Resource Nationalism – Limits to Foreign Direct Investment

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Despite a global trend toward the privatization of state assets, host governments are consolidating ownership over strategically important domestic oil and gas resources, effectively limiting corporate foreign direct investment. These findings are supported by an analysis of global reserve acquisitions for the period 2000 – 2006, a period which saw listed national oil companies (NOCs) acquire over 82% of their reserves domestically, compared to only 25% for commercial operators.

We also perform a regression analysis and find that political risk and reserve size are strongly related to state ownership retention, while the degree of state control is positively related to OPEC membership. Foreign direct investment is shown to be increasingly constrained to assets in low-risk developed countries or marginal oilfield assets.

1. INTRODUCTION

The recent wave of asset privatization has seen arguably the greatest transfer of ownership from the state to commercial entities [Bortolotti and Faccio, 2008]. Governments all over the world have sold or are selling large blocks of assets to the private sector. Yet, despite the large volume of privatization, recent studies by Bortolotti and Faccio [2008] and La Porta et al. [2002] have shown that post-privatization, the state still retains significant asset ownership and control stakes; an attribute we show to be especially prevalent in the oil and gas sector. This paper uses a global oil and gas deal data-set for the period 2000-2006 to indicate the extent to which National Oil Companies (NOCs) are dominating sector strategic asset acquisitions. Against this backdrop, we use a 2006 global oilfield ownership data-set to isolate the variables that underpin the growth in state control over oil and gas assets for the strategically important but often opaque resource sector.

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Understanding the determinants of foreign direct investment (FDI) in an economic era marked by oil price volatility and resource scarcity is of first order importance. As Ikenberry [2008] and Klare [2008] note, the future is likely to see a struggle for energy resources that will ignite geopolitical competition, limiting opportunities for resource sector FDI. Using the Organisation for Economic Co-operation and Development [OECD, 1999] definition of foreign direct investment, we suggest that resource sector specific attributes (ownership and location, see Stiglitz [2007]) enable the state to behave differently toward strategic oil and gas FDI than other asset classes (banks and financial services). We use the term strategic in the sense that actions are guided by a long term plan designed to achieve a particular goal, in oil and gas this generally involves security of supply, underpinned by exploration and production. In short, therefore, this paper aims at providing insights into specific resource sector attributes that underpin state asset control and corporate FDI for the oilfield assets that determine security of supply and production [Safarian, 1973].

Most finance research finds that state ownership retention increases in countries with higher political risk and less efficient legal frameworks. For example, Bortolotti and Faccio [2008] specifically find that governments tend to retain modest ownership positions in countries with strong legal systems but retain large control blockholdings in countries with weaker legal investor protection. A further complication raised by Jones [1984] study of economic nationalism suggests that when foreigners make large profits from oil belonging to the host nation, resentment and nationalist sentiment increases. As a consequence, we suggest that risky host governments are more likely to come under pressure to hold a larger share of assets for the benefit of their nation. Pressure for a greater share of state ownership of natural resources has certainly been a long-standing principle in Latin American countries since the early seventies (e.g. Venezuela, Peru [Furnish, 1971]).

In fact, the background to modern forms of resource conflict is rooted in the early 1970s, when the vast majority of commercially held oil reserves were nationalized. Ownership structures changed dramatically (from being centred around a few companies owning oil, creating a demand for it and managing a technical extraction knowledge and risk-based service) into powerful hydro-carbon producer states owning and exploiting their own reserves. Notable early examples of state ownership were: Venezuela, which nationalized reserves in the period in the period 1972 – 1976 [Jones, 1984, Makhija, 1993] and Saudi Aramco which was created in a series of state shareholding acquisitions (25 percent in 1973, a further 35 percent in 1974 and finally, full control in 1980 [Kesting, 1990]). Our findings highlight that commercial companies remain in direct competition with NOCs continuing to reduce corporate FDI over the period 2000 – 2006.

In emphasizing the strategic nature of oilfield assets, we show that state ownership retention increases with field size, with evidence of strong negative interaction between state ownership and the technical complexity of the field. In support of work by Stiglitz [2007] on resource nationalism, we also find a strong positive interaction between a country's OPEC membership, country risk

and state ownership of reserves. By contrast, corporate ownership opportunities are becoming limited to marginal assets in low risk non-OPEC countries. Our contribution is to add to work on oil and gas acquisitions in Asia by Paik et al. [2007] while our analysis of global ownership adds to, and is consistent with, the analysis of the effects of resource nationalism on oil and gas companies in the Middle east by Stevens [2008].

Our analysis of global oil and gas acquisition and ownership transaction data provides evidence of home acquisition bias for NOCs operating in resource-rich host countries. In summary, the dataset is used to argue that governments have identified the importance of retaining control and ownership in large strategic reserves. This realization by governments is manifested by NOC control that has a positive relationship with reserve size and country risk. This has important implications since if, as Marcel and Mitchell [2005] note, NOCs behave as profit-maximizing entities, it should make little difference if oil resources are acquired by a NOC, a domestic for-profit firm, or a foreign firm. For resource nationalism to matter, the acquisition of the resources by NOCs needs to materially affect equilibrium in the market.[1]

The question then is: does production of NOCs differ from that which is observed by foreign firms? Despite the view offered up by Marcel and Mitchell [2005] that producing country NOCs are behaving increasingly like integrated oil and gas companies views remain firmly split. In Russia for example, the politically motivated European gas supply disputes of 2005, 2007 and 2009, make it clear that the Russian state is not behaving as a oil major would. In fact, the political and economic powers of Gazprom were increased by the Duma in a March 2008 promulgation limiting FDI in the Russian strategic resource sector.[2] Consistent with Delios and Henisz [2003] our analysis of transactions finds that resource nationalism and weak political institutions pose constraints to FDI by international corporations, and, potentially to the supply of oil and gas from risky political regions.

We suggest that oil and gas corporate FDI looks set to be constrained to low risk countries and marginal, capital intensive or technical assets. For the period 2000-006, 82% of reserve acquisitions by host-country NOCs were domestic. By contrast, only 25% of the acquisitions by commercial operators were in their domestic sphere of operation. The home bias of NOC acquisitions is consistent with our 2006 cross-sectional ownership analysis. Host countries now hold over 72% of this important unlisted asset class, with the remaining 28% owned by commercial oilfield operators. Importantly, for countries without security of energy supply, reserve access is therefore a principle likely to continue to fundamentally shape global geopolitics as multinational companies and countries seek alliances to secure their ownership of strategic energy reserves.

1. This specific point was well made by an anonymous reviewer of this paper and greatly clarified the focus and importance of our findings.

2. InterfAX 26 March 2008

2. DATA AND METHODOLOGY

We use two data-sets in this paper, a transaction data-set (see subsection 2.1) which we use to illustrate the trend in corporate FDI for the period 2000-2006 and a cross section of global oilfield as at 2006 (see subsection 2.2). Both data-sets are commercially available from the Wood Mackenzie Corporate Analysis Tool and the Global Economic Model respectively. The transaction data-set is constructed using the commercially available Wood Mackenzie Corporate Analysis Tool for Acquisition Strategy Performance (ASP) as the primary database. Global ownership and reserve data are, in turn, available from the commercially available Global Economic model.

To limit data bias, data are hand-collected and updated quarterly by Wood Mackenzie specialist oil and gas research teams through interviews with commercial operators and state agents. Data are further cross referenced with all publicly available data. Oilfields covered in both data-sets in this study comprise those considered either commercial or technical; where commercial fields are in production, under development or will be under development within five years from 2006. Technical fields, on the other hand, are fields that have no immediate commercial interest or are not considered to be capable of being developed within the five years from 2006.

2.1 Transactions Dataset 2000-2006

Our global acquisition dataset comprises the 185 strategic resource asset acquisitions transacted by 14 state-owned oil companies and 22 commercial operators during the period 2000-2006. All 185 strategic acquisitions included in this study meet specific criteria. Our study of the dynamics underpinning acquisitions covers only material transactions; defined as reserve acquisitions valued above 50 million USD, where the transaction value is defined as nominal consideration paid by the acquiror excluding fees and expenses, consistent with [Fuller et al., 2002]. The nominal consideration for the acquired assets is collected from the ASP database as recorded on the acquisition announcement date. The announcement dates of the acquisitions have been collected from the Thomson One Banker Deal Announcement module.

Summary data presented in Table I are summarized from deal level data; we collect the country of listing for the acquiror, the country of where the acquired assets are located, the seller, country of listing or domicile, the amount of physical reserves attributable to each acquisition and detailed characteristics of each acquisition. We exclude deals performed by NOCs domiciled in OPEC countries, e.g. Saudi Aramco, Emirates National Oil Company, as they do not disclose acquisitions details. By 2006 the 36 companies included in this study held 29.96% of global oil and gas reserves with the remaining 70.04% owned by companies that did not have (or do not disclose) completed strategic asset acquisitions. Mergers of equivalent entities (as opposed to asset acquisitions, which is the focus of this

Table I. Sector Domestic and Foreign Acquisitions by State-owned Companies

Table I presents the summary of all deals transacted by 14 state-owned companies for the period 2000-2006. The column listing the companies is followed by the column that lists the number of acquisitions above 50 million USD each company transacted for the given period. Reserve Ownership column summarizes each company's holdings of oil and gas fields larger than 5 mmboe as at 2006. Acquired Reserves (mmboe) reflects the amount of physical reserves attributable to the acquisitions included in the study, followed by the percentage of physical reserves acquired as a fraction of reserve ownership as of 2006 for each acquiror. Acquired Domestic Reserves reflects the reserves attributable to domestic acquisitions followed by the column tabulating the percentage of domestic acquisitions as a fraction of total acquisitions for the period. The following two columns summarize reserves acquired through foreign direct investment (FDI). For example, 82.61% of the acquisitions made by state owned companies were domestic; therefore, the remaining 17.31% were direct foreign investments (FDI). The table also provides an insight into the nature of the assets acquired, specifically the asset type and reserve classification.

Company	N	Reserves Ownership 2006 (mmboe)	Acquired Reserves 2000-2006 (mmboe)	(%) of 2006 Reserve Ownership	Acquired Reserves 2000-2006 (mmboe)	Domestic (%) of Acquired Reserves	FDI 2000-2006 (mmboe)	(%) of Acquired Reserves	Asset Type	Reserve Classification
					State owned					
LUKoil	8	16952.07	7221.80	42.60%	6,905	95.61%	316.80	4.39%	Onshore	CO
Gazprom	4	52757.69	13689.27	25.95%	13689.27	100.00%	0.00	0.00%	On-/offshore	CG
Rosneft	5	31588.55	11175.11	35.38%	11175.11	100.00%	0.00	0.00%	Onshore	CO
TNK-BP	1	13347.94	176.00	1.32%	176.00	100.00%	0.00	0.00%	Onshore	CG
CNOOC	6	3237.40	1237.66	38.23%	42	3.39%	1195.66	96.61%	Offshore	CO
CNPC	7	3188.85	905.91	28.41%	0	0.00%	905.91	100.00%	Onshore	CO
Inpex	4	5896.61	1418.99	24.06%	356	25.09%	1062.99	74.91%	Mixed	CG
ONGC	7	7048.40	420.90	5.97%	4	0.95%	416.90	99.05%	Onshore	CO
Petronas	5	4425.03	1114.78	25.19%	0	0.00%	1114.78	100.00%	Offshore	LNG
Sinopec	6	6803.25	862.78	12.68%	0	0.00%	862.78	100.00%	Onshore	CO
Petrobras	1	15278.50	589.34	3.86%	0	0.00%	589.34	100.00%	Onshore	CG
Statoil	5	6161.93	3219.10	52.24%	2,572	79.90%	647.10	20.10%	Offshore	CO
Norsk-Hydro	3	3114.63	579.38	18.60%	281	48.50%	298.38	51.50%	Mixed	CO
Total	62	169800.85	42611.02	25.09%	35200.38	82.61%	7410.64	17.39%		

CO – conventional oil, CG – conventional gas, HO – heavy oil, OU – other unconventionals, LNG – liquified natural gas

Table II. Sector Domestic and Foreign Acquisitions by Commercial Companies

Table II presents the summary of all deals transacted by 22 commercial companies for the period 2000-2006. The column listing the companies is followed by the column that lists the number of acquisitions above 50 million USD each company transacted for the given period. Reserve Ownership column summarizes each company's holdings of oil and gas fields larger than 5 mmboe as at 2006. Acquired Reserves (mmboe) reflects the amount of physical reserves attributable to the acquisitions included in the study, followed by the percentage of physical reserves acquired as a fraction of reserve ownership as of 2006 for each acquiror. Acquired Domestic Reserves reflects the reserves attributable to domestic acquisitions followed by the column tabulating the percentage of domestic acquisitions as a fraction of total acquisitions for the period. The following two columns summarize reserves acquired through foreign direct investment (FDI). The table provides an insight into the nature of the assets acquired, specifically the asset type and reserve classification.

Company	N	Reserves Ownership 2006 (mmboe)	Acquired Reserves 2000-2006 (mmboe)	(%) of 2006 Reserve Ownership	Acquired Reserves 2000-2006 (mmboe)	Domestic (%) of Acquired Reserves	FDI 2000-2006 (mmboe)	(%) of Acquired Reserves	Asset Type	Reserve Classification
					Commercial					
BP	5	25721.43	11131.68	43.28%	29	0.26%	11102.68	99.74%	Mixed	CO
Chevron	2	17870.05	3118.13	17.45%	33	1.06%	3085.13	98.94%	Mixed	CG
ConocoPhillips	5	13475.68	5133.62	38.10%	2,618	51.00%	2515.62	49.00%	Mixed	CG
ENI	5	12880.42	1458.93	11.33%	0	0.00%	1458.93	100.00%	Mixed	CG
ExxonMobil	2	23959.48	291.57	1.22%	0	0.00%	291.57	100.00%	Offshore	CO
Shell	11	24104.42	2619.52	10.87%	0	0.00%	2619.52	100.00%	Mixed	CO
Total	8	20045.92	2511.19	12.53%	0	0.00%	2511.19	100.00%	On-/offshore	CO/HO
Hess	5	1914.28	1128.42	58.95%	93	8.24%	1035.42	91.76%	Offshore	LNG
Marathon	6	1598.06	638.95	39.98%	157	24.57%	481.95	75.43%	Onshore	OU
Murphy Oil	1	1395.38	10.20	0.73%	0	0.00%	10.20	100.00%	Onshore	HO
Occidental	4	2209.17	657.00	29.74%	657	100.00%	0.00	0.00%	Onshore	CO
Petrocanada	4	5215.89	1577.92	30.25%	914	57.92%	663.92	42.08%	Mixed	CO
Apache	11	1164.75	1033.75	88.75%	312	30.18%	721.75	69.82%	Offshore	CO
BG	8	772.22	528.05	68.38%	34	6.44%	494.05	93.56%	Offshore	CG
Nexen	3	2655.12	340.03	12.81%	0	0.00%	340.03	100.00%	Offshore	CO
Repsol	6	3054.81	1491.78	48.83%	0	0.00%	1491.78	100.00%	Offshore	CO/LNG

Table II. Sector Domestic and Foreign Acquisitions by Commercial Companies (continued)

Company	N	Reserves Ownership 2006 (mmboe)	Acquired Reserves 2000-2006 (mmboe)	(%) of 2006 Reserve Ownership	Acquired Reserves 2000-2006 (mmboe)	Domestic (%) of Acquired Reserves	FDI 2000-2006 (mmboe)	(%) of Acquired Reserves	Asset Type	Reserve Classification
					Commercial					
Talisman	8	1364.30	645.55	47.32%	109	16.88%	536.55	83.12%	Mixed	CO
Woodside	1	567.26	19.00	3.35%	0	0.00%	19.00	100.00%	Offshore	CG
Anadarko	6	1275.43	2427.34	190.32%	2,170	89.40%	257.34	10.60%	Onshore	CO
CNRL	7	292.00	813.92	278.74%	754	92.64%	59.92	7.36%	Onshore	CG
Devon	5	1512.69	2851.52	188.51%	1,839	64.49%	1012.52	35.51%	Onshore	CG
Encana	6	2760.17	558.80	20.24%	0	0.00%	558.80	100.00%	Onshore	UO
Pioneer	4	123.31	458.31	371.67%	458.31	100.00%	0.00	0.00%	Onshore	UO
Total	123	165932.26	41445.18	24.98%	10177.31	24.56%	31267.87	75.44%		

CO – conventional oil, CG – conventional gas, HO – heavy oil, OU – other unconventionals, LNG – liquified natural gas

paper) excluded from the study are Chevron/Texaco (16 October, 2000), Conoco/Phillips (18 November, 2001) and the Alberta Energy/Canadian Petroleum (27 January, 2002) merger to form EnCana. We include any asset transactions completed by either constituent company prior to their merger.

Table I presents the summary of all deals transacted by 14 state-owned companies and Table II for the 22 commercial operators for the period 2000-2006. Reserve Ownership summarizes each company's holdings of oil and gas fields larger than 5 mmboe as at 2006. Acquired Reserves (mmboe) reflects the amount of physical reserves attributable to strategic acquisitions included in the study, followed by the percentage of physical reserves acquired as a fraction of reserve ownership as of 2006 for each acquiror. Acquired Domestic Reserves reflects the reserves attributable to domestic acquisitions followed by the column tabulating the percentage of domestic acquisitions as a fraction of total acquisitions for the period. The following two columns summarize reserves acquired via FDI. The table also provides an insight into the nature of the assets acquired, specifically the asset type and reserve classification.

2.2 2006 Cross Sectional Reserve Ownership: Key Concepts and the Dataset

A granular analysis of 2006 global ownership data uses specific ownership variables of political risk, reserve size, and development status to demonstrate how these influence strategic reserve ownership retention by host NOCs. Tellingly, our results show that state ownership increases with country risk. Among investment grade (IG) countries, OPEC investment grade countries and Russia (also IG) are unique in having a preponderance of direct state reserve ownership. This feature of state ownership is also reflected in OPEC host countries, where 80-95% of domestic reserves are state owned compared to 35-58% in non-OPEC countries. BY comparison, commercial participants hold smaller stakes in reserves in OPEC countries with 4-19% average ownership in fields, (compared with 42-65% in non-OPEC host countries). Findings provide evidence in support of work on listed global asset classes by La Porta et al. [2002] and Bortolotti and Faccio [2008]; demonstrating that when country risk increases, state ownership increases.

We use the OECD [1999] definition of FDI; where FDI in the resource sector includes ownership of objects such as an oilfield or oil drilling rigs that operate within an economy for at least one year (if accounted for separately by commercial companies). This is considered to be direct investment in a notional foreign enterprize in a host country. Our definitions of ownership rely on cash-flow entitlement rather than voting rights. Ownership attributable to cash flow rights has previously been emphasized in studies by Faccio and Lang [2002] and Holderness [2007] and in oil and gas, ownership of cash flows is often commensurate to ownership in the field. In this study *Ownership* therefore is measured as the percentage of reserves remaining in the field attributable to company's holding. We examine the ownership of each company in the dataset. For example, if a company X owns 60% of company Y, which in turn owns 30% of field Z, then we

assume that company X owns 18% of field Z. Using an example from the dataset, Repsol-YPF owns 66% of company Pluspetrol, which owns 55% of Block 1-AB field in Peru, we posit that Repsol-YPF owns 36.3% of field Block 1-AB.

Our study expands on previous studies that use the definition of political risk comparable to the definition used in this paper. Durnev and Kim [2007] identify the importance of political risk effects on ownership structures of listed assets. We include sovereign rating (IG, NIG, Unrated), host-country's GDP, OPEC membership, reserve size, capital and operating expenditures, and development status of the field (onstream, probable development, under development, technical reserves) as explanatory variables, explained in detail in Table VI.

We examine the extent of state ownership in oilfield reserves and how the ownership structure varies with countries and field size. We also distinguish blockholdings defined as state ownership (SO) 25% of the field and above. Table III differentiates large fields from small, where large fields contain above 60 mmboe of remaining reserves. Our study uses only material oil field assets with a minimum of 5 million barrels of oil equivalent (mmboe) in remaining reserves. This lower limit to asset size enables us to overcome idiosyncracies associated with small oilfield assets previously identified by Kretzschmar and Moles [2006].

The global ownership analysis is based on a dataset of ownership structures (and technical attributes) for oilfields across 79 oil producing countries as at the year end 2006. Of the 5,005 global oilfields above 5 mmboe, we analyze ownership structure for 4,809 oilfields (see Figure 1); 196 oilfields are excluded as field ownership data is either closely held, opaque or not available. The ownership dataset is further subdivided into three categories based on the sovereign risk rating of a given host country in which fields are grouped into three categories and described in Table III: investment grade countries (ratings range from Baa3 to Aaa), non-investment grade countries (ratings range from Caa3 to Ba1) and unrated countries (for which Moody's country ratings are not provided).

Additionally, we differentiate between OPEC member countries and non-OPEC countries. We consider OPEC membership as at 2006, consistent with the ownership data. The above country and OPEC categories allow data characteristics to be described by six groups as shown in Table III. From 4,809 oilfields, the total amount of remaining global reserves is 1,120,438 mmboe, a combination of 904,982 mmbbl oil reserves and 1,224,180 bcf gas reserves.[3] Field size is differentiated by the amount of physical remaining oil and gas reserves, where large fields are those with oil and gas reserves greater than 60 mmboe [Kretzschmar and Moles, 2006].

We distinguish between two main categories of owners: *state* (host) and *commercial*. State includes any form of government involvement – direct state, domestic government, national oil companies and joint ventures between state and others. Joint ventures, where state ownership outweighs corporate participa-

3. Gas is converted from bcf to mmboe by industry standard conversion factor 0.125 – we accept that equivalence is a debatable point, but only use this conversion ratio where gas reserves may be considered commercial

Table III. Summary Statistics Global Reserve Ownership

Ownership data is classified by field location into non-OPEC countries and OPEC countries. Countries are grouped into investment grade, non-investment grade and unrated countries, based on sovereign ratings in 2006. Results are grouped into three panels – global reserves, state ownership in reserves and commercial ownership in reserves. We analyze the population of 5,005 oilfields with reserves in excess of 5 mmboe. 196 fields that do not have participant data are excluded. Global (%) is calculated by total reserves in each group divided by total global reserves (i.e. investment grade, 15.44% = 173,045 / 1,120,438). Average percentage ownership in fields is calculated by ownership in each field expressed as a percentage, multiplied by reserves at the field level, summed and then divided by total reserves in each group (i.e. sum of % ownership at field level in IG multiplied by reserves in the field, then divided by total reserves in IG).

State ownership and commercial ownership in panel B and C are analyzed based on field level information. State participation is summed up for each field (some fields have more than 1 NOC). We include state share in joint venture companies. The sum of ownership (Panel B and C) in each field is 100%.

State ownership in reserves is calculated as the sum of percentage state ownership of reserves in each field. State participation is present in 2,578 of the 4,809 oilfields. (This data is not reported in the table but is included in the chart), accounting for 802,393 mmboe. State ownership is low in most investment grade countries and is concentrated in OPEC and non-investment grade countries.

		Non-OPEC Countries			OPEC Countries		
	Total	Investment Grade	Non-Investment Grade	Unrated	Investment Grade	Non-Investment Grade	Unrated
Panel A: Global Reserves							
Countries	79	26	14	26	3	4	6
No. of oilfields	4809 (5005)	2431	467	423	273	202	1013
- Large fields	1207	637	99	51	68	104	248
- Small fields	3602	1794	368	372	205	98	765
Oil Reserves (mmbbl)	904982	269863	31192	15491	232115	175355	180967
Gas Reserves (bcf)	1224180	688734	40325	20038	180883	45602	248598
Total Reserves (mmboe)	1120438	391080	38289	19018	263950	183381	224720
Global (%)	100%	34.90%	3.42%	1.70%	23.56%	16.37%	20.06%
Panel B: State Ownership in Reserves							
Ownership (mmboe)	802393	173045	22086	6632	252683	166098	181850
Global (%)	71.61%	15.44%	1.97%	0.59%	22.55%	14.82%	16.23%
Average % Ownership in Fields		44.25%	57.68%	34.87%	95.73%	90.58%	80.92%
Panel C: Commercial Ownership in Reserves							
Ownership (mmboe)	318045	218035	16203	12386	11267	17284	42870
Global (%)	28.39%	19.46%	1.45%	1.11%	1.01%	1.54%	3.83%
Average % Ownership in Fields		55.75%	42.32%	65.13%	4.27%	9.42%	19.08%

tion, are treated as 100% state owned. Listed company reserves data are reported under strict conditions to the Securities and Exchange Commission while the majority of state reserves are simply stated and accepted without any definition or audit. These reserves statements have in the past changed dramatically (e.g. when they upgraded during the competition to justify OPEC quota allowances).

For fields with multiple state ownership stakes, the percentage of state ownership represents the sum of the stakes held directly by the state or its NOCs (i.e. countries like China have multiple NOCs). Similarly, percentage of state ownership of reserves represents the sum of state-owned proportions in each field. Of 4,809 oilfields, we find state participation in 2,578 oilfields, accounting for 802,393 mmboe or 71.61% of global reserves.

3. DESCRIPTIVE DATA ANALYSIS

3.1 Acquisition Transactions Analysis

With reference to the summary of the transactions data presented in Table I, we observe that the vast majority (82.61%) of the acquisitions transacted by host-country NOCs were domestic, demonstrating the home bias and dominance, with the balance of 17.39% being classified as effective FDI deals. This provides important background to the control consolidation observable in the sector.

By contrast, we observe that only 24.56% (see Table II) of the acquisitions by commercial operators were domestic with the remaining 75.44% of the reserves acquired via FDI. These acquisitions led to reserve ownership structures currently observed in the 2006 ownership dataset, where host-country NOCs own 71.61% of the world's reserves, restricting commercial operators' competition for the remaining 28.39% as shown in Table III Panels B and C.

3.2 Reserve Ownership Analysis

Holdings by commercial local oil companies, commercial foreign companies and integrated global companies are grouped into *commercial* ownership. In addition, we consider foreign National Oil Companies' ownership as commercial ownership.

Figure 1 clearly illustrates and compares the percentage of state and commercial ownership in Non OPEC and OPEC, IG, NIG and unrated countries. The percentage of state ownership in non-OPEC regions is demonstrated to have median values in the mid 20% and 50% ranges (investment grade and non-investment grade countries, respectively). Non OPEC state ownership is significantly below that for OPEC, which is around 80%. The exception to this trend is the average ownership in NIG countries where high ownership by commercial companies is explained by a large number of small fields with high average commercial ownership and only few large fields, where commercial ownership tends to be low in percentage terms (e.g. Indonesia).

Figure 1. Reserve Ownership Percentage Calculated at the Field Level

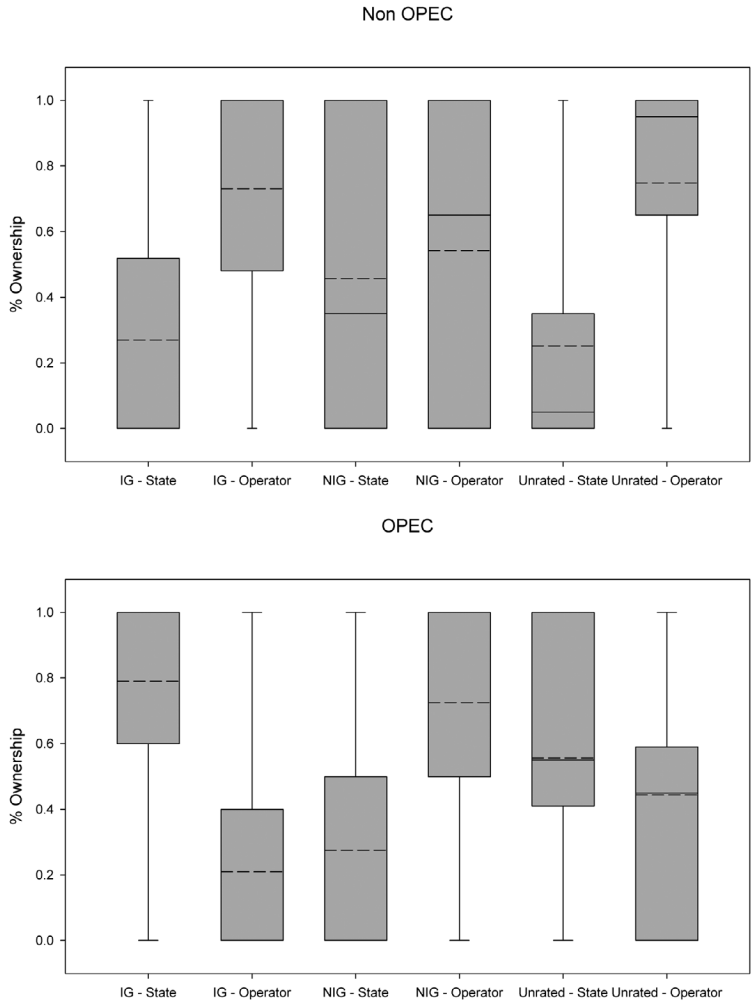

Figure 1 compares ownership percentage between IG and NIG, OPEC are demonstrated to have higher state participation in contrast to non-OPEC countries. The number of observations for IG fields and NIG (excluding OPEC) is 2,431 and 467, respectively. In OPEC, the number of observations for IG is 202, for NIG 273 (126 of which are in Indonesia and 81 in Ecuador – where only 8 of 81 are large assets). Number of observation for Unrated excluding (ex) OPEC observations is 423 and 1,013 for OPEC. The vertical axis shows the percentage of ownership in fields. The line in the bar represents the median. The mean of non-OPEC IG state ownership is around 30%, while NIG averages around 50% ownership. In OPEC, IG State is around 80% and NIG state ownsership is around 30%.

Table IV presents the summary of descriptive statistics of the ownership data for the population of material oilfields (above 5 mmboe) globally for all

Table IV. Summary Statistics of Field Level Ownership Data, Non-OPEC Countries

This table presents the summary of descriptive statistics for the field level data, for all fields located in non-OPEC countries. Each panel of the table summarizes the country groupings based on the sovereign ratings, where Panel A presents the summary of IG country data, Panel B and Panel C summarize NIG and Unrated countries' data, respectively.

	State			Commercial		
	All	**Large[a]**	**Small[b]**	**All**	**Large[a]**	**Small[b]**
Panel A: Investment Grade						
Mean	26.99%	27.55%	26.79%	73.01%	72.45%	73.21%
Standard Error	0.80%	1.62%	0.92%	0.80%	1.62%	0.92%
Median	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%
Mode	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%
Standard Deviation	39.51%	40.78%	39.06%	39.51%	40.78%	39.06%
Sample Variance	15.61%	16.63%	15.26%	15.61%	16.63%	15.26%
Kurtosis	-0.69	-0.84	-0.63	-0.69	-0.84	-0.63
Skewness	1.02	0.98	1.03	-1.02	-0.98	-1.03
N	2431	637	1794	2431	637	1794
Panel B: Non-Investment Grade						
Mean	45.74%	53.02%	43.79%	54.26%	46.98%	56.21%
Standard Error	2.09%	4.47%	2.35%	2.09%	4.47%	2.35%
Median	35.00%	50.00%	25.00%	65.00%	50.00%	75.00%
Mode	0.00%	100.00%	0.00%	100.00%	0.00%	100.00%
Standard Deviation	45.11%	44.46%	45.15%	45.11%	44.46%	45.15%
Sample Variance	20.35%	19.77%	20.38%	20.35%	19.77%	20.38%
Kurtosis	-1.78	-1.79	-1.75	-1.78	-1.79	-1.75
Skewness	0.21	-0.08	0.29	-0.21	0.08	-0.29
N	467	99	368	467	99	368
Panel C: Unrated						
Mean	25.21%	28.36%	24.77%	74.79%	71.64%	75.23%
Standard Error	1.79%	5.34%	1.90%	1.79%	5.34%	1.90%
Median	5.00%	12.00%	5.00%	95.00%	88.00%	95.00%
Mode	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%
Standard Deviation	36.86%	38.14%	36.71%	36.86%	38.14%	36.71%
Sample Variance	13.59%	14.55%	13.48%	13.59%	14.55%	13.48%
Kurtosis	0.09	-0.23	0.16	0.09	-0.23	0.16
Skewness	1.33	1.21	1.36	-1.33	-1.21	-1.36
N	423	51	372	423	51	372

a. Fields with total remaining reserves >60mmboe
b. Fields with total remaining reserves <60mmboe

fields located in non-OPEC countries. Similarly, Table V presents the summary of the OPEC member countries. The population data is non-normal and is positively skewed for the state ownership in non-OPEC countries, whereas the data is negatively skewed for commercial ownership in those countries, suggesting that

there are few cases of very high state ownership in fields. By contrast, in OPEC countries field level state ownership data is negatively skewed, while commercial ownership demonstrates positive skewness. Most of the ownership data distribution is platykurtic (negative kurtosis), mainly explained by wide variations in ownership forms and the consequent fact that extreme ownership normally takes the values of 0% or 100%, this results in a very low probability of ownership data being normally distributed around the mean.

3.2 Regression Analysis

In order to provide robust insights into what underpins trends in the oil and gas sector, we undertake a regression analysis, seeking to understand four important questions. Specifically, we examine whether state ownership increases with country risk, whether state participation in assets increases with OPEC membership, if state stakeholdings increase with asset (field) size and finally whether state control decreases with capital and knowledge intensity.

3.2.1 Model and Variables Definitions

The explanatory variables included in the analysis are informed by the two main questions that underpin our research design. We are interested in the characteristics that underpin higher state ownership of reserves. We use granular field level data to examine how asset level characteristics influence state ownership of reserves. Hence, similar to Bortolotti and Faccio [2008] and La Porta et al. [2002], we use country-specific and asset-specific explanatory variables to identify the relation between state ownership and country risk, country wealth, and individual field attributes. These data are used to formulate and examine the following hypotheses.

Hypothesis 1: *State ownership of reserves increases with country risk.*

Hypothesis 1 is rooted on previous studies of ownership and ownership concentration of *listed* assets (e.g. Holderness [2007], La Porta et al. [2002], Durnev and Kim [2007]), where studies find that ownership is more concentrated and often in the state's hands in risky countries with low investor protection.

Hypothesis 2: *State ownership of reserves increases with OPEC membership*

For Hypothesis 2 we have regard to the historical development of the oil and gas sector. Stevens [2008] emphasizes the role of the state in the formation of oil and gas sector for OPEC member countries. In fact OPEC's June 1968 Declaratory Statement of Petroleum Policy in Member Countries baldly entitled governments to acquire "reasonable participation on the grounds of the principle of changing circumstances" (Seymour [1980], p. 219). A statement that specifically excluded national private interests in the sector [Mommer, 1998]. A recent dataset allows this study to test whether the state in OPEC countries has in fact reached a level significantly higher than in other producer states. The limitation

Table V. Summary Statistics of Field Level Ownership Data, OPEC Countries

This table presents the summary of descriptive statistics for the field level data, for all fields located in OPEC member countries. Each panel of the table summarizes the country groupings based on the sovereign ratings, where Panel A presents the summary of IG country data, Panel B and Panel C summarize NIG and Unrated countries' data, respectively.

	State			Commercial		
	All	**Large[a]**	**Small[b]**	**All**	**Large[a]**	**Small[b]**
Panel A: Investment Grade						
Mean	78.99%	87.42%	70.04%	21.01%	12.58%	29.96%
Standard Error	2.38%	2.79%	3.70%	2.38%	2.79%	3.70%
Median	100.00%	100.00%	88.00%	0.00%	0.00%	12.00%
Mode	100.00%	100.00%	100.00%	0.00%	0.00%	0.00%
Standard Deviation	33.76%	28.45%	36.68%	33.76%	28.45%	36.68%
Sample Variance	11.40%	8.09%	13.45%	11.40%	8.09%	13.45%
Kurtosis	0.92	4.40	-0.38	0.92	4.40	-0.38
Skewness	-1.49	-2.34	-0.97	1.49	2.34	0.97
N	202	104	98	202	104	98
Panel B: Non-Investment Grade						
Mean	27.56%	41.82%	22.83%	72.44%	58.18%	77.17%
Standard Error	2.53%	5.64%	2.73%	2.53%	5.64%	2.73%
Median	0.00%	10.00%	0.00%	100.00%	90.00%	100.00%
Mode	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%
Standard Deviation	41.82%	46.50%	39.13%	41.82%	46.50%	39.13%
Sample Variance	17.49%	21.63%	15.32%	17.49%	21.63%	15.32%
Kurtosis	-0.78	-1.78	-0.06	-0.78	-1.78	-0.06
Skewness	1.03	0.38	1.32	-1.03	-0.38	-1.32
N	273	68	205	273	68	205
Panel C: Unrated						
Mean	55.60%	66.11%	52.19%	44.40%	33.89%	47.81%
Standard Error	1.07%	2.61%	1.12%	1.07%	2.61%	1.12%
Median	55.00%	100.00%	55.00%	45.00%	0.00%	45.00%
Mode	100.00%	100.00%	60.00%	0.00%	0.00%	40.00%
Standard Deviation	34.18%	41.15%	30.87%	34.18%	41.15%	30.87%
Sample Variance	11.69%	16.93%	9.53%	11.69%	16.93%	9.53%
Kurtosis	-0.93	-1.30	-0.53	-0.93	-1.30	-0.53
Skewness	-0.24	-0.63	-0.22	0.24	0.63	0.22
N	1013	248	765	1013	248	765

a. Fields with total remaining reserves >60mmboe
b. Fields with total remaining reserves <60mmboe

that high state ownership puts on foreign direct investment in the oil and gas sector has previously been proposed in a discussion of a formation of NOCs in the book by Hartshorn [1993]. He suggests that nationalizations did not necessarily occur because reserves were privately owned but because they were owned by foreign companies.

The above two hypotheses deal with country level characteristics. With regards to the field level characteristics, we emphasize size of the asset and the capital intensity by testing the following two hypotheses:

Hypothesis 3: *State ownership increases with asset (field) size.*

With the knowledge that the large strategic fields especially in the Middle East were discovered by Integrated Majors Stevens [2008], but were nationalized by the state, we suggest that state ownership in large strategic fields is higher than in smaller and `less strategic fields'.

Hypothesis 4: *State ownership retention decreases with capital and knowledge intensity.*

Hypothesis 4 aims to test the very early argument by Vernon [1971] stating that the state's bargaining strength with companies is inversely proportional to the scale and technological complexity of the industry concerned. This implies that host state will be less reluctant to foreign direct investment, and furthermore will try to attract more foreign investment especially in terms of technological expertise in complex fields, therefore limiting its (state's) ownership. Capital and technological intensity is controlled by measuring the capital expenditure and the amount of remaining technical reserves in the field, defined further in variable definitions and summarized in Table VI.

We use linear regression with OLS estimates to investigate the effect of a selection of ten independent variables (X_1,¼,... X_{10}) on SO. We acknowledge that despite the limitations in explanatory power of the regression tests due to non-normality of the dataset, the tests are used to support the descriptive analysis of the population data. The dependent variable SO reflects the state ownership percentage of each field's reserves as a fraction of total remaining reserves in the given field. Country level characteristic variables control for a country's sovereign risk, country wealth and OPEC membership via the following variables. Sovereign ratings in the model enable us to link country risk to state ownership. Countries are grouped into investment grade (X_1) and unrated (X_2) categories with binary variables allocated accordingly. To limit collinearity, we do not control for non-investment grade countries, the group with the smallest number of observations. Furthermore, we find an insignificant correlation coefficient between non-investment grade and state ownership. As a result, non-investment grade sovereign rating sets the baseline for the constant. The effect of OPEC membership (X_3) on state ownership is modeled by a binary variable dependent on membership status.

Quantitative independent variables include the natural log transformations of remaining reserves in mmboe (X_4) controlling for the asset size; capital intensity of the domestic investment or an FDI, a measure informed by one of the earlier studies of FDI flows by Pugel [1981], is proxied by capital expenditures (CAPEX) in US$M ($X_5$). We additionally control for operational complexity of the investment by including the natural log of operational expenditures (ln(OPEX)) in US$M ($X_6$) as an independent variable. These asset level variables

Table VI. Variable Definitions

This table illustrates explanatory variables used in the determination of State participation in oilfields. Global oilfield Data are updated annually and are commercially available from Energy Research House – Wood Mackenzie. Data are typically relied on by all oil majors, investment and commercial banks.

Variable	Description
Country characteristics	
- Investment Grade	Dummy variable that equals one if the field is located in an investment grade country (sovereign rating is between Baa3 and Aaa) and zero otherwise. Metric used to isolate political risk, consistent with the concept of country risk by La Porta et al. [1999]. *Source: Government Bond Ratings in Foreign currency, Moody's Sovereign ratings summary issued in June, 2006.*
- Non-Investment Grade	Dummy variable that equals one if the field is located in a non-investment grade country (sovereign rating is between Caa3 and Ba1) and zero otherwise. Metric used to isolate political risk, consistent with the concept of country risk by La Porta et al. [1999]. *Source: Same as above.*
- Unrated	Dummy variable that equals one if the field is located in a country that is not rated by Moody's and zero otherwise. Metric used to isolate political risk, consistent with the concept of country risk by La Porta et al. [1999]. *Source: Same as above.*
ln (GDP)	The natural log of country's Gross Domestic Product per Capita to proxy the development stage of the economy, measure informed by previous theoretical and empirical studies of FDI flows (e.g. Sethi et al. [2003]). *Source:Thomson Financial Datastream*
OPEC Membership	Dummy variable that equals one if the field locates in an OPEC country and zero otherwise. *Source: www.opec.org.*
Field characteristics	
Ln (Reserves)	The natural logarithm of remaining oil and gas reserves in mmboe, a unique measure we use to isolate the effect of asset size on state ownership. We use a log transformation to mitigate the extreme observations in reserve size. *Source: Wood Mackenzie ownership data as of 2005.*
Ln (Capex)	The natural logarithm of capital expenditures in millions US dollars, variable informed by prior ownership studies (e.g. Holderness [2003]), in this study used as control for the capital intensity [Pugel, 1981] of either a domestic investment or an FDI. We use log transformation to mitigate the extreme observations in reserve. *Source: Financial statements of the companies.*
Ln (Opex)	The natural logarithm of operational expenditures in millions US dollars. *Same as above.*
Onstream	Dummy variable equals one if the field is onstream and zero otherwise. *Source: Wood Mackenzie reserve and ownership data as of 2005.*
Probable development	Dummy variable equals one if the field is probably developed and zero otherwise. *Same as above.*
Under development	Dummy variable equals one if the field is under development and zero otherwise. *Same as above.*
Technical Reserves	Dummy variable equals one if the field contains technical reserves and zero otherwise. Variable used to control for the technical complexity and knowledge intensity of the field. *Same as above.*

are informed by previous ownership studies of listed assets in the U.S. by Holderness [2003] and determinants of FDI by Pugel [1981] and Sethi et al. [2003]. Log transformations of the above quantitative variables harmonize different scales, reduce variance and improve explanatory power, we nevertheless include the results of the regressions run with actual values of remaining reserves, CAPEX and OPEX in the Appendix. The development status of the field is described by four binary variables: onstream (X_7), probable development (X_8), under development (X_9) and technical reserves (X_{10}), which add unique insights to studies in resource sector ownership. Variable definitions and sources are presented in Table VI.

Descriptive statistics for the quantitative variables used for the regression analysis are presented in Table VII.

3.2.2 Parameter Estimation and Results

Table VIII illustrates the regression estimates of five different regression models with the percentage of state ownership SO as a dependent variable. Models 1 to 4 represent restricted versions of the base Model 5 where the coefficients β_3 to β_{10} are either set to zero or estimated. All regression estimates are baselined with reference to non-investment grade sovereign ratings of each oilfield's host country. Corresponding robustness tests using an alternative GDP metric as a country risk measure are shown in Table IX.

Results for Model 1 show significant coefficients for the two independent qualitative variables controlling for the country risk; investment grade sovereign ratings (X_1) and unrated sovereigns (X_2). For low risk investment grade host countries with higher level of investor protection, we observe a significantly negative effect on SO. By contrast, unrated sovereigns exhibit a positive and significant effect on state ownership. The effect of non-investment grade ratings on state ownership as described by the constant, which is also significant for Model 1. Model 1 therefore establishes a significant inverse link between country ratings and state participation, suggesting, that state ownership increases with increasing country risk, constraining corporate inward FDI to low-risk developed countries. These results show limited support to previous studies of the broad listed asset class by Bortolotti and Faccio [2008] and state ownership in the banking sector by La Porta et al. [2002].

Including host country OPEC membership (X_3) as a third qualitative variable in Model 2 yields a significant positive effect on SO, which outweighs the effect of the country risk rating. Correlation analysis indicates a negative correlation of X_1 to SO of -0.157 and a positive correlation of X_3 to SO of 0.27. X_1 itself is strongly negatively correlated with X_3 (-0.55).

Addition of the reserve size variable Ln(Res) (X_4) in Model 3, yields a positive significance for the reserve size coefficient. Consistent with Model 2, the coefficients for X_3 remains significant. In line with our ex-ante expectations and evidence provided by Kretzschmar [2007], reserve size is demonstrated to be a significant driver of state ownership. Comparing R^2 for Models 1 to 5 shows an

Table VII. Descriptive Statistics – Quantitative Variables

This table illustrates the summary of the descriptive statistics for the quantitative variables estimated in the regression analyses. We use percentage of state ownership in a given field as a dependent variable SO. We use the natural logarithm of a country's GDP per capita to control for the country's wealth. The natural logarithm of remaining physical reserves in each field is used to control for the asset size. The natural logs of capital expenditure and operational expenditure for each field are used to control for the complexity of the field.

Statistic	State ownership	Ln(GDP)	Ln(Res)	Ln(Capex)	Ln(Opex)
No. of observations	4809	4809	4809	4809	4809
Minimum	0.000	0.000	-1.044	0.000	0.000
Maximum	1.000	11.070	11.912	11.767	12.465
Range	1.000	11.070	12.956	11.767	12.465
1st Quartile	0.000	7.444	0.000	0.000	0.000
Median	0.125	8.526	2.409	0.000	0.000
3rd Quartile	0.757	9.504	4.120	4.511	4.973
Mean	0.369	8.510	2.509	1.799	1.911
Variance	0.172	1.983	5.285	8.853	9.858
Standard deviation	0.415	1.408	2.299	2.975	3.140
Variation coefficient	1.124	0.166	0.916	1.654	1.643
Skewness (Pearson)	0.530	-0.005	0.498	1.209	1.179
Skewness (Fisher)	0.530	-0.005	0.498	1.209	1.180
Skewness (Bowley)	0.670	-0.050	-0.170	1.000	1.000
Kurtosis (Pearson)	-1.398	0.132	-0.587	-0.196	-0.278
Kurtosis (Fisher)	-1.398	0.133	-0.586	-0.195	-0.277
Standard error of the mean	0.006	0.020	0.033	0.043	0.045
Lower bound on mean (95%)	0.357	8.470	2.444	1.715	1.823
Upper bound on mean (95%)	0.381	8.549	2.574	1.883	2.000
Standard error(Skewness (Fisher))	0.035	0.035	0.035	0.035	0.035
Standard error(Kurtosis (Fisher))	0.071	0.071	0.071	0.071	0.071
Mean absolute deviation	0.380	1.101	1.940	2.576	2.737
Median absolute deviation	0.125	1.038	2.409	0.000	0.000

increase in explanatory power for each variable added to the model.

The field level variable controlling for the capital intensity of the investment, the natural logarithm of capital expenditure (X_5), is shown to have a negative and significant effect on state ownership in Model 4, providing evidence of a link between high capital expenditures and a lower degree of state ownership. For complex fields requiring high capital investments, host states prefer to engage knowledge and capital rich commercial operators, therefore welcoming commer-

cial FDI. The required expertise and resources to develop complex reservoirs, for example deep water fields in the Gulf of Mexico or the North Sea, generally lies with major international commercial companies. Commercial companies appear to consider more capital and knowledge intensive opportunities. Operating expenditures (X_6) in Model 4 show some positive effect on the percentage of state ownership, however, they are not significant in an unrestricted Model 5. The remaining field status variables (X_7 to X_9) are insignificant.

3.2.3 Robustness Tests

While sovereign ratings, both investment grade and unrated, have shown strong significant effects on state reserve ownership in Model 1 results and weak significance in Model 4, they are not significant when replicating calculations for the other three models.

The effect of OPEC membership in the linear Model 2 outweighs sovereign ratings. Therefore, by including OPEC membership, the significance of the investment grade and unrated group are reduced. Notwithstanding interesting insights, the explanatory power is somewhat limited based on the use of dummy variables to accurately predict a quantitative variable.

The use of GDP per capita to represent a country's development status as a factor determining FDI is informed by the previous studies focused on FDI flows, which include GNP (e.g. Sethi et al. [2003]) or GDP (e.g. Dunning [1998], Kobrin [1976], Root and Ahmed [1978]). Likewise, we therefore test our findings for robustness and replace sovereign ratings with the logarithmic transformation of GDP per capita. High correlation greater than 0.5 between GDP per capita and sovereign ratings suggests an independent estimation of the models may be necessary. Factor loadings are described in Table IX and prove to be robust when compared to the estimates in Tables VIII. Coefficients for OPEX (X_6) and field status (X_7,...,X_9) are insignificant and consistent with the results obtained for sovereign ratings as a country risk proxy. Replacing sovereign ratings with GDP per capita leads to marginally higher R^2. We attribute this effect to the different characteristics of the two proxies. The logarithmic transformation of GDP per capita is represented by a quantitative variable, whereas sovereign ratings are modeled by a binary explanatory variable. The negative effect of higher GDP on state ownership suggests a more favorable environment for FDI in reserves by commercial operators in developed countries with high GDP, supporting studies that mostly find positive interaction between GDP, GNP or similar variables in FDI inflow (e.g. Kobrin [1976], Root and Ahmed [1978]).

Table VIII. Regressions Analysis

This table illustrates linear regression analysis with percentage of state ownership SO as the dependent variable. Parameters are estimated for the population of 4,809 oilfields at the individual field. `Investment Grade' sovereign ratings baseline the independent variables. Models 1 to 4 represent restricted versions of the base Model 5 where the coefficients β_1 to β_{10} are either set to zero or estimated. Parameter significance at a 90% level is indicated by *, at a 95% level by **, and at a 99% level by *** respectively; *p*-values are quoted in parentheses.

		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept		0.386***	0.525***	0.513***	0.469***	1.712***
		(19.149)	(24.213)	(22.175)	(20.467)	(1.469)
Dummy IG	X_1	-0.081***	-0.011	-0.014	-0.028*	-0.017
		(-4.735)	(-0.642)	(-0.821)	(-1.653)	(-0.986)
Dummy Unrated	X_2	0.076***	-0.004	-0.003	-0.021	-0.003
		(4.112)	(-0.210)	(-0.185)	(-1.135)	(-0.183)
Dummy OPEC	X_3		0.238***	0.236***	0.203***	0.200***
			(15.267)	(15.080)	(13.044)	(13.006)
Ln(Res)	X_4			0.012*	0.028***	0.041***
				(1.617)	(9.275)	(12.309)
Ln(Capex)	X_5				-0.057***	-0.059***
					(-3.823)	(-3.946)
Ln(Opex)	X_6				0.023*	0.009
					(1.613)	(0.656)
Onstream	X_7					0.472
						(1.215)
Probable Development	X_8					0.426
						(1.095)
Under Development	X_9					0.415
						(1.067)
Technical Reserves	X_{10}					0.330
						(0.850)
Number of observations		4809	4809	4809	4809	4809
R^2		0.028	0.073	0.073	0.111	0.127
Adjusted R^2		0.028	0.072	0.073	0.110	0.125

Table IX. Regressions Analysis – GDP

This table illustrates linear regression analysis with percentage of state ownership SO as the dependent variable. Parameters are estimated for the population of 4,809 oilfields at the individual field. `Investment Grade' sovereign ratings baseline the independent variables. Models 1 to 4 represent restricted versions of the base Model 5 where the coefficients β_1 to β_9 are either set to zero or estimated. Parameter significance at a 90% level is indicated by *, at a 95% level by **, and at a 99% level by *** respectively; *p*-values are quoted in parentheses.

		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept		0.892***	0.830***	0.826***	0.770***	2.089***
		(24.886)	(23.553)	(23.448)	(22.096)	(1.802)
Ln(GDP)	X_1	-0.061***	-0.038***	-0.040***	-0.035***	-0.032***
		(-14.787)	(-8.712)	(-9.011)	(-8.203)	(-7.508)
Dummy OPEC	X_2		0.201***	0.200***	0.170***	0.174***
			(15.195)	(15.065)	(12.790)	(13.164)
Ln(Res)	X_3			0.007***	0.030***	0.042***
				(2.670)	(9.894)	(12.679)
Ln(Capex)	X_4				-0.047***	-0.049***
					(-3.168)	(-3.321)
Ln(Opex)	X_5				0.015	0.002
					(1.036)	(0.153)
Onstream	X_6					0.506
						(1.311)
Probable Development	X_7					0.457
						(1.182)
Under Development	X_8					0.460
						(1.190)
Technical Reserves	X_9					0.373
						(0.966)
Number of observations		4809	4809	4809	4809	4809
R^2		0.044	0.087	0.089	0.122	0.137
Adjusted R^2		0.043	0.087	0.088	0.122	0.135

4. CONCLUSION

Important evidence is provided that the future of global energy extraction and production is likely to be characterized by barriers to commercial operators. We suggest that this will occur concurrent with ownership concentration in risky oil producing countries. A direct and strong relationship is established between country risk profile and state ownership of strategic oil and gas resources. For four specific questions examined; global data is used to conclude that state ownership of strategic oilfield assets increases with country risk, OPEC membership, asset (field) size and decreases with capital and knowledge intensity.

We differentiate OPEC from non-OPEC countries, suggesting that in the latter, state ownership increases as country risk increases. By contrast, OPEC cartel members and Russia are unique in that, notwithstanding investment rating, the state dominates reserve ownership with 80-95% of domestic reserves. Findings suggest that commercial entities seeking to increase ownership of strategic resources (especially in large fields) will need to form alliances with high risk oil producing sovereigns. This pattern is likely to play out globally as commercial producers and NOCs seek secure access to reserve replacement. For corporates, this strategy is ironically likely to increase their country and political risk exposures – and therefore project discount rates. As result, foreign firms may actually be inclined to produce as fast as possible if a future high-risk environment has the effect of raising project risks.

The structure and sustainable form that future strategic geopolitical alliances will take now seems clear; oil producing states will consolidate their control of strategic oilfield assets. The commodity asset class has moved centre-stage globally and limited resource access is redefining geopolitical market structures; identifying the importance of strategic alliances. Consistent with studies that link unstable legal and regulatory environments with ownership concentration [Durnev and Kim, 2005, Durnev and Kim, 2007] we find that in the oil and gas sector, state ownership concentration increases with political and legal risk. Findings for the sector have broad relevance to understanding the political risks for future security of supply.

5. APPENDIX

Table X. Regressions Analysis

This table illustrates linear regression analysis with percentage of state ownership SO as the dependent variable. Parameters are estimated for the population of 4,809 oilfields at the individual field. `Investment Grade' sovereign ratings baseline the independent variables. Models 1 to 4 represent restricted versions of the base Model 5 where the coefficients b1 to b10 are either set to zero or estimated. Parameter significance at a 90% level is indicated by *, at a 95% level by **, and at a 99% level by *** respectively; *p*-values are quoted in parentheses.

		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept		0.386***	0.525***	0.521***	0.522***	1.380
		(19.149)	(24.213)	(24.036)	(24.031)	(1.152)
Dummy IG	X_1	-0.081***	-0.011	-0.012	-0.012	-0.012
		(-4.735)	(-0.642)	(-0.705)	(-0.716)	(-0.699)
Dummy Unrated	X_2	0.076***	-0.004	-0.001	-0.001	-0.001
		(4.112)	(-0.210)	(-0.049)	(-0.050)	(-0.037)
Dummy OPEC	X_3		0.238***	0.233***	0.233***	0.232***
			(15.267)	(14.905)	(14.923)	(14.765)
Remaining reserves	X_4			0.000***	0.000***	0.000***
				(4.320)	(4.128)	(4.133)
Total Capex (US$m)	X_5				0.000	0.000
					(-1.251)	(-1.239)
Total Opex (US$m)	X_6				0.000	0.000
					(1.386)	(1.418)
Onstream	X_7					0.303
						(0.759)
Probable Development	X_8					0.295
						(0.739)
Under Development	X_9					0.256
						(0.640)
Technical Reserves	X_{10}					0.306
						(0.768)
Number of observations		4809	4809	4809	4809	4809
R^2		0.028	0.073	0.077	0.077	0.078
Adjusted R^2		0.028	0.072	0.076	0.076	0.076

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