudi Arabia. Data collected from Mu'assasat al-Naqd al-Arabi al Saudi (1960), Noori (1965), and Mikdashi (1966).

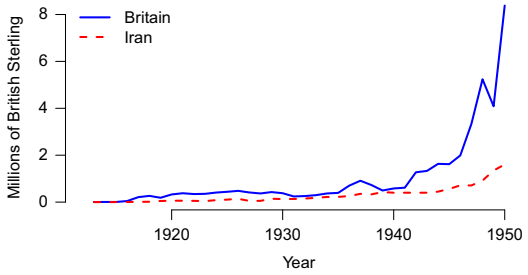

Fig. 7. Oil revenues collected by the Iranian government versus the British government, 1911–1950. Data collected from Noori (1965) and Mikdashi (1966).

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.[23]

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 opening 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 1950/1951 – 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 7 by the extremist xenophobic group *Fedayan-e Islam*. Thirteen days after Razmara's death, both the Parliament and the unelected Senate passed Mossadegh's nationalization bill on March 20, 1951 and soon thereafter established the National Iranian Oil Company.[24]

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 late 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.

3.2.2. *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 company joined forces with Texaco in setting up Aramco.[25] 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

[23] (Makki, 1950, 33240).

[24] 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).

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

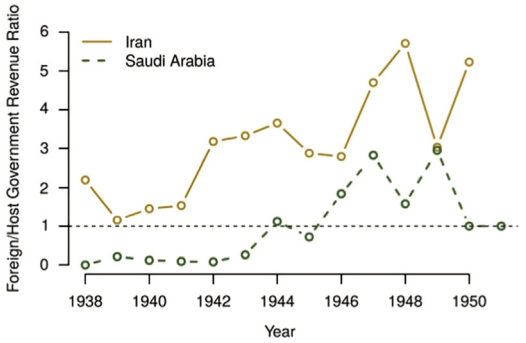

Fig. 8. Ratio of collected oil revenues between foreign and host state, Iran versus Saudi Arabia, 1938–1951. Higher values indicate more revenue for the foreign operator and state relative to the host state.

King would receive greater royalties."[26] 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?"[27]

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.

3.2.3. *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 Fig. 8.

Table 1
Comparative metrics of oil revenue-sharing between host government and foreign government and/or operating company, Iran vs. Saudi Arabia, 1938–1951. One-sided *t*-statistics in parentheses. (1) The data period for the host-state share of revenues is limited to 1943–1951 while the rest of the metrics are calculated using data from 1938 to 1951.

Metric	*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: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

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 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%.

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."[28] But upon completing negotiations, the government formally acknowledged that the agreement "constitutes a complete satisfaction 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

[26] 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).

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

[28] 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.

parliament, negotiations resulted in a more favorable foreign-to-host-state ratio in 1949 that, as reflected in Fig. 8, 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.[29] 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.

4. Conclusion and policy implications

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.[30] For oil companies operating in these states prone to expropriation, the findings in this study provide predictive 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;
(4) and, 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.

Similarly for governments of operating firms which are in positions of political negotiations with host countries, the findings here imply that leverage will be with the host country in periods of high oil prices and nationalizations in other states. This position is further strengthened when revenues from the sale of oil are perceived to be shared unfairly between operating firm and host government. To reduce the likelihood of nationalization in these contexts, operating firms and their governments are recommended to consider renegotiating contracts to narrow the gap between host and operator. To wit, this recommendation will come as no surprise to veteran firms with experience operating with resource nationalistic leaders. But to new operators and the ever-growing number of "independents", understanding the negotiation context and pursuing renegotiation of contracts can be decisive in reducing outright nationalization.

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Appendix A. 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

Table 2
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.

(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?

[29] 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.

[30] Indeed, many have already established NOCs, such as Staatsolie in Suriname, GPNC in Ghana, or the National Oil Corporation in Kenya.

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

$$y_{i,j}|\pi_{i,j} \sim \text{Bernoulli}(\pi_{i,j}) \quad (1)$$

$$\text{logit}(\pi_{i,j}) = \mathbf{x}'_{i,j}\alpha + \mathbf{z}'_i\beta_i + \epsilon_{i,j} \quad (2)$$

$$\alpha \sim \text{N}(m, v) \quad (3)$$

$$\beta_i|\tau^2 \sim \text{N}(0, \tau^2) \quad (4)$$

$$\tau^2 \sim \text{InvWishart}(r, R) \quad (5)$$

$$\epsilon_{i,j} \sim \text{N}(0, D) \quad \text{where } D = 1 \quad (6)$$

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

Table 3
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.

Variable	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

Table 4
Posterior estimates for fixed effects from Bayesian hierarchical logistic regression with informative priors. Coefficient estimates are on the logistic scale.

Variable	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 (years)	−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

Table 5
Regression results from alternative model specifications. OLS refers to the linear probability model; OLS cfe refers to the linear probability model with country fixed effects.

Independent Variable	*Dependent variable:*					
	NOC nationalization			Guriev expropriation		
	OLS (1)	*OLS, cfe* (2)	*logistic* (3)	*OLS* (4)	*OLS, cfe* (5)	*logistic* (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 (years)	−0.010	−0.006	−0.367	−0.001***	−0.001**	−0.073***
	(0.007)	(0.013)	(0.303)	(0.0002)	(0.0003)	(0.015)
Regime index (Polity)	−0.018**	−0.026**	−0.539**	−0.001	0.001	−0.048
	(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 (percent)	0.001	0.010**	0.021	0.036	−0.037	0.876
	(0.005)	(0.005)	(0.132)	(0.054)	(0.054)	(1.311)
Change in oil production	0.007	0.007	0.124*	0.00001	0.00000	0.0004
	(0.005)	(0.004)	(0.071)	(0.00001)	(0.00001)	(0.0003)
Count of previous nationalizations	0.012**	0.011**	0.255**	0.026***	0.020***	0.465***
	(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	1260	1260	1260	2314	2314	2314
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: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table 6
Additional regression results, controlling for regional diffusion (models 1–3) and changing oil production (models 4 and 5). Compare to main results from Model 1, Table 5. All models are run using the linear probability model specification with country fixed effects.

Independent Variable	*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	1260	1260	1260	1260	1260
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: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table 7
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 5. All models are run using the linear probability model specification with country fixed effects.

Independent Variable	*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 (years)	−0.005	−0.007	−0.007	−0.007
	(0.013)	(0.013)	(0.013)	(0.013)
Regime index (polity)	−0.026**	−0.030**	−0.028**	−0.029**
	(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 (percent)	0.009*	0.009*	0.009*	0.009*
	(0.005)	(0.005)	(0.005)	(0.005)
Change in oil production	0.006	0.007	0.007	0.007
	(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	1260	1260	1260	1260
R^2	0.254	0.251	0.251	0.251
Adjusted R^2	0.217	0.213	0.214	0.213

Note: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

been estimated in the literature.[31] 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). 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%.[32] Priors for some predictors – oil price, regime index, and GDP – are collected from previous work by Guriev et al. (2011), who employ a different dataset (adapted and updated from Kobrin (1985)), replicated in Table 3 in the Appendix.[33] 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.[34]

[31] 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 $((\text{logit}(.95)-\text{logit}(.05))/9)=0.654$.

[32] This is transformed to the Logit scale to a mean of −5.29 with a variance of $(\text{logit}(.01)-\text{logit}(.001)/2)^2=1.34$.

[33] Guriev et al. (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).

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

Table 8
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 5. All models are run using the linear probability model specification with country fixed effects.

Independent Variable	*Dependent variable:*			
	NOC nationalization			
	(1)	(2)	(3)	(4)
Years producing	0.045 (0.028)	0.043 (0.028)	0.044 (0.028)	0.043 (0.028)
Oil price shock	0.024*** (0.005)	0.024*** (0.005)	0.024*** (0.005)	0.024*** (0.005)
Regime age (years)	−0.005 (0.013)	−0.006 (0.013)	−0.006 (0.013)	−0.006 (0.013)
Regime index (polity)	−0.025* (0.013)	−0.026** (0.013)	−0.026** (0.013)	−0.027** (0.013)
OPEC dummy	0.030*** (0.006)	0.030*** (0.006)	0.030*** (0.006)	0.031*** (0.006)
GDP/capita (log)	0.010 (0.023)	0.011 (0.023)	0.010 (0.023)	0.011 (0.024)
GDP growth (percent)	0.009* (0.005)	0.009* (0.005)	0.010* (0.005)	0.010* (0.005)
Change in oil production	0.007 (0.004)	0.007 (0.005)	0.007 (0.005)	0.007 (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	1260	1260	1260	1260
R^2	0.255	0.253	0.253	0.252
Adjusted R^2	0.218	0.215	0.215	0.215

Note: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

References

Adelman, M., 1993. The Economics of Petroleum Supply. MIT Press, Cambridge.
Alnasrawi, A., 2002. Iraq's Burdens: Oil, Sanctions, and Underdevelopment. Greenwood Press, Westport, CT.
Aslaksen, S., 2010. Oil and democracy: more than a cross-country correlation?. J. Peace Res. 47, 421–431.
Berrios, R., Marak, A., Morgenstern, S., 2011. Explaining hydrocarbon nationalization in Latin America: economics and political ideology. Rev. Int. Polit. Econ. 18, 673–697.
Boix, C., 1997. Privatizing the public business sector in the eighties: economic performance, partisan responses, and divided governments. Br. J. Polit. Sci..
Box, G.E.P., Tiao, G.C., 1973. Bayesian Inference in Statistical Analysis. Addison-Wesley, Reading, MA.
Bremmer, I., Johnston, R., 2009. The rise and fall of resource nationalism. Survival 51 (2), 149–158.
Chang, R., Hevia, C., Loayza, N., 2010. Privatization and Nationalization Cycles. NBER Working Paper.
Cheibub, J.A., Gandhi, J., Vreeland, J.R., 2010. Democracy and dictatorship revisited. Publ. Choice 143, 67–101.
Cohn, G., 1968. Petroleo e nacionalismo. Sao Paolo.
Dunning, T., 2008. Crude Democracy. Cambridge University Press, New York, NY.
Gandhi, J., 2008. Political Institutions under Dictatorship. Cambridge University Press, New York, NY.
Gelman, A., Carlin, J.B., Stern, H.S., Dunson, D.B., Vehtari, A., Rubin, D.B., 2013. Bayesian Data Analysis. Chapman & Hall/CRC Texts in Statistical Science, 3rd edition.
Golden, M.A., Mahdavi, P., 2015. The institutional components of political corruption. In: Gandhi, J., Ruiz-Rufino, R. (Eds.), Routledge Handbook of Comparative Political Institutions. Routledge, New York, NY.
Grayson, L., 1981. National Oil Companies. Wiley Press, New York, NY.
Guriev, S., Kolotilin, A., Sonin, K., 2011. Determinants of nationalization in the oil sector: a theory and evidence from panel data. J. Law Econ. Organ. 27 (2), 301–323.
Haber, S., Menaldo, V., 2011. Do natural resources fuel authoritarianism? A reappraisal of the resource curse. Am. Polit. Sci. Rev. 105 (1), 1–26.
Hansohm, D., 2007. Oil and foreign aid: curse or blessing? The case of Sudan. In: Wohlmuth, K. (Ed.), Reconstructing Economic Governance after Conflict in Resource-rich African Countries. Learning from Country Experiences. Institute for World Economics and International Management, Berlin, pp. 117–150.
Hartley, P., Medlock, K.B., 2008. A model of the operation and development of a national oil company. Energy Econ. 30 (5), 2459–2485.
Heckman, J., 1977. Linear probability models of the demand for attributes with an empirical application to estimating the preferences of legislators. Rand J. Econ. 28, 142–189.
Henisz, W., 2000. The institutional environment for multinational investment. J. Law Econ. Organ. 16 (2), 334–364.
Henisz, W.J., 2004. Political institutions and policy volatility. Econ. Polit. 16 (1), 1–27.
Horrace, W.C., Oaxaca, R.L., 2006. Results on the bias and inconsistency of ordinary least squares for the linear probability model. Econ. Lett. 90 (3), 321–327.
Karl, T.L., 1997. The Paradox of Plenty: Oil Booms and Petro-States. University of California Press, Berkeley, CA.
Kobrin, S.J., 1984. Expropriation as an attempt to control foreign firms in LDCs: trends from 1960 to 1979. Int. Stud. Q. 28, 329–348.

Kobrin, S.J., 1985. Diffusion as an explanation of oil nationalization: or the domino effect rides again. J. Confl. Resolut. 29, 3–33.
Kretzschmar, G., Kirchner, A., Sharifzyanova, L., 2010. Resource nationalism: limits to foreign direct investment. Energy J. 31 (2), 27–52.
Kuhn, A.K., 1951. Nationalization of foreign-owned property in its impact on international law. Am. J. Int. Law 45 (4), 709–712.
Lenczowski, G., 1949. Russia and the West in Iran. Cornell University Press, New York.
Luong, P.J., Weinthal, E., 2010. Oil Is Not a Curse: Ownership Structure and Institutions in Soviet Successor States. Cambridge University Press, New York.
Maddison, A., 2007. Contours of the World Economy 1-2030 AD. Oxford University Press, Oxford, UK.
Mahdavi, P., 2012. Oil, monarchy, revolution, and theocracy: a study on the National Iranian Oil Company (NIOC). In: Thurber, M.C., Hults, D., Victor, D.G. (Eds.), Oil and Governance. Cambridge University Press, Cambridge, UK.
Makki, H., 1950. Kitabe Siah (The Black Book). Elmi Press, Tehran.
Manzano, O., Monaldi, F., 2009. The political economy of oil production in latin America. Economia 9, 59–98.
Marcel, V., 2006. Oil Titans: National Oil Companies in the Middle East. Brookings Institution Press, Baltimore, MD.
Marshall, M.G., Jaggers, K., 2006. Political Regime Characteristics and Transitions 1800-2004. Center for International Conflict Management & Development; http://www.systemicpeace.org/polity/polity4.htm.
McPherson, C., 2010. State participation in the natural resource sectors: evolution, issues and outlook. In: Daniel, P., Keen, M., McPherson, C. (Eds.), The Taxation of Petroleum and Minerals: Principles, Problems, and Practice. Routledge, New York, pp. 263–288, chapter 9.
Mikdashi, Z., 1966. A Financial Analysis of Middle Eastern Oil Concessions: 1901–65. Praeger Publishers, New York.
Mu'assasat al-Naqd al-Arabi al Saudi, S.A.M.A., 1960. Annual report. Jeddah: Research and Statistics Dept., Saudi Arabian Monetary Agency, Kingdom of Saudi Arabia.
Nikogosian, V., Veith, T., 2012. The impact of ownership on price-setting in retail-energy markets—the German case. Energy Policy 41 (0), 161–172, Modeling Transport (Energy) Demand and Policies.
Nolan, P.A., Thurber, M.C., 2010. On the state's choice of oil company: risk management and the frontier of the petroleum industry. PESD Working Paper, 99.
Noori, H.S.-H., 1965. A Study on the Nationalization of the Oil Industry in Iran (Ph.D. thesis), Colorado State College.
Park, T.W., Abolfathi, F., Ward, M., 1976. Resource nationalism in the foreign policy behavior of oil exporting countries, 1947–1974. Int. Interact. 2 (4), 247–262.
Philip, G., 1982. Oil and Politics in Latin America. Cambridge University Press, New York, NY.
Philip, K., 2002. The quest for rural enterprise support strategies that work. Small Enterp. Dev. 13 (1), 13–25.
Ross, M.L., 2012. The Oil Curse: How Petroleum Wealth Shapes the Development of Nations. Princeton University Press, Princeton, NJ.
Singh, C., 1989. Multinationals the State and the Management of Economic Nationalism. Praeger Publishers, New York, NY.
Smith, B., 2007. Hard Times in the Land of Plenty: Oil Politics in Iran and Indonesia. Cornell University Press, Ithaca, NY.
Solberg, C.E., 1979. Oil and Nationalism in Argentina: A History. Stanford University Press, Stanford, CA.
Stevens, P., 2007. Investing in Oil in the Middle East and North Africa: Institutions, Incentives and the National Oil Companies. Technical Report, ESMAP, The World Bank.
Stevens, P., 2008. Resource nationalism and the role of national oil companies in the middle east: history and prospects. J. World Energy Law Bus. 1 (1).
Tordo, S., Tracy, B., Arfaa, N., 2011. National oil companies and value creation. World Bank Working Paper 218, The World Bank.
Tsebelis, G., 2002. Veto Players: How Political Institutions Work. Princeton University Press, Princeton, NJ.
Vernon, R., 1971. Sovereignty at Bay: The Spread of U.S. Enterprises. Basic Publishing, New York.
Victor, D.G., 2013. National oil companies and the future of the oil industry. Annu. Rev. Resour. Econ. 5, 445–462.
Victor, D.G., Hults, D., Thurber, M.C. (Eds.), 2012. Oil and Governance: State-owned Enterprises and the World Energy Supply. Cambridge University Press, Cambridge, UK.
Vivoda, V., 2009. Resource nationalism, bargaining and international oil companies: challenges and change in the new millennium. New Polit. Econ. 14 (4), 517–534.
Warshaw, C., 2012. The political economy of expropriation and privatization of national oil companies. In: Victor, D.G., Thurber, M.C., Hults, D. (Eds.), Oil and Governance: State-owned Enterprises and the World Energy Supply. Cambridge University Press, Cambridge.
Weiss, R.E., 2005. Modeling Longitudinal Data. Springer, New York, N.Y..
Wolf, C., 2009. Does ownership matter? The performance and efficiency of state oil vs. private oil (1987–2006). Energy Policy 37 (7), 2642–2652.
Yergin, D., 1991. The Prize. Simon and Schuster, New York, NY.
Yergin, D., Stanislaw, J., 1998. The Commanding Heights: The Battle for the World Economy. Simon and Schuster, New York, NY.