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Property Rights, Oil and Income Levels: Over a Century of Evidence*

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Abstract

We investigate the effects of different regimes of control rights over oil exploitation on aggregate domestic income. We construct a new panel dataset on petroleum ownership structures for up to 68 countries between 1867-2008, distinguishing among regimes of Domestic Control, Foreign Control, and international Partnerships. Results show that Partnerships tend to generate higher domestic income than Foreign and Domestic Control. This result is robust to controlling for political regimes (i.e. democracy, anocracy, autocracy), time effects, and other factors. Existing theories of incomplete contracts capture several aspects, but not the general mechanism underlying the relationships between aggregate domestic income and control regimes in primary sectors.

JEL Codes D23, F20, O13.

Keywords Property rights, Control rights, National Income, Panel data, Petroleum.

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1 Introduction

Modern theories of the firm show that, in a world with incomplete contracts, the structure of property rights over assets influences the size of the gains from economic activity by affecting agents' incentives to invest.[1] From this perspective, who has control over critical resources determines economic performance, and the allocation of control rights over essential primary inputs acquires paramount importance for developing countries richly endowed with natural wealth. In this paper, we investigate the effects on aggregate income of different regimes of control rights over the exploitation of oil, one of the economically most important natural resources. We construct a new dataset on petroleum ownership structures for up to 68 countries in the 1867-2008 period by collecting data from primary and secondary sources. Our analysis has three distinctive features. First, we depart from standard observations concerning sectoral efficiency and analyze, instead, the consequences of different control regimes in the primary sector for the aggregate domestic income of oil-rich economies. Second, we look beyond the conventional division between private and public ownership and instead focus on domestic, foreign, and mixed 'international partnership' structures. Third, we address the role of political contingencies in shaping the ownership-income nexus by distinguishing between different political regimes.

In most countries, the State is the *de jure* owner of domestic natural resources.[2] Given this basic assignment of ownership, the salient question becomes who has control rights over the *exploitation* of these resource stocks. In this respect, situations of substantial foreign control over strategic primary resources are quite common in today's globalized world. Considering a representative sample of sixty-four oil-producing economies in 2005, we observe that Domestic Control over extraction is the dominant property structure in only nine countries: Foreign Control and international Partnerships prevail in the vast majority of cases – twenty-four and thirty-one countries, respectively.[3] Standard economic reasoning suggests that technological

[1] Property rights structures specify the separation between *operative control rights* (e.g., using and having access to productive assets) and *ownership*, which conveys *residual control rights* (e.g., regaining control over previously rented assets). In line with this notion, we use the terms "property rights structures" and "control regimes" interchangeably.

[2] The United Nations General Assembly resolution 1803 (XVII) of 14 December, 1962 (on "Permanent sovereignty over natural resources") grants "The right of peoples and nations to permanent sovereignty over their natural wealth and resources", a concept that is echoed in most countries' constitutions.

[3] See Section 4 below for a detailed description of sources and methods.

gaps play a fundamental role in the rise of foreign-control regimes or international partnerships. Countries that discover new stocks of natural resources often lack the technological know-how necessary to exploit these endowments, and the foreign firms operating abroad in the sector of interest are typically more efficient than yet-to-be-established domestic enterprises.

In this scenario – which most likely but not exclusively arises in less developed economies – the resource-rich country may gain from assigning full or partial control rights to foreign firms: the natural endowment is exploited with the most efficient technology and generates additional domestic income as the foreign firm pays concession fees and royalties. The flip side of these international arrangements is that the profit shares and resource rents accruing to foreign firms are largely repatriated and potentially re-invested abroad. A recent OECD study shows that, in low-income countries, foreign firms' profit remittances exceeded new foreign direct investment inflows in every year between 1999-2005 – a pattern which is especially strong during periods of economic crisis, when parent companies tend to repatriate financial resources to strengthen their balance sheet (Mold et al., 2009). More generally, foreign-based firms have little interest in raising domestic welfare in the host country as this is beyond the scope of their profit-maximization obligation towards shareholders (Vrankel, 1980; Onorato, 1995).

To single out relationships between aggregate income and control rights over critical resources, we adopt a conceptual framework that partially resembles the *GHM* model pioneered by Grossman and Hart (1986) and Hart and Moore (1990). In the GHM framework, the firm is viewed as a project involving two parties that choose investment strategies and share profits conditionally on asset ownership. In our context, the primary sector is an entreprise extracting natural resources to produce a commodity, and the parties involved are the State, which is the initial owner of natural resource stocks, and extracting firms that act as technology providers. The allocation of both operative and residual control rights over the various assets used during the production process is determined by the contract that the State offers to firms. In particular, the State may choose among Domestic control, Foreign control and international Partnerships, where the latter regime implies that foreign firms and domestic entities jointly own the project.

Within this scheme, we disentangle the property-income relationship as follows. First, control regimes affect *sectoral profitability* through the impact of property rights on sectoral investments and profit sharing. Second, profit sharing and input allocation in the primary sector influence *aggregate income* via, respectively, the direct impact of rents accruing to domestic

residents and side-effects on input availability in other sectors. Third, *political contingencies* affect the size and direction of the two previous mechanisms by determining the investment environment.

The theoretical literature provides specific insights mainly on the first mechanism: interpreting the project as a repeated game, partnerships may increase sectoral profitability relative to individual ownership by discouraging opportunistic investment (Halonen, 2002), by eliminating inefficient bargaining induced by asymmetric information (Schmitz, 2008) and, more generally, by creating reputational concerns among the parties (Bar-Isaac, 2007). Concerning the role of political contingencies, models with insecure property rights suggest that political regimes influence productivity by determining the expropriation risk faced by private firms and, more generally, the degree of enforceability of contracts in which the State is a contractor as well as the nation's coercive authority (Thomas and Worrall, 1994). There are no theories, however, concerning the impact on aggregate domestic income of domestic/foreign control and partnerships in strategic primary sectors. In section 3.2, we emphasize two unexplored channels represented by "excessive residual rights" and "asymmetric benefits". Besides these two potential mechanisms, control regimes will affect aggregate income via their impact on the level of rents accruing to domestic residents.

In our empirical analysis, we focus on the petroleum sector because oil is an essential input and is found in a large number of countries in different regions and at different stages of economic development, making a comparison particularly relevant. Collecting data from a variety of primary and secondary sources, we construct a large new dataset on control rights regimes and national incomes for up to 68 oil-producing countries, starting as early as 1867 and extending to 2008 in up to 28 five-year periods. We explore the empirical relationship between control regimes and domestic income levels using fixed-effects panel data estimations. Our results show that both Partnership and Foreign Control have led to higher domestic income than Domestic Control. We take into account the technology level, following the reasoning mentioned above that newly-discovered oil deposits in previously oil-poor countries are most likely to require foreign technology for exploitation. We also give particular attention to political contingency, not only as it affects the economic outcome, but also because it may shape the choice of control rights regime. Separating our sample into democracies, autocracies, and anocracies, we find that Partnership-style control regimes are still linked to the highest income levels, regardless of political regime type. Our results are highly significant and robust to controlling for factors

such as schooling, investment, openness, OPEC membership and time effects.

Our empirical results complement the empirical literature on ownership structures analyzing the consequences of private versus public ownership for the productive efficiency of primary sectors (Al-Obaidan and Scully, 1992; Megginson, 2005; Wolf, 2009). In several related studies from the political science field, Jones Luong and Weinthal (2001, 2010) have long held that ownership structures are important when looking at the socio-economic impacts of resource abundance, particularly petroleum and natural gas. We draw inspiration from their work but depart from their focus on public versus private ownership and fiscal policy outcomes.

The plan of the paper is as follows. Section 2 describes the conceptual framework guiding our analysis; Section 3 places our work in the context of the theoretical literature on property rights and draws some relevant conclusions; Section 4 describes our new dataset and presents our empirical methodology and the results; and Section 5 concludes.

2 Conceptual Framework

Property rights structures define a basic separation between *operative control rights* (e.g., having access to capital, using the asset for productive purposes, improving the asset by investing in innovations) and ownership, which conveys *residual control rights* (e.g., regaining control over rented capital and excluding the tenant from further use when the agreement expires or breaks down). This distinction immediately suggests that property rights structures influence economic performance by shaping individual investment incentives, although modern economic theories began to address this point only recently (see Besley and Ghatak, 2010). In particular, the property-rights theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990) emphasizes the role of incomplete contracts in determining a relationship between control regimes and productivity outcomes. In the GHM framework, the firm is a project involving two parties endowed with different control rights over the firm's assets. The parties first choose levels of project-specific investments and then bargain about how to share the resulting profits. With incomplete contracts, investment choices (and, hence, a firm's total profits) will depend on the structure of property rights.

Applying this general setup to our context, the project consists of exploiting a natural resource stock to produce a commodity, and the parties involved are the State, which is the *de jure* owner of the resource stock, and firms that act as technology providers. While the State

retains ownership rights over the resource stock, the allocation of both operative and residual control rights over the assets used within the project – e.g., assets used in resource extraction, processing, commodity transport and sale – is determined by the type of contract the State grants to extracting firms. Our focus is on the consequences of granting contracts to domestic versus foreign technology providers. In this respect, the State may choose among three regimes: Domestic Control, which assigns all control rights to domestic enterprises (which may be public or private); Foreign Control, which assigns all control rights to foreign firms (which may have the better technology); or creating an international Partnership in which foreign firms and domestic (public or private) entities jointly own the project.

Two distinctive features of the problem we address concern the asymmetric objectives of the parties involved, and the transmission mechanisms between sectoral control regimes and aggregate income. In the first respect, evidence suggests that foreign firms repatriate their share of profits to their country of origin whereas governments supposedly aim at maximizing domestic income. In the second respect, we disentangle the income-ownership relationship into three sub-mechanisms: (i) the impact of control regimes on the primary sector's profitability, (ii) the impact of the primary sector on aggegrate income, and (iii) the impact of political contingencies on the size and direction of the two previous effects. The existing theories do not capture all these aspects into a unified model. We can nonetheless draw relevant insights from different strands of literature, which we summarize below.

3 Theoretical Results

This section discusses the results and potential insights of property-rights theories with respect to the ownership-profit nexus at the sectoral level (sect. 3.1), the ownership-income relationship at the aggregate level (sect. 3.2), and the impact of political contingencies (sect. 3.3).

3.1 Property Rights and Sectoral Profitability

The Benchmark GHM Model. The property-rights theory of the firm builds on the idea that residual control rights over assets are a source of power within the firm. In the benchmark GHM model (Grossman and Hart, 1986; Hart and Moore, 1990), investments are not contractible at the first stage and affect the parties' relative bargaining power at the profit-sharing stage. Therefore, the party in charge of investments has an incentive to pursue opportunistic

investment strategies that raise its own profit share while undermining efficiency at the firm level. In particular, the benchmark model predicts that[4]

Result 1 *(Benchmark GHM Model) Residual control rights raise the incentive to invest above the efficient level. The owner should be the party able to obtain the highest marginal return from own investment.*

Result 1 hinges on two hypotheses. First, residual rights allow the owner to obtain, in the event of bargaining breakdown, some positive profit without the other party's collaboration and this *default payoff* increases with the level of investment chosen at the first stage. Second, the owner's default payoff acts as a "threat" to the other agent because Nash bargaining determines a profit-sharing rule whereby the owner's share increases with the owner's default payoff. In general, a party that correctly anticipates the impact of investments on default payoffs will calibrate investments so as to increase its relative bargaining power. More specifically, the owner tends to over-invest because a higher default payoff increases the threat to the other agent and thereby the owner's profit share. Since selfish investment strategies generate inefficiently low profits at the firm level, the (ex-post) optimal control regime is to allocate ownership to the party with the highest marginal return.

Modified GHM Models. In the Benchmark GHM model, partnerships are not optimal because joint residual rights act like reciprocal veto powers leading to more inefficient investments. However, the prediction that partnerships cannot be optimal is counterfactual (Holmström, 1999) and the recent literature has identified a number of circumstances under which joint ownership may yield the highest surplus. The main arguments are listed below.

Result 2 (*Modified GHM Models*) *Joint ownership is potentially optimal when:*

(a) *the parties engage in repeated relationships (Halonen, 2002; Bar-Isaac, 2007)*

(b) *the parties have asymmetric information (Schmitz, 2008)*

(c) *the project output involves public goods or externalities (Besley and Ghatak, 2001)*

(d) *default payoffs represent outside options (Chiu, 1998)*

[4] Concise formal proofs of Result 1 are Proposition 2 in Schmitz (2008) and Result 6 in Besley and Gathak (2010).

Result 2(a) hinges on signalling and reputational concerns. With respect to the one-shot game of the benchmark GHM model, the owner's ability to fire the collaborator is a much less binding threat in repeated games because it exposes the firm to a reputation loss that will affect future relationships and thereby the firm's future profitability. Joint ownership may thus yield the highest social surplus by being the structure that provides the strongest punishment if one party deviates (Halonen, 2002) or, more generally, the most credible commitment device (Bar-Isaac, 2007). The general message is that the gains induced by joint ownerships through "loyalty" outweigh the gains induced by individual ownerships through "opportunism". This conclusion is of direct interest to our analysis since allocations of control rights over oil exploitation typically involve long-lasting economic relationships.

Result 2(b) follows from relaxing a relevant hypothesis in the GHM scheme, namely that parties have symmetric information. Schmitz (2008) shows that joint ownership may be optimal when a party is able to acquire private information about its own default payoff between the investment stage and the bargaining stage. The reason is that, under asymmetric information, individual ownership makes the bargaining outcomes ex-post inefficient whereas joint ownership ensures efficient profit sharing: the party's anticipation of ex-post efficiency under joint ownership affects investment incentives yielding positive effects on total profits.[5]

Result 2(c) establishes that when the parties enjoy external benefits from the project in addition to the returns to own investments, partnerships become potentially optimal as they minimize free-riding: joint ownership is more likely to dominate individual ownership the greater is the public good component in production (Besley and Ghatak, 2001).

Result 2(d) was first conjectured by Chiu (1998). In the GHM model, residual control rights induce over-investment because default payoffs act as a "threat" in view of the assumption that parties split the total surplus according to Nash bargaining. However, if parties share profits according to the alternative method known as deal-me-out division, default payoffs represent an "outside option" that may induce the party *without* residual rights to invest more due to the fear of losing profits in the event of bargaining breakdown. This result suggests that joint ownership may dominate individual ownership because dual veto power can be more efficient than sole ownership by either player (Chiu, 1998: p.891).

[5]In the GHM framework, investments are inefficient but bargaining is efficient ex-post. In Schmitz (2008), instead, bargaining is inefficient ex-post under individual ownership because the friction induced by asymmetric information hits the sequence of events after investments have been made.

Endogenous Selection of Contractors. In the GHM model, the existence and characteristics of the parties are exogenous and the firm is mainly viewed as a collection of assets. From a different perspective, firms arise and develop starting from an initial state, in which the original owner controls the assets and seeks possibilities to enhance productivity through collaboration, considering different degrees of involvement of new parties ranging from simple hiring to partnerships entailing the sharing of the firm's profits. This view underlies the analyses of Rajan and Zingales (1998) and Levin and Tadelis (2005), and is relevant to our analysis since, in most countries, the granting of concessions over oil exploitation includes a selection process supervised by the government. Rajan and Zingales (1998), in particular, show that allocating access rights to critical resources may be a superior mechanism than allocating ownership because the power agents get from access is more contingent on their making the right investment, whereas ownership has adverse effects on the incentive to specialize. This result suggests that a specific notion of partnership – namely, an organization of production in which the State allows firms to extract and refine oil without transferring full control over the management of the oil deposit to them – may optimize the firms' incentive to enhance productivity via more efficient investments. Whether and to what extent this conclusion is applicable to primary sectors in resource-rich countries is an open question that deserves future research.[6]

3.2 Property Rights and Total Domestic Income

Our analysis focuses on how total *domestic* income is affected by the *international* allocation of control rights over strategic primary sectors. Tackling this problem requires identifying transmission channels between sectoral profitability and aggregate income, as well as considering asymmetries in the objectives of the two parties. Both these issues are unexplored at the theoretical level[7] but nonetheless suggest two potential transmission channels which we label

[6] Levin and Tadelis (2005) depart more fundamentally from the GHM framework and consider hiring policies when product quality is not observable ex-ante by clients. In this setting, partnerships that maximize profits per partner induce more selection than corporations and this translates into a higher quality product. While Levin and Tadelis (2005) aim at explaining partnerships in service sectors, their theory seems more general. If we reinterpret the assumption of non-observable product quality as asymmetric information between the initial owner and a pool of technology providers competing for access, partnerships may optimize the selection of technology providers and yield productivity gains ex-post (possibly connected with Result 2(b) above).

[7] The contributions reviewed in section 3.1 study the impact of property rights structures on economic performance, identifying the latter with sectoral profitability. The parallel literature studying control rights' allocation

as "excessive residual rights" and "asymmetric benefits".

Excessive residual rights. In the benchmark GHM model, the conclusion that residual control rights induce over-investment unveils a potential source of Resource-Curse phenomena – i.e., a reduction in aggregate productivity induced by excessive input absorption by primary sectors. If the State grants some critical residual rights to foreign firms involved in the exploitation of domestic resources, private over-investment in the resource sector may crowd-out the use of productive assets in other sectors of the economy and lead to inefficiently low productivity at the aggregate level. From this perspective, assigning Foreign Control over domestic resources may induce lower domestic income relative to International Partnerships via excessive residual rights, which would be a novel explanation for Resource-Curse phenomena.[8]

Asymmetric benefits. Empirical evidence suggests that foreign firms aim at maximizing own profits whereas national authorities – i.e., the State – supposedly aim at maximizing domestic incomes. These asymmetric objectives imply a re-definition of the concept of joint surplus with respect to theories of the firm. In particular, if the State objective takes into account the side-effects of the primary sector's investments on other sectors of the economy, a partnership regime in which the State retains some control rights over domestically mobile assets or regulates the primary sector's use of public infrastructures may be more suitable to attain high domestic total income. This argument is linked to Besley and Ghatak's (2001) result: when the parties value the project differently, ownership should lie with the party with highest valuation regardless of who is the key investor. Several case studies indeed stress the maximization of national income and the pursuit of national interest as a major reason behind state involvement in strategic sectors (Kobrin, 1984; Randall, 1987).[9]

between public authorities and private agents (e.g. Besley and Gathak, 2001) typically denies international issues. The international dimension of control-rights allocation is considered in open-economy extensions of the GHM model – see Antràs (2014) – that, however, address different issues such as outsourcing strategies and the rise of multinational firms.

[8] The theoretical explanations for the rise of Resource-Curse phenomena are diverse: see Melhum et al. (2006) and Brunnschweiler and Bulte (2008). Jones Luong and Weinthal (2001, 2010) are the only authors to our knowledge who stress the role of oil ownership structures in the context of the resource curse; however, they focus on fiscal outcomes (see the empirical section below for more details). The resource curse literature has so far neglected the possibility that the crowding-out mechanism stems from incomplete contracts and the granting of excessive residual rights to foreign firms.

[9] Kobrin (1984) traces the evolution of petroleum sector control rights from mostly foreign control to increasing participation (right up to nationalization) by host-country governments as "the perception that foreign investors

Besides the mechanisms of "excessive residual rights" and "asymmetric benefits", control regimes in primary sectors obviously affect aggregate income via their impact on the level of rents accruing to domestic residents. Still, a proper account of the ownership-income nexus at the aggregate level would require explicit consideration of specialization effects that are seldom studied at the theoretical level.[10]

3.3 Property Rights and Political Contingency

A defining characteristic of the State is its coercive authority, which converys *inter alia* the power to enforce property rights or, in a negative sense, the power to expropriate. This aspect is relevant since the perception of higher expropriation risk reduces private incentives to invest and therefore the profitability of projects based on agreements between State and firms.[11] Theory suggests that these inefficiencies can be minimized if the State's ability to expropriate is limited by means of commitment devices or by self-enforcing contracts. Considering international partnerships in oil extraction, external commitment devices are hardly effective,[12] but self-enforcing agreements may be feasible. Thomas and Worrall (1994) study a model of FDI agreements and show that contracts limiting expropriation risk are self-enforcing when there are dynamic gains from cooperation: the host country trades off its short-term incentive to

could not be trusted to develop resources in the national interest became widespread" (ibid., p. 146). In her case study, Randall (1987) describes how the "remarkably high rate of repatriation of profits [by foreign oil firms] from Venezuela" (ibid., .21) led to a decades-long series of negotiations over rent distribution that culminated in the 1976 nationalization of the petroleum industry.

[10] Specialization effects are seldom studied also at the empirical level. An exception is the analysis of Lederman and Maloney (2007), which links aggregate economic performance to resource abundance after controlling for specialization effects: their results suggest that resource abundance increases the potential for productivity growth whereas high sectoral concentration of export revenues hampers productivity.

[11] Bohn and Deacon (2000) provide empirical evidence supporting the investment-reducing effect in oil-related industries. Expropriation risk also underlies the cross-country evidence provided by Melhum et al. (2006) on the institutional resource curse, i.e., the fact that resource-rich countries display low (high) income and slow (fast) growth when institutions are grabber-friendly (producer-friendly).

[12] Modern petroleum contracts include explicit provisions for arbitration in case of disputes (Taverne, 1994; Onorato, 1995) but these clauses are difficult to enforce since the host country's government is often a contractor. A case in point is the recent dispute between Spanish oil company Repsol and the Argentinian government, which led to a lenghty dispute, delays in energy-related investments in Argentina as well as to tensions between the national governments before a compensation deal was finally reached (Reuters, "Spain's Repsol has initial deal with Argentina on YPF", Nov 25 2013).

expropriate with the long-term incentive to foster good relations with potential investors that will provide further benefits in the future. Whether these grounds for establishing partnerships are solid is an open question. Guriev et al. (2011) show, both theoretically and empirically, that increases in the oil price make nationalizations more likely to happen because the incentive to expropriate suddenly becomes dominant due to external factors (i.e., the increase in market value of the oil deposit). Nonetheless, if we focus on the relationship between control regimes and productivity, the results of Thomas and Worrall (1994) are in line with those of Halonen (2002) and Bar-Isaac (2007) showing that joint ownership is potentially superior in repeated games (cf. Result 2(a) above). This issue has historically been relevant for oil industries since confiscation characterized several processes of nationalization (Guriev et al. 2011), but the opposite case of State repurchase, including forms of compensation such as preferential access for the formally expropriated firms, is not a rare event either (Philip, 1994).

3.4 From Theory to Empirics

The theoretical literature discussed above suggests three main remarks. First, control regimes and access rights influence sectoral productivity by shaping investment incentives and international Partnerships may boost the primary sector's profitability when agreements involve long-lasting relationships. Second, input reallocation and specialization effects spreading from the primary to other sectors induce asymmetric objectives between foreign firms and the State, possibly providing further rationale for joint control over resource exploitation. Third, political contingencies enhance (depress) productivity by determining a lower (higher) expected risk of expropriation.

However, the existing theories do not yield specific predictions on the impact of resources control rights on aggregate income, adding relevance to an empirical analysis of this relationship. Tackling this issue empirically is furthermore interesting in view of two facts. First, the existing empirical literature on ownership and resource extraction (e.g., Megginson, 2005; Wolf, 2009) concentrates on the profitability, or efficiency, of the primary sectors without assessing the impact on aggregate income. Second, the property-productivity nexus is likely to depend on several economic and political factors, including the technology level in the domestic (oil-rich) country – if it is very high, there may be little benefit in granting control rights to foreign firms – and political contingency – in particular, the State reliability as an enforcer. In the latter respect, we stress that low (high) expropriation risk is not necessarily associated to high (low)

levels of democracy because the *stability* of political regimes can be more important than their level of democratization. This is indeed one of the conclusions of our empirical analysis in the next section.

4 Empirical Analysis

Our empirical analysis revolves around the fundamental question: what type of control regime leads to highest aggregate income in oil-producing countries? We address this issue empirically by constructing a new dataset on petroleum ownership structures for up to 68 countries between 1867-2008. In the estimations, we control for the effects of technology levels and political contingencies, as well as a range of others factors, on the relationship between control regimes in oil extaction and aggregate domestic income. Below, we first describe the dataset on oil control rights and the empirical methodology, and then discuss the estimation results.

4.1 Oil Control Rights Dataset

Our dataset includes information on 68 oil-producing countries from all regions of the world (see the Appendix for a detailed list). The main criteria for inclusion in the dataset were that the country had a minimum of 0.2 billion barrels in (proved) oil reserves between 1980-2008, and that it produced an average of at least 20'000 barrels of crude oil per day during at least one year over the same period.[13] The principal source for this information was the U.S. Energy Information Administration (EIA). We cross-checked the entries from the EIA with the BP Statistical Review of World Energy (2010), which covers fewer countries in detail, but over a longer time period. Our sample includes 96.6 percent of known worldwide proved crude oil reserves in 1980, while in 2008 the share goes up to 99.9 percent.

The main variable of interest is the control rights structure of the petroleum industry. We distinguish between Domestic, Foreign, and mixed domestic-foreign (i.e., "Partnership") control rights regimes.[14] Note that our classification methodology is inspired by the one developed by Jones Luong and Weinthal (2001, 2010), but differs from it in that we distinguish between Domestic, Foreign, and mixed Domestic-Foreign control of the petroleum sector. Jones Luong

[13] These inclusion criteria are similar to the ones implemented by Jones Luong and Weinthal (2001, 2010).

[14] We focus on oil exploration and extraction/ production. The oil refinery and petroleum-derived products industries are not considered, as these do not presume the presence of an actual oil production sector in a country and are therefore more similar to other manufacturing sectors.

and Weinthal draw up four categories of resource ownership with a focus on private versus public ownership and control: state ownership with control, state ownership without control, private domestic ownership, and private foreign ownership. Moreover, our sample includes a wider range of countries from both the developed and the developing world and we are interested in overall income effects, while they concentrate mainly on transition economies and consider only fiscal policy outcomes.

We code each country according to the following criteria:

Domestic Control: The state or private domestic firm(s) holds the rights to develop the majority of petroleum deposits and owns the majority of shares (over 50%) in the oil sector. The managerial power lies mainly in domestic hands, with foreign involvement being limited to roles with little or no operational and managerial control (e.g., service contracts).

Partnership: The rights to develop the majority of petroleum deposits and the majority of shares (over 50%) in the oil sector lie in domestic hands, but there is substantial involvement by foreign firms. Both domestic and foreign oil firms (private or public) have operational and managerial competencies, e.g., through Production Sharing Agreements (PSAs).

Foreign Control: Foreign (private or state-owned) firms hold the rights to develop the majority of petroleum deposits and own the majority of shares (over 50%) in the domestic oil sector. The managerial power lies mainly in foreign hands, e.g., via concessions.

As these criteria imply, control right structures are seldom absolute in the sense that either domestic or foreign firms hold the exclusive rights to all exploration and extraction of petroleum. For practical purposes, the essential point is who holds the majority rights to exploit petroleum deposits according to domestic legislation. For the coding, we rely on the countries' constitutions, official laws and regulations governing the petroleum sector, sample petroleum contracts (where available), and secondary sources. The initial (post-independence) year of inclusion of each country is based on the date of the first national law, rule or regulation pertaining explicitly to the petroleum sector.[15] This method allowed us to gather information on

[15]The only exception is Canada, where petroleum-specific legislation is passed by the provincial governments, while the national government sets out the laws for the mining sector in general. The first mining sector law was passed in 1867, the year of Canada's independence from Great Britain. Given that oil refining (for kerosene

control regimes for 68 countries starting as early as 1867 up until 2008, with the average time period of a country's inclusion being around 53 years (see the Appendix for a detailed data description).

We condense the dataset into five-year periods to avoid capturing short-term fluctuations, starting with the period 1870-1874, 1875-1879, ..., until 2005-2008, for a total of potentially 28 periods and 761 observations. Since not all countries enter the dataset at the same time, we have an unbalanced panel. 209 country-periods had Domestic control; 306 had Foreign control; and 246 had Partnership. 36 countries from all parts of the world changed their regimes at least once during the period of observation, for a total of nearly 60 switches. Many changed regimes twice or even more, with Bolivia showing a record five changes since 1920. Several of these regime changes, especially in the pre-1970 period, came in the wake of general national upheavals such as revolutions or other profound changes in the political regime. In more recent times, changes have usually come about more smoothly during the course of adapting the control regimes to new developments and learning processes. The influence of politics on both control regime choice and income levels is a potential source of bias that we will seek to address in the empirical analysis.

4.2 Methodology

We would like to investigate whether different oil control regimes have led to different development outcomes in terms of income per capita in oil-producing countries. Our empirical strategy is to control for country-specific fixed effects that could be affecting both factors, i.e., we use a panel fixed-effects estimation approach (note that the Hausman test rejects random-effects estimation in favor of fixed effects). We do not argue that our findings will establish a causal relationship beyond any shadow of a doubt;[16] but we do believe that the major source of omitted variable bias is likely to stem from (historical) characteristics of a country, which can be captured by fixed effects. To minimize other potential sources of omitted variable bias, we control for other time-varying factors in our sensitivity analysis, and in a second step (see 4.4)

production) was originally invented in Canada in the 1840s, and that the Canadian petroleum industry developed in parallel with that of the United States in the second half of the nineteenth century, we argue that the 1867 law fully applies to the petroleum sector. Canada therefore enters our dataset in 1867.

[16] The ideal strategy for demonstrating causality would be using an instrumental variables approach with strong exogenous instruments.

also explore in more detail the effects of political contingency.

Our basic estimation model is as follows:

$$Y_{it} = \alpha_1 + \alpha_2 regimedummy_{it} + \alpha_3 X_{it} + \omega_{it}, \tag{1}$$

where i is the country and t the period index. The dependent variable Y_{it} is (the natural logarithm of) real income per capita at the start of period t, taken from the historical dataset of Maddison (2006) and measured in 1990 Geary-Khamis PPP-adjusted USD. X_{it} is a vector of control variables, and ω_{it} is the composite error term (see below). Our main variable of interest is $regimedummy_{it}$ and its coefficient α_2.

We have three 0-1 regime dummies for *Domestic Control*, *Foreign Control* and *Partnership*, constructed according to the classification described above. A dummy takes on value one if a country had the respective control regime for at least three of the five years in a given period. We choose Domestic Control as our base outcome and test whether Partnership and Foreign Control led to higher incomes than Domestic Control *at a given technology level*. The latter point is important as we argue that the choice of control regime is greatly influenced by the level of technology in a country at the time oil exploitation is decided upon. The challenge lies in finding a good proxy for technology level: we choose average labor productivity per worker in a period, measured in thousands of 1990 USD (The Conference Board Total Economy Database, 2011). This is a commonly used measure for technology in applied work, and it offers the additional benefit of having a wide data coverage starting in 1950.[17] In addition to the measure of *labor productivity*, our baseline estimation also includes time period dummies.

In further estimations, we include the following control variables. First, a dummy variable for membership in the Organization of Petroleum Producing Countries (OPEC), to take into consideration the possible effects of the wave of nationalizations that swept through the major oil producers in the late 1950s and 1960s and led to the Organization's creation. This provides a historical reason for the adoption of a particular control rights structure not considered by conventional theory. Another potentially relevant factor that could affect both the choice of control regime and income is "oil geography", or where the oil is located – either onshore or offshore. Offshore oil requires more sophisticated technology and is more likely to involve

[17] Unfortunately, this still doesn't take full advantage of our data on control structures, but we are not aware of a proxy for technology reaching even further back in time for a large set of countries. For comparison, we also provide estimation results without labor productivity that use all observations in our dataset.

foreign firms. Lujala et al. (2007) also find that offshore oil is less probable to lead to violent conflict, and conflict depresses income levels. We construct an offshore oil dummy based on the information compiled by Lujala et al. (2007).[18]

We also include two political variables taken from the Polity IV dataset (Marshall et al., 2010) as a first stab at controlling for the effects of political stability and institutional quality (i.e., the investment environment) on the type of petroleum sector contracts that a country offers. Foreign or Partnership regimes would be less likely in countries with poor institutional quality and unstable or unpredictable political systems, as this increases the uncertainty for foreign firms evaluating an investment in the oil sector. The first political measure is the composite variable *polity* (i.e., the *polity2* variable from the Polity IV dataset), which assigns values between -10 (strong autocracy) and 10 (strong democracy) to all political systems. The second political measure is one of the component variables of the total polity score, namely *executive constraints*. This arguably also proxies for the strength of the legal system and particularly property rights (see Acemoglu and Johnson, 2005).[19] We expect both political measures to enter with a positive sign. For now, we focus on this general specification of political contingency. In section 4.4, we will unravel the influence of political factors in more detail by distinguishing between regime types (i.e., democracies, autocracies, and anocracies).

We further include typical covariates from the income and growth literature: *investment* ratios as a percentage of GDP and *openness* measured as the GDP share of the sum of exports and imports (both from PWT 7.1, Heston et al. 2012), and years of *schooling* (Barro and Lee, 2010). All three variables are averaged over each period and are expected to enter with a positive sign. Details for all variables are provided in the Appendix.

All independent variables except for the OPEC and period dummies are lagged by one period to address another potential source of endogeneity, namely reverse causality: the development level (i.e., the income) of a country may influence its choice of control regime. Similar results were obtained for up to six lags (i.e., 30 years); beyond this the sample size starts to become too small for meaningful inference. Income levels are surely less persistent than the 30-year period for which our results hold, making the hypothesized direction of influence from control regime towards income – instead of vice versa – more probable. Moreover, we explicitly control

[18] We do not include a dummy for onshore oil as nearly every oil-producing country has this type of oil.

[19] The variable *executive constraints* was purged of all cases of political transition or interrruption (coded as -88, -77, or -66 in the Polity IV dataset), adding 31 missing observations to our dataset.

for the level of technology – a crucial development characteristic in our context – by including labor productivity (described above).[20]

The composite error term consists of the country-specific error component ϵ_i and the combined cross-section and time series error component u_{it}, according to $\omega_{it} = \epsilon_i + u_{it}$. We tackle the issue of serial correlation by reporting two different estimates of the standard errors.[21] The first uses robust clustered errors at the panel (i.e., country) level. This approach of one-level-up clustering - in this case, at the country instead of the country-period level - allows for unrestricted correlation of the residuals within clusters (Angrist and Pischke, 2009, ch. 8). The second approach uses adjusted standard errors according to the nonparametric covariance matrix estimator introduced by Driscoll and Kraay (1998) and adapted by Hoechle (2007) to unbalanced panels. This approach has the added advantage of producing heteroskedasticity-consistent standard errors that are robust to very general types of both temporal and spatial dependence. The latter point may be important when we consider the possible diffusion and contagion effects of events across oil producers, for example the signalling effect of the unsuccessful nationalization of the petroleum sector in Iran in 1951 or the formation of OPEC in 1960.[22]

4.3 Main results

Table 1 shows the main estimation results. The first two columns show parsimonious specifications for comparison: column (1) includes only the control regime dummies, using the full sample of 63 countries for which we have income data available. Partnership has an economically large but statistically insignificant effect, although the positive sign seems reliable (the

[20] We are not interested in dynamic effects and the partial adjustment of income to ownership structures over time, so we do not add a lagged dependent variable.

[21] The assumption of the classical error component model is that any temporal persistence is due to the presence of the same country i across the panel, and that this effect can be captured by the fixed country term ϵ_i. However, this is likely to be too restrictive here, where a shock - e.g., a control regime change - in one period could affect the behavioral relationship for several periods (see e.g., Baltagi, 2008, ch. 5.2). The error component u_{it} would then be serially correlated across periods: tests following Wooldridge (2002) confirm this suspicion. Failing to correct standard errors for serial correlation leads to biased statistical inference and less efficient estimates.

[22] For example, Myers Jaffe (2007) argues that the events in Iran between 1951-54 – the failed oil sector nationalization – affected policy in Iraq, since the Iraqi government was considering similar measures to increase its share in foreign companies' oil profits, but then opted for a less aggressive ownership strategy. On diffusion as a possible exogenous explanation for nationalization (or lack thereof), see also Kobrin (1985).

p-values using clustered and Driscoll-Kraay standard errors are, respectively, 0.218 and 0.102). Foreign Control has a large negative and significant impact on income, suggesting that it has led to lower income levels than Domestic Control, without considering any other factors. Column (2) adds our proxy for the technology level (i.e., labor productivity), making the sample size shrink by nearly 200 observations and six countries. We see that now, *ceteris paribus*, both Partnership and Foreign Control lead to significantly higher per-capita income levels than Domestic Control. The average income effect of Partnership is nearly twice as high as that of Foreign Control: choosing Partnership appears to have led to income per capita around 26 percent (or, more precisely, $100 \cdot (\exp^{0.23} - 1) = 30.1$ percent) higher than Domestic Control, while choosing Foreign Control led to 11.6 percent (12.3 percent) higher income. Labor productivity is positive, highly significant, and has great explanatory power (judging by the R-squareds), which was to be expected.

Our baseline estimation with period dummies is given in column (3). The coefficients on the control regime dummies show that both Partnership and Foreign Control led to significantly higher income levels than Domestic Control, holding all else equal, although the magnitude of the coefficient on Partnership shrinks after the introduction of the period fixed effects. The ranking of control regimes still suggests that Partnership has the highest positive impact on income levels (around 15 percent – or 16.3 percent to be exact – higher than Domestic Control), followed by Foreign Control (10.4 – or 11 – percent higher than Domestic Control).

The remaining columns successively add the control variables described in 4.2. We see that joining OPEC has had no discernible effect on income levels, not has the level of schooling. Discovering offshore oil seems to have had a small positive income effect, though it is not entirely robust. Higher investment shares and greater openness to trade have also had positive effects on income. The inclusion of investment also reduces the magnitude of the control regime coefficients, and although Partnership remains highly significant, Foreign Control loses significance.

Interestingly, the polity indicator is consistently negatively related to income, suggesting that democracies have seen lower income levels than autocracies. This seems puzzling, though the relationship between income and democracy is subject to debate (see, e.g., Acemoglu et al. 2008). As a first sensitivity test, we substitute executive constraints – a proxy of property rights security – for polity. The results are shown in Table 2, with specifications otherwise analogous to those of columns (6)-(9) of Table 1. The substitution makes no qualitative difference to the main

variables of interest, the dummies for Partnership and Foreign control: these remain positive and (for the case of Partnership) highly significant, and their magnitudes are substantially unaltered. And again, the institutional measure is consistenly negative, though not always significant. The effect of the institutional measures may be driven by the influence of so-called "anocracies": political regimes that are neither strong democracies nor strong autocracies, but instead lie in the middle range on the polity and executive constraints scales. Both strong democracies and strong autocracies offer more stable investment environments than anocracies, which may be biasing the effect of the more general political variables. Since we are particularly interested in the potential interaction effects between various political regimes and the choice of oil control regime, we will explore this point further in Section 4.4 below.

The results so far suggest that some degree of foreign involvement is better than "going it alone": both Partnership and Foreign Control lead to higher income than Domestic Control. However, the differences between the main coefficients may not be as systematic as the findings above suggest; Partnership may actually not be strictly preferable to Foreign Control in terms of its income effects. From the State's point of view, the choice of degree of foreign involvement is often politically sensitive, so we will explore the exact ranking a little bit further. Wald tests reject equality of the coefficients for Partnership and Foreign Control in five out of the nine specifications shown in Table 1 (we cannot reject equality at conventional levels in specifications (3)-(6)). In additional sensitivity analyses (see Table 6 in the Appendix), we set Foreign Control as the base outcome to directly test whether Partnership indeed has higher positive income effects than Foreign Control. The results support the conclusions from the simple Wald tests on the findings from Table 1. In specifications corresponding to those shown in Table 1, Partnership enters with a positive and significant sign in six out of nine cases. In the remaining three cases, significance lies between 16 and 13 percent, which still allows us to at least put a positive sign on the coefficient.

To sum up, the evidence so far speaks in favor of the following ranking of control rights regimes in terms of their effects on income: Partnership leads to the highest income levels, followed by Foreign control and finally Domestic control. We will now take a closer look at the issue of political contingency.

4.4 Political contingency

Choosing a control regime over oil resources is not only an economic and legal issue, but also a highly political decision, especially when the natural resource sector is – or will be – a main contributor to the national economy. One could argue for example that autocratic leaders are more likely to give precedence to domestic firms and restrict access of foreign companies for reasons of "national security" or "national interest". There are many examples of this throughout the history of oil exploitation. Recent episodes include the (re-) nationalization of the oil sector in Venezuela under Hugo Chavez in 2007, which undid the opening-up towards foreign activity of the 1990s; or the stepwise moves towards sectoral domination by (public and private) domestic oil firms in Russia under Vladimir Putin. The political environment may not be fully captured by the combination of country and period fixed effects and institutional control variables introduced so far: we may still be missing a part of the story. For example, there could be a bias in favor of Partnership if Partnership were particularly encouraging for development in strong autocracies, and strong autocracies were dominating our sample for several periods. This could then lead us to erroneously conclude that Partnership has the strongest positive income effects of all control regimes.

To gain an overview, in Table 3 we first list our three oil control regimes by political regime – autocracy, anocracy or democracy (see below for more details). The data show that autocracies had the most five-year-periods with Domestic Control in the sample (119 out of 288 periods with autocracy), while democracies had the fewest (38 out of 264), confirming our conjectured autocratic bias towards Domestic Control. The table also shows that Partnership-type control regimes are most frequent in democracies (101 out of 246 periods with Partnership), closely followed by autocracies (96 out of 246), while they are least frequent in anocracies – the politically most unstable countries (49 out of 246). Finally, Foreign Control regimes are not only the most frequent in absolute terms (306 out of 761 periods), but are also most often found in democracies (125 out of 306). These summary statistics suggest that oil control regimes are not evenly distributed across political regimes, and it is therefore worth exploring whether this uneven distribution is driving the effect of control regimes on income.

In order to investigate whether political contingency has been influencing our results so far, we first interact our oil regime control variables with the polity variable. Results are shown in column (1) of Table 4. The coefficient for Partnership now gives us the impact on

income when polity is equal to zero – the "perfect" anocracy: we see that Partnership leads to around 11 percent higher income than when there is Domestic Control. The negative signs on the interaction terms indicate that as polity scores increase, the positive impacts of both Foreign Control and Partnership start to diminish. At some point, the effect can even become negative: the turning points for Partnership and Foreign Control are at polity scores of 10 and 6, respectively. In a "perfect" democracy (polity=10), the impact of Partnership would be $[0.107-(0.0118*10) = -0.011]$, leading to around around 1 percent lower income than Domestic Control, all other things equal. On the other hand, for lower polity scores, Partnership and Foreign Control are linked to higher income levels than Domestic Control.

These initial results point towards different income effects in different political regimes. In order to gain more insight into these differences in our sample of oil-producing countries, we construct three political regime dummies for autocracy, democracy, and anocracy, based on the original polity scores from the Polity IV dataset.[23] In column (2) of Table 4, we add these new dummy variables separately, taking anocracy as our base variable. The coefficients for Partnership and Foreign Control are similar to the ones found when using the composite polity variable as a control (Tables 1-2). Both democracies and autocracies in our sample appear to have had lower income levels on average than anocracies.

We'd like to know what the income effects of the different oil control regimes are in each type of political regime. In addition, we would like to compare these effects to the results found in our basic estimations in Tables 1-2 and see whether Partnership and Foreign Control still lead to the highest income levels, regardless of the political regime of the country, and what the exact ranking is. In order to do this, in columns (3)-(5) we interact each political regime dummy with our oil control regime variables according to the following model:

$$\begin{aligned} Y &= \beta_1 + \beta_2 partnership + \beta_3 foreign + \beta_4 polregime + \\ &\quad \beta_5 polregime \cdot partnership + \beta_6 polregime \cdot foreign + \text{other factors} + \upsilon, \end{aligned} \tag{2}$$

where υ is the composite error term and other factors include labor productivity and period dummies. We omit the period and panel subscripts for simplicity.

[23] Following Marshall and Cope (2011), we define autocracies as having a polity score of -6 or less; democracies of 6 or more; and anocracies as having intermediate scores or as experiencing episodes of regimes transition or interruption. Detailed descriptions are in the Appendix.

Interpreting these results takes a bit of care. First, we note that the interaction effects are significant, and that Partnership and Foreign Control both enter with positive (though not always significant) signs on their own. For the net effect of each political regime, we need to add up the various coefficients. In column (3), for example, we test the effects of having an autocratic regime combined with our different oil control regimes. The base outcome is Domestic Control in a democracy or anocracy (i.e., autocracy=0). The net effect of Partnership in an autocracy is ($\beta_2 + \beta_4 + \beta_5 = 0.11$) or 11 percent; the net effect of having Foreign Control in an autocracy is ($\beta_3 + \beta_4 + \beta_6 = 0.021$) or around 2 percent. Finally, the net effect of being an autocracy with a Domestic Control regime is simply given by β_4, i.e., -12 percent. The effects for the other political regimes are calculated in an analogolous manner. For a convenient overview, we list all net effects in Table 5.

Looking at the findings shown in Table 5, we first note that both Partnership and Foreign Control have consistently positive income effects and, with one exception, both control regimes with foreign involvement lead to higher income than Domestic Control. Autocracies and democracies present the clearest pictures: (substantial) foreign involvement of any kind in the oil sector – be it in a Partnership with domestic firms or under full Foreign Control – has been related to higher income levels than full Domestic Control. Moreover, democratic or autocratic countries that chose Partnership have on average achieved the best development outcomes.

The exception is presented by the so-called anocracies, those countries that have either weak democracies or weak autocracies (or no clear political regime at all). These are shown in the last column of Table 5. Partnership is still linked to the highest income levels, but both Domestic and Foreign Control have had positive impacts of similar magnitude on income levels. For the sake of a clear ranking, we again perform alternative estimations, with Foreign Control and political regime=0 as the base outcome (see Table 7 in the Appendix). These confirm that Partnership has the highest positive impact (0.03) on income in the case of an anocracy, but suggest that Domestic Control follows with a lower positive effect (0.02), while Foreign Control clearly leads to the relatively worst outcome (-0.03).

In summary, the ranking from Section 4.3 is mostly confirmed: Partnership has always been associated with the highest income levels, regardless of the political regime of the oil-producing country. Foreign Control follows with the second-highest positive income effects, albeit "only" in democracies and autocracies: in so-called anocracies, Domestic Control may

have been the better control regime choice in terms of overall income. Otherwise, Domestic Control is generally linked to the lowest income levels.

5 Conclusions

Our empirical analysis shows that a substantial degree of foreign involvement in a country's oil sector, be it in the form of a domestic-foreign partnership or full Foreign Control, has generally led to higher income levels than 'going it alone' under full Domestic Control. Moreover, the ranking suggests that Partnership is associated with the highest income levels of all three oil control regimes. The use of country fixed effects, as well as lagged explanatory variables, suggests a causal relationship, though we acknowledge that the best way to demonstrate causality would be through the use of instrumental variables. We have investigated another main potential source of endogeneity in more detail, namely the issue of political contingency. We found that Partnership still leads to the highest income regardless of the political regime of the oil-producing country; however, Foreign Control may not be the best option in anocracies, i.e., countries where there is the greatest political uncertainty. Under this scenario, a large degree of domestic involvement in oil production may be preferable in order to achieve high levels of development.

If the goal is to attain high total domestic income, combining the expertise of foreign technology providers with partial domestic control seems the best option. This conclusion matches anecdotal evidence from some oil producers that have chosen a Partnership exploitation strategy (e.g., Norway) and may add an additional explanation for why some oil-producing countries have managed to achieve positive development outcomes and escape the worst consequences of a 'resource curse'.

Looking at the theoretical literature, the existing models of incomplete contracts capture some aspects but not the general mechanism underlying the relationships betweeen aggregate domestic income and control regimes in primary sectors. Potential mechanisms include the impact of asymmetric objectives between domestic governments and foreign firms as well as aggregate resource-curse phenomena induced by inefficient investments that result from the structure of control rights within the primary sector. More generally, drawing explicit links among the three key relationships – i.e., the productivity-ownership nexus at the sectoral level, the ownership-income relationship at the aggregate level, and the impact of political contin-

gencies – in a formal model of resource-rich economy appears an important task for future research.

References

Acemoglu, D., Johnson, S. (2005). Unbundling institutions. *Journal of Political Economy* 113 (5): 949-995.

Acemoglu, D., Johnson, S., Robinson, J., Yared, P. (2008). Income and democracy. *American Economic Review* 98 (3): 808–842.

Al-Obaidan, A.M., Scully, G.W. (1992). Efficiency differences between private and state-owned enterprises in the international petroleum industry. *Applied Economics* 24 (2): 237-246.

Angrist, J.D., Pischke, J.-S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press.

Antràs, P. (2014). Grossman–Hart (1986) Goes Global: Incomplete Contracts, Property Rights, and the International Organization of Production. *Journal of Law, Economics, and Organization*. Forthcoming.

Property rights and the international organization of production. *American Economic Review* 95 (2): 25-32.

Baltagi, B.H. (2008). *Econometric analysis of panel data*. Chichester, UK: Wiley & Sons.

Bar-Isaac, H. (2007). Something to prove: reputation in teams. *RAND Journal of Economics* 38 (2): 495-511.

Barro, R.J., Lee, J.-W. (2010). A new data set of educational attainment in the world: 1950-2010. *NBER Working Paper* No. 15902.

Besley, T., Ghatak, M. (2001). Government versus private ownership of public goods. *Quarterly Journal of Economics* 116 (4): 1343-1372.

Besley, T., Ghatak, M. (2010). Property Rights and Economic Development. *Handbook of Development Economics*, Vol. 5, Chapter 68, pp. 4525-4595.

Bohn, H., Deacon, R.T. (2000). Ownership Risk, Investment, and the Use of Natural Resources. *American Economic Review* 90: 526-549.

BP (2010). Statistical Review of World Energy, June 2010.

Brunnschweiler, C.N., Bulte, E. (2008). The resource curse revisited and revised: a tale of paradoxes and red herrings. *Journal of Environmental Economics and Management* 55: 248–264.

Chiu, Y.S. (1998). Noncooperative Bargaining, Hostages, and Optimal Asset Ownership. *American Economic Review* 88 (4): 882-901.

Driscoll, J.C., Kraay, A.C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics* 80: 549-560.

EIA, Energy Information Administration (2010). Crude oil proved reserves 1980-2008, database accessed September 2010, available at http://www.eia.gov/petroleum/

Grossman, S.J., Hart, O.D. (1986). The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy* 94 (4): 691-719.

Guriev, S., Kolotilin, A., Sonin, K. (2011). Determinants of nationalization in the oil sector: A theory and evidence from panel data. *Journal of Law, Economics & Organization* 27 (2): 301-323.

Halonen, M. (2002). Reputation and the allocation of ownership. *Economic Journal* 112: 539-558.

Hart, O., Moore, J. (1990). Property rights and the nature of the firm. *Journal of Political Economy* 98 (6): 1119-1158.

Heston, A., Summers, R., Aten, B. (2012). Penn World Table Version 7.1, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, July 2012.

Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *Stata Journal* 7 (3): 1-31.

Holmström, B. (1999). The firm as a subeconomy. *Journal of Law, Economics, and Organization* 15: 74-102.

Jones Luong, P., Weinthal, E. (2001). Prelude to the resource curse: Explaining oil and gas development strategies in the Soviet successor states and beyond. *Comparative Political Studies* 34 (4): 367-99.

Jones Luong, P., Weinthal, E. (2010). *Why oil is not a curse: Ownership structure and institutions in the petroleum rich Soviet successor states.* New York: Cambridge University Press.

Kobrin, S.J. (1984). The nationalisation of oil production, 1918-1980. In D.W. Pearce, H. Siebert, I. Walter (eds.) *Risk and the political economy of resource development.* New York: St. Martin's Press.

Kobrin, S.J. (1985). Diffusion as an explanation of oil nationalization, or the domino effect rides again. *Journal of Conflict Resolution* 29 (1): 3-32.

Levin, J., Tadelis, S. (2005). Profit sharing and the role of professional partnerships. *Quarterly Journal of Economics* 120: 131-171.

Lujala, P., Rod, J.K., Thieme, N. (2007). Fighting over Oil: Introducing a New Dataset. *Conflict Management and Peace Science* 24: 239-256.

Maddison, A. (2006). *Historical Statistics of the World Economy: 1-2006 AD.* Database available at http://www.ggdc.net/MADDISON/oriindex.htm

Marshall, M.G., Jaggers, K., Gurr, T.R. (2010). *Polity IV Project: Political Regime Characteristics and Transitions, 1800-2010.* Database accessed December 13, 2010, available at: http://www.systemicpeace.org/polity/polity4.htm

Marshall, M.G., Cope, B.R. (2011). Global Report 2011: Conflict, Governance, and State Fragility. Center for Systemic Peace.

Megginson, W.L. (2005). *The financial economics of privatization.* New York : Oxford University Press.

Mehlum, H., Moene, K., Torvik, R. (2006). Institutions and the Resource Curse. *Economic Journal* 116, 1-20.

Mold, A., Paulo, S., Prizzon, A. (2009). Taking Stock of the Credit Crunch: Implications for Development Finance and Global Governance. OECD Development Centre Working Paper n. 277.

Myers Jaffe, A. (2007). Iraq's oil sector: Past, present and future. James A. Baker III Institute for Public Policy, Rice University, mimeo.

Onorato, W.T. (1995). Legislative frameworks used to foster petroleum development. World Bank Policy Research Working Paper n. 1420.

Philip, G. (1994). *The political economy of international oil.* Edinburgh: Edinburgh University Press.

Rajan, R., Zingales, L. (1998). Power in a theory of the firm. *Quarterly Journal of Economics* 113 (2): 387-432.

Randall, L. (1987). *The political economy of Venezuelan oil.* New York: Praeger.

Schmitz, P.W. (2008). Joint ownership and the hold-up problem under asymmetric information. *Economics Letters* 99: 577-580.

Solberg, C.E. (1979). *Oil and nationalism in Argentina: A History.* Stanford: Stanford University Press.

Taverne, B. (1994). An introduction to the regulation of the petroleum industry. *International Energy and Resource Law & Policy Series.* London: Graham & Trotman.

The Conference Board Total Economy Database (2011), January 2011, accessed March 12, 2011, available at http://www.conference-board.org/data/economydatabase/

Thomas, J., Worrall, T. (1994). Foreign Direct Investment and the Risk of Expropriation. *Review of Economic Studies* 61 (1): 81-108.

Vrankel, P.H. (1980). The rationale of National Oil Companies. In United Nations Centre for Natural Resources, Energy and Transport (UNCRET), *State Petroleum Enterprises in Developing Countries.* New York: Pergamon Press.

Wolf, C. (2009). Does ownership matter? The performance and efficiency of state oil vs. private oil (1987-2006). *Energy Policy* 37 (7): 2642-2652.

Wooldridge, J.M. (2002). *Econometric analysis of cross-section and panel data.* Cambridge, MA: MIT Press.

Table 1: Oil control regimes and income levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Partnership	0.171	0.263***	0.151***	0.151***	0.150***	0.162***	0.109***	0.125***	0.123***
	(1.244)	(4.828)	(2.219)	(2.232)	(2.251)	(2.512)	(2.004)	(2.334)	(2.504)
	[1.658]	[5.402]	[3.364]	[3.462]	[3.520]	[3.808]	[4.419]	[4.610]	[4.708]
Foreign	-0.289**	0.116***	0.104*	0.104**	0.0979*	0.121**	0.0367	0.0401	0.0475
	(-2.250)	(2.171)	(1.431)	(1.433)	(1.423)	(1.798)	(0.574)	(0.616)	(0.736)
	[-1.749]	[2.140]	[1.958]	[2.066]	[1.985]	[2.317]	[0.866]	[0.912]	[1.157]
Labor productivity		0.0270***	0.0173***	0.0173***	0.0173***	0.0178***	0.0201***	0.0199***	0.0174***
		(4.958)	(7.104)	(7.095)	(7.117)	(7.538)	(2.842)	(2.863)	(2.395)
		[6.173]	[16.37]	[16.40]	[16.23]	[17.83]	[7.430]	[7.184]	[5.267]
OPEC				0.00606	0.000462	0.0101	-0.0281	0.0462	0.0462
				(0.0369)	(0.00291)	(0.0635)	(-0.211)	(0.404)	(0.403)
				[0.0629]	[0.00487]	[0.118]	[-0.431]	[0.550]	[0.537]
Oil offshore					0.0383**	0.0430**	0.0452**	0.0443**	0.0282
					(0.558)	(0.643)	(0.681)	(0.659)	(0.409)
					[2.041]	[2.312]	[2.525]	[2.069]	[1.133]
Polity						-0.00551***	-0.00435**	-0.00432*	-0.00457**
						(-1.249)	(-1.047)	(-0.837)	(-0.881)
						[-3.104]	[-2.178]	[-1.970]	[-2.230]
Investment							0.00549***	0.00698***	0.00599***
							(1.281)	(1.460)	(1.276)
							[2.840]	[3.017]	[2.725]
Schooling								-0.00247	0.00553
								(-0.0507)	(0.110)
								[-0.0672]	[0.139]
Openness									0.00254**
									(2.043)
									[2.118]
Constant	8.328***	7.900***	7.695***	7.694***	7.692***	7.664***	7.564***	7.579***	7.494***
	(101.9)	(80.14)	(151.1)	(133.9)	(136.6)	(152.2)	(83.21)	(33.13)	(29.53)
	[78.99]	[65.51]	[182.8]	[188.4]	[191.4]	[179.8]	[127.3]	[50.33]	[41.00]
Period dummies	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	648	455	455	455	455	453	423	398	398
Number of countries	63	57	57	57	57	57	56	50	50
Ave obs per country	10.3	8	8	8	8	7.9	7.6	8	8
R^2 within	0.059	0.425	0.640	0.640	0.641	0.647	0.662	0.673	0.683

Notes: The dependent variable is (log) income per capita at start of five-year period. *Domestic Control* is the base outcome. All covariates except the OPEC dummy are lagged by one period. Estimations are fixed effects (within) panel estimations. T-statistics for robust country-clustered standard errors are in parentheses, and for Driscoll-Kraay standard errors in square brackets. Asterisks refer to Driscoll-Kraay standard errors.

Table 2: Sensitivity tests with executive constraints

	(1)	(2)	(3)	(4)
Partnership	0.158***	0.106***	0.121***	0.119***
	(2.316)	(1.836)	(2.105)	(2.252)
	[3.502]	[4.367]	[4.497]	[4.545]
Foreign	0.121**	0.0327	0.0365	0.0422
	(1.669)	(0.467)	(0.517)	(0.600)
	[2.074]	[0.747]	[0.813]	[1.019]
Labor productivity	0.0178***	0.0202***	0.0200***	0.0176***
	(7.640)	(2.900)	(2.933)	(2.446)
	[17.36]	[7.425]	[7.166]	[5.269]
OPEC	-0.000738	-0.0354	0.0342	0.0329
	(-0.00457)	(-0.271)	(0.298)	(0.286)
	[-0.00812]	[-0.529]	[0.397]	[0.374]
Oil offshore	0.0391*	0.0433**	0.0423*	0.0268
	(0.564)	(0.633)	(0.608)	(0.377)
	[1.939]	[2.290]	[1.853]	[1.047]
Executive constraints	-0.0130**	-0.00814	-0.00826	-0.00977*
	(-1.485)	(-0.973)	(-0.755)	(-0.896)
	[-2.385]	[-1.495]	[-1.454]	[-1.977]
Investment		0.00625***	0.00740***	0.00635***
		(1.381)	(1.496)	(1.304)
		[3.096]	[3.180]	[2.873]
Schooling			-0.00280	0.00575
			(-0.0586)	(0.117)
			[-0.0765]	[0.146]
Openness				0.00253**
				(1.993)
				[2.051]
Constant	7.728***	7.591***	7.612***	7.533***
	(105.6)	(83.97)	(36.71)	(32.62)
	[198.3]	[155.8]	[52.05]	[42.46]
Observations	444	414	390	390
Number of countries	57	56	50	50
Ave obs per country	7.800	7.400	7.800	7.800
R^2 within	0.644	0.661	0.670	0.680

Notes: The dependent variable is (log) income per capita at start of five-year period. *Domestic Control* is the base outcome. All covariates except the OPEC dummy are lagged by one period. Estimations are fixed effects (within) panel estimations. T-statistics for robust country-clustered standard errors are in parentheses, and for Driscoll-Kraay standard errors in square brackets. Asterisks refer to Driscoll-Kraay standard errors.

Table 3: Oil control regimes by political regime

	Domestic	Foreign	Partnership	Total
Autocracy	119	73	96	288
Anocracy	52	108	49	209
Democracy	38	125	101	264
Total	209	306	246	761

Notes: The table shows the frequency of oil control regimes (in terms of five-year periods) listed by political regime.

Table 4: Oil control regimes and political regimes

	(1)	(2)	(3)	(4)	(5)
Partnership	0.107**	0.156***	0.0409	0.178***	0.179***
	(1.687)	(2.436)	(0.582)	(2.347)	(2.754)
	[2.348]	[3.313]	[0.782]	[4.382]	[3.532]
Foreign	0.122**	0.103**	0.000496	0.121**	0.150***
	(1.702)	(1.485)	(0.00645)	(1.487)	(2.004)
	[2.614]	[2.052]	[0.00855]	[2.162]	[2.879]
Polity	0.00336				
	(0.523)				
	[1.250]				
Partnership*Polity	-0.0118***				
	(-2.118)				
	[-4.581]				
Foreign*Polity	-0.0235***				
	(-3.639)				
	[-6.237]				
Autocracy		-0.0102	-0.116***		
		(-0.178)	(-1.767)		
		[-0.583]	[-6.269]		
Democracy		-0.0782**		-0.00979	
		(-1.828)		(-0.161)	
		[-2.587]		[-0.181]	
Anocracy					0.122***
					(2.568)
					[3.505]
Partnership*political regime			0.188***	-0.0950**	-0.115**
			(2.993)	(-1.341)	(-1.230)
			[4.928]	[-2.156]	[-2.333]
Foreign*political regime			0.331***	-0.0853*	-0.148*
			(3.341)	(-1.043)	(-1.926)
			[5.941]	[-1.756]	[-1.664]
Period dummies	yes	yes	yes	yes	yes
Observations	453	455	455	455	455
Number of countries	57	57	57	57	57
Ave obs per country	7.9	8	8	8	8
R^2 within	0.659	0.644	0.654	0.645	0.646

Notes: The dependent variable is (log) income per capita at start of five-year period. In column 1 control regime dummies are interacted with Polity. In columns 3-5 oil control regime dummies are interacted with political regime dummies (*democracy*, *autocracy*, *anocracy*). *Domestic Control with political regime=0* is the base outcome. Labor productivity and constant term are included in all estimations but not shown for space reasons. All covariates are lagged by one period. Estimations are fixed effects (within) panel estimations. T-statistics for robust country-clustered standard errors are in parentheses, and for Driscoll-Kraay standard errors in square brackets. Asterisks refer to Driscoll-Kraay standard errors.

Table 5: Net effects of oil control regimes

	(1)	(2)	(3)
	Democracy	Autocracy	Anocracy
with Domestic control	-1.0 (-1.0)	-12.0 (-9.5)	12.0 (12.7)
with Foreign control	2.0 (2.0)	2.1 (2.1)	12.0 (12.7)
with Partnership	7.0 (7.3)	11.0 (11.6)	18.0 (19.7)

Notes: The table gives the total (net) effects in percent of oil control regimes on income according to the political regime. The figures in parentheses give the precise effects according to $100 \cdot [exp(\hat{\beta}) - 1]$. Calculations are based on the coefficients from columns (3)-(5) in Table 4.

A Appendix: data description and additional tables

Countries for which control rights regime data is available, with period included (starting with beginning of first five-year period):

Albania (1930-2008), Algeria (1965-2008), Angola (1980-2008), Argentina (1910-2008), Australia (1905-2008), Azerbaijan (1995-2008), Bahrain (1975-2008), Bolivia (1920-2008), Brazil (1895-2008), Brunei (1985-2008), Cameroon (1965-2008), Canada (1870-2008), Chad (1965-2008), Chile (1930-2008), China (1950-2008), Colombia (1915-2008), Congo Brazzaville (1965-2008), Cuba (1955-2008), Denmark (1950-2008), East Timor (2005-2008), Ecuador (1910-2008), Egypt (1955-2008), Equatorial Guinea (1980-2008), France (1925-2008), Gabon (1965-2008), Germany (1990-2008), West Germany (1955-1989), Guatemala (1950-2008), India (1955-2008), Indonesia (1960-2008), Iran (1905-2008), Iraq (1955-2008), Italy (1930-2008), Kazakhstan (1995-2008), Kuwait (1965-2008), Libya (1955-2008), Malaysia (1970-2008), Mexico (1905-2008), Netherlands (1965-2008), Nigeria (1965-2008), Norway (1965-2008), Oman (1975-2008), Pakistan (1950-2008), Papua New Guinea (1980-2008), Peru (1925-2008), Philippines (1950-2008), Qatar (1975-2008), Romania (1895-2008), Imperial Russia (1875-1918), Russian Federation (1995-2008), Saudi Arabia (1935-2008), Sudan (1975-2008), Syria (1955-2008), Thailand (1975-2008), Trinidad and Tobago (1965-2008), Tunisia (1960-2008), Turkey (1930-2008), Turkmenistan (1995-2008), United Arab Emirates (1980-2008), Ukraine (2005-2008), United Kingdom (1935-2008), United States (1900-2008), USSR (1920-2008), Uzbekistan (1995-2008), Venezuela (1905-2008), Vietnam (1985-2008), Yemen (1990-2008), North Yemen (1975-1990), South Yemen (1980-1990).

Technical notes: For the case of former colonies, the simple act of maintaining colonial-era contracts upon independence until their expiry does not constitute a national law in the sense of it being passed deliberately by a sovereign government. The year of inclusion of a country in our dataset does therefore not necessarily coincide with its year of gaining independence. We are aware that there is often a time lag between the introduction of a new piece of legislation and its full implementation throughout the petroleum industry. E.g., the decision to switch from a domestic control structure to partnership may involve delineating the geographical sectors to be offered for tender to foreign companies, organizing the bidding rounds, and drawing up the final contracts, a process which can take several months or even years. However, a legislative

change in control rights structures is usually transformed into a real change, which is why we concentrate on the date of the passing of the legislation rather than on the less precisely definable date of its full implementation. A borderline case is presented by Argentina between 1910-1963. The original executive decree of December 1907 excluded private concessions for the newly-discovered petroleum reserves, and therefore set up a majority domestic control structure. However, after Law 7059 of 1910, the deposits were little by little opened to exploitation by private (mostly foreign) investors, with the new national oil company being limited to the deposits on the shrinking Public Lands. We thus classify the control regime as mixed domestic-foreign from 1910-1963, even though several decrees passed between 1910-1955 tried to limit the activities of (foreign) private oil companies, with very little effect on the flourishing industry. There was therefore a certain discrepancy between formal regulation and practice on the ground, which persisted for several decades. It wasn't until nationalization in 1963 that all private oil companies' contracts were truly and finally declared null and void – a situation which however lasted only until 1966, when mixed domestic-foreign control was fully mandated by law (Solberg, 1979).

Data and sources

income per capita: natural logarithm of GDP per capita in 1990 international Geary-Khamis (PPP-adjusted) dollars. *Source*: Maddison (2006).

oil control rights regime: oil sector control rights variable categorized into majority domestic, majority foreign, or majority mixed domestic-foreign (i.e., partnership) control. *Source*: own coding.

polity: revised Combined Polity Score. This variable modifies the combined annual POLITY score by applying a simple treatment, or "fix," to convert instances of "standardized authority scores" (i.e., -66, -77, and -88) to conventional polity scores, i.e., within the range -10 (strong autocracy) to +10 (strong democracy). *Source*: Polity IV database (Marshall et al., 2010).

executive constraints: measure of the decision rules that define the extent of institutionalized constraints on the decisionmaking powers of chief executives, whether individuals or collectivities. The measure ranges from 1 (unlimited authority) to 7 (executive parity or subordination). Periods of political upheavals such as transitions or occupations (scores

of -88, -77, -66) are dropped from the sample. *Source*: Polity IV database (Marshall et al., 2010).

democracy, autocracy, anocracy: dummy variables based on the original, non-revised polity variable. As suggested by Marshall and Cole (2011), democracy has value one if the polity score is 6 and higher; autocracy has value one if the polity score is -6 or lower; and anocracy has value one if the polity score lies between -5 and 5, as well as when there are various forms of interrupted government (polity scores of -88, -77 or -88). *Source*: own coding according to Polity IV database (Marshall et al., 2010).

OPEC: dummy variable with value one in a period when a country is a member of the Organization of the Petroleum Exporting Countries. *Source*: own coding based on OPEC information on http://www.opec.org/opec_web/en/.

oil offshore: dummy variable with value one in a period when a country discovers offshore oil. *Source*: own coding based on Lujala et al. (2007).

labor productivity: labor productivity per person employed in thousands of 1990 US$ (converted at Geary Khamis PPPs), average over five-year period. Available from 1950 onwards. *Source*: The Conference Board Total Economy Database (2011).

investment: Average investment Share of PPP converted GDP Per Capita at 2005 constant prices [rgdpl] over five-year period. Available from 1950 onwards. *Source*: Penn World Tables 7.1 (Heston et al. 2012). For China, official data (version 1) were taken.

openness: Average openness at 2005 constant prices (%) [(exports+imports)/rgdpl] over five-year period. Available from 1950 onwards. *Source*: Penn World Tables 7.1 (Heston et al. 2012). For China, official data (version 1) were taken.

years of schooling: Average years of total schooling of population over five-year period. Available from 1950 onwards. *Source*: Barro Lee education dataset v. 2.0, 07/10 (Barro and Lee, 2010).

Table 6: Oil control regimes and income levels with Foreign Control as omitted category

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Partnership	0.455***	0.153***	0.0517	0.0515	0.0566*	0.0459	0.0749**	0.0867**	0.0776**
	(3.525)	(3.174)	(0.874)	(0.861)	(0.958)	(0.758)	(1.462)	(1.656)	(1.478)
	[4.434]	[3.585]	[1.564]	[1.558]	[1.705]	[1.436]	[2.197]	[2.570]	[2.238]
Domestic	0.286*	-0.109**	-0.0999*	-0.100**	-0.0939*	-0.117**	-0.0340	-0.0383	-0.0455
	(2.234)	(-2.052)	(-1.381)	(-1.382)	(-1.367)	(-1.741)	(-0.538)	(-0.594)	(-0.713)
	[1.754]	[-2.034]	[-1.901]	[-2.005]	[-1.922]	[-2.268]	[-0.823]	[-0.877]	[-1.122]
Labor productivity		0.0271***	0.0174***	0.0174***	0.0173***	0.0178***	0.0202***	0.0199***	0.0175***
		(4.966)	(7.117)	(7.110)	(7.134)	(7.550)	(2.839)	(2.861)	(2.395)
		[6.168]	[16.34]	[16.37]	[16.21]	[17.86]	[7.502]	[7.239]	[5.299]
OPEC				0.00371	-0.00196	0.00748	-0.0296	0.0453	0.0452
				(0.0226)	(-0.0123)	(0.0471)	(-0.223)	(0.396)	(0.395)
				[0.0384]	[-0.0206]	[0.0871]	[-0.456]	[0.542]	[0.528]
Oil offshore					0.0389**	0.0435**	0.0454**	0.0445**	0.0283
					(0.568)	(0.651)	(0.685)	(0.661)	(0.411)
					[2.043]	[2.296]	[2.568]	[2.080]	[1.144]
Polity						-0.00549**	-0.00433**	-0.00431*	(-2.226)
						(-1.248)	(-1.042)	(-0.834)	
						[-3.088]	[-2.169]	[-1.966]	
Investment							0.00550***	0.00700***	0.00601***
							(1.286)	(1.464)	(1.281)
							[2.814]	[2.997]	[2.699]
Schooling								-0.00259	0.00540
								(-0.0529)	(0.107)
								[-0.0701]	[0.136]
Openness									0.00254**
									(2.042)
									[2.116]
Constant	8.042***	8.011***	7.796***	7.796***	7.787***	7.783***	7.599***	7.618***	7.540***
	(121.5)	(88.74)	(118.3)	(114.7)	(124.3)	(132.3)	(76.80)	(34.60)	(31.52)
	[53.97]	[66.97]	[411.4]	[357.2]	[387.4]	[395.0]	[264.8]	[55.74]	[45.34]
Period dummies	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	648	455	455	455	455	453	423	398	398
Number of countries	63	57	57	57	57	57	56	50	50
Ave obs per country	10.3	8	8	8	8	7.9	7.6	8	8
R^2 within	0.059	0.424	0.640	0.640	0.641	0.646	0.662	0.673	0.683

Notes: The dependent variable is (log) income per capita at start of five-year period. *Foreign Control* is the base outcome. All covariates except the OPEC dummy are lagged by one period. Estimations are fixed effects (within) panel estimations. T-statistics for robust country-clustered standard errors are in parentheses, and for Driscoll-Kraay standard errors in square brackets. Asterisks refer to Driscoll-Kraay standard errors.

Table 7: Oil control regimes and political regimes with Foreign Control as omitted category

	(1)	(2)	(3)
Partnership	0.0431	0.0644	0.0293
	(0.645)	(0.839)	(0.546)
	[1.146]	[1.485]	[0.769]
Domestic	0.00742	-0.113**	-0.148***
	(0.0968)	(-1.402)	(-1.979)
	[0.132]	[-2.098]	[-2.851]
Autocracy	0.218***		
	(2.149)		
	[3.887]		
Democracy		-0.0893*	
		(-1.256)	
		[-1.788]	
Anocracy			-0.0294
			(-0.482)
			[-0.463]
Partnership*political regime	-0.146***	-0.0140	0.0366
	(-1.768)	(-0.168)	(0.369)
	[-2.861]	[-0.246]	[0.695]
Domestic*political regime	-0.337***	0.0802	0.157*
	(-3.393)	(0.978)	(2.051)
	[-6.231]	[1.645]	[1.793]
Labor productivity	0.0168***	0.0173***	0.0172***
	(5.935)	(7.213)	(7.185)
	[19.24]	[16.79]	[16.80]
Constant	7.759***	7.814***	7.799***
	(105.2)	(103.2)	(124.2)
	[278.3]	[234.4]	[363.4]
Period dummies	yes	yes	yes
Observations	455	455	455
Number of countries	57	57	57
Ave obs per country	8	8	8
R^2 within	0.654	0.645	0.646

Notes: The dependent variable is (log) income per capita at start of five-year period. Oil control regime dummies are interacted with political regime dummies (*democracy*, *autocracy*, *anocracy*). *Foreign Control with political regime=0* is the base outcome. All covariates are lagged by one period. Estimations are fixed effects (within) panel estimations. T-statistics for robust country-clustered standard errors are in parentheses, and for Driscoll-Kraay standard errors in square brackets. Asterisks refer to Driscoll-Kraay standard errors.