

Massive and Misunderstood Data-Driven Insights into National Oil Companies

Patrick R. P. Heller and David Mihalyi

APRIL 2019



Contents

EXECUTIVE SUMMARY	1
I. UNDER-ANALYZED BEHEMOTHS.....	6
II. THE NATIONAL OIL COMPANY DATABASE	10
III. SIZE AND IMPACT OF NATIONAL OIL COMPANIES	15
IV. BENCHMARKING NATIONAL OIL COMPANIES BY VALUE ADDITION.....	29
V. TRANSPARENCY AND NATIONAL OIL COMPANY REPORTING.....	54
VI. CONCLUSIONS AND STEPS FOR FURTHER RESEARCH	61
APPENDIX 1. NOCs IN NRGi'S NATIONAL OIL COMPANY DATABASE.....	62
APPENDIX 2. CHANGES IN NOC ECONOMIC DATA AS REVENUES CHANGED.....	66

Key messages

- National oil companies (NOCs) produce the majority of the world's oil and gas. They dominate the production landscape in some of the world's most oil-rich countries, including Saudi Arabia, Mexico, Venezuela and Iran, and play a central role in the oil and gas sector in many emerging producers. In 2017, NOCs that published data on their assets reported combined assets of \$3.1 trillion.
- At least 25 countries are "NOC-dependent," meaning that the national oil company collects revenues equivalent to more than 20 percent of all government revenues. The fiscal health of many countries – and governments' ability to use oil revenues to finance development – depend heavily on how well the NOC is run, how much revenue it is required to transfer to the state, and the quality of its spending.
- Many NOCs carry big debts, sometimes as much as 10 or even 20 percent of their countries' GDP. Several NOCs have required multi-billion-dollar government bail-outs in recent years, becoming a costly drain on public finances.
- Sixty-two percent of NOCs exhibit "weak," "poor" or "failing" performance on public transparency, as measured by the Resource Governance Index. International transparency actors should promote better NOC reporting on expenditures, transfers to the government and the breakdown of oil and gas production from different sources. NOCs and their governments should develop key performance indicators based clear goals, and benchmark rigorously.
- NRGi's National Oil Company Database, available at www.nationaloilcompanydata.org, provides the largest set of open data on NOC production, revenues, spending and transfers to government in the world, with more than 70,000 data points from 71 NOCs worldwide from 2011 to 2017.

Executive summary

National oil companies (NOCs) produce the majority of the world's oil and gas, pumping out an estimated 85 million barrels of oil equivalent per day. Within their home countries, NOCs influence the degree to which billions of people benefit (or suffer) from their countries' hydrocarbon assets. Many of these companies manage multi-billion-dollar portfolios of public assets, execute complex projects across their territories and at sea, employ citizens in the tens or hundreds of thousands, and perform a range of public services from providing energy to building infrastructure.

Despite their importance, NOCs are poorly understood thanks to weak and uneven reporting, sparse research, and an absence of publicly available comparative data. Without solid information, governments, oversight bodies and market players struggle to assess NOC performance and develop strategies for how these influential entities can generate greater benefits for citizens.

To help address this gap, Natural Resource Governance Institute (NRGI) assembled a database on NOC production, revenue generation, fiscal transfers to the state, and operational and financial performance that covers 71 companies headquartered in 61 countries worldwide, from 2011 to 2017. The database resides at www.nationaloilcompanydata.org.

NOCs are giants, managing larger portfolios and collecting more public revenue than was previously understood.

NOCs are massive. This basic fact has been known by oil-watchers for some time, but a historical lack of consistent and comparative data has made it difficult to fully understand their impact on their home economies. Our data paint a more thorough picture of the scale and impact of NOCs.

NOCs particularly dominate production within their borders. “Domestic NOCs”—which produce oil and gas largely in their home countries—were responsible for 76 percent of their countries' total production over the course of our data period. In some major producers like Saudi Arabia, Kuwait and Mexico, NOCs were responsible for almost 100 percent of production. Some “internationalized NOCs”—such as Malaysia's Petronas and several large NOCs based in China—have taken their show on the road, and are supplementing oil and gas production at home with ambitious exploration and production abroad. This underscores that effective governance of the oil sector is impossible without strategic and accountable management of NOCs.

NOCs collect huge flows of public revenues, making them critical players in the public financial management of their home countries. The International Monetary Fund defines a country as *oil-dependent* if more than 20 percent of all government revenues come from the sector. Adapting this definition, our data reveal that there are at least 25 *NOC-dependent countries* worldwide, where an NOC, by itself, collects funds equivalent to 20 percent or more of all government revenues. In many cases, flows to NOCs dwarf the revenue that governments collect from foreign aid or domestic instruments such as income tax. The Nigerian National Petroleum Corporation, for example, collected revenue from its oil and gas sales equivalent to a

Data reveal that worldwide there are at least 25 NOC-dependent countries, where an NOC, by itself, collects funds equivalent to 20 percent or more of all government revenues.

range of 45 percent to 74 percent of general government revenue across the years for which data were available.

NOCs spend a lot.

Many NOCs have delivered strong value to their citizen shareholders, including by increasing revenue flows to government, promoting the growth of the oil and gas sector, developing a cadre of skilled staff and delivering a range of non-fiscal benefits. But the reverse is also true, with some NOCs struggling to deliver value, saddled with contradictory roles and susceptible to rent-seeking and political manipulation.

Our data create a clearer picture of just how large the reverberations across the economy can be if an NOC does not succeed. The huge shares of public revenues that NOCs collect are one factor. When a NOC's revenues are equivalent to 20 percent—or even just 5 percent—of public revenues there is a strong risk of the company becoming a state-within-a-state and executing a sort of shadow fiscal policy. NOCs can end up being the largest spenders in the public sector, but often do not go through the typical public sector budgeting or oversight process. This underscores the need for well-targeted rules setting the level at which the NOC must transfer revenues to the treasury.

Most NOCs transferred less than 25 percent of their gross revenues to their governments. The median NOC in our sample transferred 23 percent of revenues to government in 2013. By 2015, when prices had plummeted, this figure dropped to 17 percent. NOCs spend most of the rest, on company operations and investments. This is fitting in some cases, for NOCs participating in complex commercial projects in pursuit of long-term benefits, or for NOCs tasked with direct delivery of public services. But it comes at an opportunity cost, as every dollar spent by an NOC is unavailable in the immediate term for spending by the government on health, education or other development needs.

There is significant variation among NOCs in the sample in terms of how much they transfer to the state, ranging from less than 5 percent (such as Thailand's PTT) to more than 90 percent (such as Chad's Société des Hydrocarbures du Tchad).

NOCs also vary widely in how such transfers are structured. In 2013, amid a sustained period of record high prices, fewer than half of the NOCs in the sample reported paying a dividend to state shareholders. Twelve of the 13 NOCs in the sample that traded some shares on a public stock exchange paid a dividend. Less than one-third of the non-listed NOCs did so, even during the recent boom years when oil prices topped \$100 per barrel.

Setting policy on the requirements for NOC transfers requires a careful balance and alignment with clear goals. If a state taxes a commercially oriented NOC too heavily, it impedes the company's ability to invest in long-term growth and efficiency. Conversely, if an NOC consistently transfers only small amounts to the state, the potential fiscal benefits from oil and gas can go unrealized. Some NOC officials describe their companies as profit-seekers—and use that rhetoric to justify heavy spending—but consistently fail to pay dividends to the state, even during boom times.

NOCs can end up being the largest spenders in the public sector, but often do not go through the typical public sector budgeting or oversight process. This underscores the need for well-targeted rules setting the level at which the NOC must transfer revenues to the treasury.

Many NOCs take on debt, creating risks for their countries' economies.

Many NOCs are significantly indebted. We identified 18 companies with long-term liabilities equal to more than 5 percent of the total GDP of their home country. In extreme cases such as Venezuela's PDVSA, NOC debt has risen above 20 percent of GDP. When extremely high NOC debt combines with other performance challenges, the company can become a risk to broader economic sustainability. This is particularly true in countries where dominant NOCs are essentially "too big to fail."

In such cases, the NOC can require costly bailouts from the state, meaning that instead of being a boon to the state coffers, it becomes a drain. Several governments—ranging from major oil producers such as Mexico and Kazakhstan to Namibia, which doesn't even produce oil yet—have spent hundreds of millions, even billions of dollars bailing out NOCs in recent years. As of early 2019, a committee of creditors had declared Venezuela's PDVSA to be in default on its debts.

We identified 18 companies with long-term liabilities equal to more than 5 percent of the total GDP of their home country.

During the recent oil boom, many NOCs spent most of the revenue windfall they received, rather than passing it to their countries' treasuries.

Our data show that when NOC revenues rose during the boom years 2011—2014, their transfers to governments remained relatively flat. Instead, the average NOC appears to have directed large shares of boom-time windfalls to their own expenditures—both capital and operating expenditures rose significantly. This increase in spending among NOCs mirrors trends observed among international oil companies (IOCs), which also increased spending during the boom.

These trends are likely the result of a range of factors, including high average costs across the industry, government policy that incentivized NOC spending and investment during the boom, and increases in IOC tax payments that financed fiscal priorities. In some cases, NOC spending is also closely linked to inefficiency and weak management incentives in times of plenty. Spending rises in some cases because of political pressure and corruption, as illustrated by the high-profile scandals around NOCs such as Brazil's Petrobras.

When prices crashed, NOC transfers to governments dropped more sharply than revenues. This suggests that many NOCs spent a large share of the boom period's upside but then passed along the downside impact to their governments. For NOCs that can convert that boom-time spending into long-term growth, this trade-off may have been worthwhile. But for some countries the fiscal revenue sacrificed by NOC spending during the boom may not generate a meaningful return.

There is significant variance among NOCs on measures of commercial efficiency.

NOCs often have complex mandates. Governments task some with becoming commercially efficient entities that deliver value to citizens by exploring new frontiers, reducing production costs or promoting technological innovation. Others are required to sacrifice the commercial bottom line in favor of delivering public goods such as subsidized energy or large-scale employment. The data reveal significant differences among NOCs on various measures of commercial efficiency.

NOC reporting on employees is spotty, but staffing levels among NOCs that did report range from around 100 employees—such as Timor Leste’s Timor GAP—to hundreds of thousands—such as the Chinese giant Sinopec. This range reflects the variety among NOCs in role and scope. Measuring how much oil a company produces per employee is one way to assess how much it prioritizes commercial efficiency versus other public goods. Overall, the larger an NOC’s workforce, the less it produces per employee. But in this respect too the variance is substantial. Our data show that publicly listed NOCs—which generally prioritize the pursuit of commercial profit—tend to generate higher production-per-employee than unlisted NOCs.

Governments and NOCs should define company roles more clearly and invest in more consistent benchmarking.

In light of the challenges, how do NOCs and their governments maximize their chances of success? Creating clear and transparent performance benchmarks is one step. Some NOCs—including Colombia’s Ecopetrol and Malaysia’s Petronas—exhibit a strong approach to rigorous benchmarking. But many countries have struggled to define what “success” for an NOC looks like or to create a performance-based culture in which the NOC’s leadership is accountable for achieving clear targets.

One challenge is that the catch-all term “national oil company” encompasses a wide range of entities with varying roles, resources and experience. NOCs and governments need to be clear in defining companies’ principal goals and developing benchmarks accordingly. We identify three broad types of NOCs:

- The primary goal of a “cash cow” is to deliver fiscal revenues to the government’s treasury, and its performance benchmarks should prioritize overall government revenues from the NOC and the sector, and the share of NOC revenues paid to the government.
- A “profit seeker” NOC prioritizes commercial success, in the form of profit and the development of commercial skills and efficiency. If successful, a profit seeker will deliver significant long-term financial returns to the state in the form of dividends and income taxes. But the company’s short-term incentives may include a desire to minimize payments to the state.
- A “state supplement” NOC delivers value to citizens through public services rather than commercial success, such as by providing public employment, energy and fuel, promoting the local private sector and infrastructure construction.

Developing strong benchmarks requires a clear and honest assessment of which goals are most important, especially as few NOCs have enough resources to accomplish everything simultaneously.

These neat categories belie the complexity of many real-world NOCs, which are called upon to play various roles simultaneously. Developing strong benchmarks, however, requires a clear and honest assessment of which goals are most important, especially as few NOCs have enough resources to accomplish everything simultaneously.

There are major shortcomings in NOC transparency, and many companies fail to report critical information necessary for oversight.

Our research confirms and builds upon the findings of the 2017 Resource Governance Index (RGI), which showed that public reporting by many NOCs remains insufficient. Of the 52 NOCs studied in the RGI, 62 percent exhibited “weak,” “poor” or “failing” performance on public transparency. Within the larger sample in the NOC database, some companies produced almost all of the information we sought on production, revenues, transfers and performance. Others produced none of it, or produced it in a manner that made it difficult to discern its accuracy. Overall, only 20 of the 71 companies in the sample produced sufficient information for NRG1 to be able to enter data for all ten of the most critical indicators in the database.

Companies in the Middle East and North Africa—home to many of the world’s largest NOCs—produced the least information on average. Sub-Saharan Africa—which combines established companies such as Nigeria’s NNPC and Angola’s Sonangol as well as NOCs in up-and-coming oil producers such as Tanzania—finished second from the bottom, despite more extensive disclosure in some countries such as Ghana. Overall, company disclosure is weakest in the areas of employment and spending. This opacity has potentially serious consequences for the public’s ability to scrutinize NOC priorities, efficiency and company contributions to public employment.

In the process of building the database came across several indicators that have not attracted much attention in global transparency initiatives but which are essential for strong citizen oversight of NOCs. We recommend that international efforts to encourage better reporting among NOCs prioritize more detailed reporting on:

- company expenditures
- the breakdown of transfers to government across fiscal vehicles and jurisdictions (for NOCs operating abroad)
- how much production a company produces in fields that it “operates”—meaning that the company either runs the field exclusively or is the lead company responsible for managing the finances and the operations of a project with partners

Long-term improvements in the thoroughness and consistency of NOC disclosures will enhance the abilities of NOCs and their governments to benchmark performance effectively, and of citizens to scrutinize how well these companies are managing public resources.

Long-term improvements in the thoroughness and consistency of NOC disclosures will enhance the abilities of NOCs and their governments to benchmark performance effectively, and of citizens to scrutinize how well these companies are managing public resources.

I. Under-analyzed behemoths

National oil companies (NOCs) play a dominant role in international energy markets and in the economies of oil and gas producing countries across the world. NOCs produce the majority of the world's oil and gas, pumping out an estimated 85 million barrels of oil equivalent per day.¹ They control up to 90 percent of global reserves, thereby serving as gatekeepers for international oil companies' access to hydrocarbons.² Within their home jurisdictions, NOCs can determine in large measure the degree to which billions of people benefit—or not—from their national hydrocarbon assets. These companies often rank among the largest single collectors of public-sector revenues. They manage multi-billion-dollar portfolios of public assets, execute complex projects across their territories and at sea, employ citizen staffs in the tens or hundreds of thousands and perform a range of public services from providing energy to constructing infrastructure.

In many oil-dependent countries, NOCs sit at the epicenter of the oil economy, playing a fundamental role in every facet of public governance. Even in new oil producers with smaller NOCs, the companies can be critical to ambitions to use the sector as a driver of development. At their best, NOCs can be revenue generators, technological innovators and sources of national pride. At their worst, they have enabled rent-seeking by politicians, diverted money from the public, mismanaged precious natural resource deposits and engaged in regime-rattling corruption.³

Over the years, a few intrepid researchers have sought to examine NOC performance and governance, analyze trends across companies and make recommendations to NOC leaders and their government and citizen shareholders.⁴ Some international organizations including the Organization for Economic Cooperation and Development (OECD) and the Extractive Industries Transparency Initiative (EITI) have increasingly sought to incorporate guidance on NOC reporting and corporate

1 Rystad Energy, *UCube Database*, reported average for the 2011 to 2017 period. According to Rystad, NOC production represented 55 percent of total oil and gas production worldwide over this period. Estimates from the World Bank earlier this decade put NOCs' share of global oil production at 75 percent, and their share of global reserves at 90 percent. Silvana Tordo, Brandon S. Tracy and Noora Arfaa. *National Oil Companies and Value Creation* (World Bank, 2011).

2 Tordo, et al., *National Oil Companies and Value Creation*.

3 In recent years, prominent cases where NOCs have been linked to devastating corruption include Brazil, where the "car wash" scandal caused billions of dollars in lost public assets and resulted in convictions of hundreds of prominent officials; Mexico, where Pemex has been accused of accepting millions of dollars in bribes; and Congo-Brazzaville, where senior officials at the Société Nationale des Pétroles du Congo have allegedly engaged in arbitrage in oil sales in order to enrich politically-connected businesses to the tune of hundreds of millions of dollars.

4 Among the most important analyses of NOC governance and performance are Valerie Marcel, *Oil Titans* (Brookings Institution Press, 2006); Tordo, et al., *National Oil Companies and Value Creation*; Christian Wolf, "Does Ownership Matter? The Performance and Efficiency of State Oil versus Private Oil," *Energy Policy* 37 (2009): 2642—52; Stacey L. Eller, Peter R. Hartley and Kenneth B. Medlock III, "Empirical Evidence on the Operational Efficiency of National Oil Companies," *Empirical Economics* 40 (2010): 623—643; David G. Victor, David R. Hults and Mark Thurber, eds., *Oil and Governance: State-Owned Enterprises and the World Oil Supply* (Cambridge University Press, 2012); Miranda L. Wainberg, Dmitry Volkov and Michelle Michot Foss, *Commercial Frameworks for National Oil Companies* (Center for Energy Economics Working Paper, 2007); James A. Baker Institute for Public Policy, *The Role of National Oil Companies in International Energy Markets* (Rice University, 2007).

governance into their standards and guidelines.⁵ Additionally, a number of journalists and watchdogs have dug deeply into the evolution of specific NOCs.⁶

But in comparison to their economic importance, NOCs have been significantly under-researched, and there remain huge gaps in public understanding of their roles, performance, opportunities and risks. This stems in part from the lack of data about NOCs. NOCs remain opaque: the 2017 Resource Governance Index showed that 62 percent of the 52 NOCs surveyed exhibited “weak,” “poor” or “failing” performance on public transparency.⁷ Even when companies have made some public information available, it has traditionally been difficult for regulators, legislators and public interest groups to use it. The reports are often company-specific, partial and geared to narrow audiences such as investors.

Without good data, and especially without comparative data across companies, it is extremely difficult to assess how well an NOC is performing. Given their size and impact, this is a huge shortcoming. Citizens, legislators, regulators, investors, journalists and other observers all need better tools to answer important questions such as:

- Is the company managing public resources efficiently?
- Is the company investing effectively in pursuit of a coherent strategy?
- Is the government collecting enough in taxes and other transfers from the NOC? Is it collecting too much?
- Does the company’s portfolio create risks for the broader economy that need to be addressed?

This paper, and the database behind it, use publicly available data to help answer these questions more effectively. We collected information from public reporting on 71 NOCs, headquartered in 61 countries, from 2011 to 2017.⁸ This work was made possible by growth in the amount of information that NOCs and their governments put into the public domain, via company financial statements and public reporting mechanisms such as EITI. The resulting database, available at www.nationaloilcompanydata.org, is the largest open resource in the world on NOCs, and covers their production, revenues, expenditures, balance sheets, taxation and performance.

5 Organization for Economic Cooperation and Development, *Guidelines on Corporate Governance of State-Owned Enterprises—2015 Edition* (OECD, 2015); Extractive Industries Transparency Initiative, *The EITI Standard 2016* (EITI International Secretariat, 2016).

6 In-depth investigations of NOCs have been conducted on large producers such as Brazil’s Petrobras—see, e.g., Jonathan Watts, “Operation Car Wash: Is This the Biggest Corruption Scandal in History?” *The Guardian*, June 1 2017; and Nigeria’s NNPC—see, e.g., Aaron Sayne, Alexandra Gillies and Christina Katsouris, *Inside NNPC Oil Sales: A Case for Reform in Nigeria* (New York, Natural Resource Governance Institute, 2015), resourcegovernance.org/sites/default/files/NRGI_InsideNNPCOilSales_CompleteReport.pdf. Detailed analyses have also been published on several smaller NOCs with important roles in their home economies. See, e.g., The Sentry, *Fueling Atrocities: Oil and War in South Sudan* (2018), cdn.thesentry.org/wp-content/uploads/2018/03/FuelingAtrocities_Sentry_March2018_final.pdf.

7 Natural Resource Governance Institute, *2017 Resource Governance Index* (2017). The index assessed NOC transparency according to the rules and disclosure practices associated with its operations and finances. Of the 52 countries where an NOC was assessed, only six exhibited what the index categorized as “good” practice.

8 The National Oil Company Database is designed to be a “living” tool, and NRGI will update it periodically as more information becomes available in the public domain. The data used in this paper reflect the database as of February 28, 2019. These data draw on reports that were published by NOCs and their governments through the end of the data collection period, September 30, 2018, with one exception. On April 1, 2019, Saudi Aramco released an investor prospectus including consolidated financial statements covering the years 2016, 2017 and 2018. Because of the size and influence of Saudi Aramco, and the complete absence of any financial data from the company before the release of the prospectus, we opted to include figures derived from it in the database.

After a brief explanation of our methodology, this paper examines what the data tell us about the influence of NOCs globally and within their home economies.

The data we assembled make it clearer than ever that NOCs are giants. In a general sense, this has been known for some time, but our data-gathering lends significantly more shape to our understanding of NOC size and influence, especially within their home economies. We have found that:

- **Many governments depend on NOCs for major revenues.** We identified 25 countries for which NOC revenues were equivalent to more than 20 percent of total government revenues in 2013.⁹ These numbers would grow even higher if several large NOCs that are currently opaque began reporting their revenues more systematically.
- **NOCs have amassed large assets, and large liabilities.** There is significant variance in size among NOCs, but many companies have accumulated huge asset bases, measured in both absolute terms and in relation to their economies. Several NOCs have also taken on debts that add up to substantial shares of GDP. Examining comparative data on NOC liabilities allows analysts to more fully assess the debt challenges facing a company or a national economy.

Box 1. The Natural Resource Governance Institute's work on state-owned enterprises

This paper and the associated database form part of NRGi's portfolio of work on state-owned enterprise governance. This work includes research, advocacy and technical assistance at the global level, as well as in several countries including Azerbaijan, the Democratic Republic of Congo, Ghana, Guinea, Indonesia, Mexico, Mongolia, Myanmar, Tanzania, Tunisia and Uganda. The projects target five major topics:

- 1 Reporting and transparency practices
- 2 Performance benchmarking and financial flows
- 3 Institutional structure and oversight
- 4 Commodity trading accountability
- 5 Reducing corruption risks

For more information, visit www.resourcegovernance.org/topics/state-owned-enterprises.

⁹ The large fiscal space that NOCs occupy amplifies the importance of decisions made by governments and NOCs about how much an NOC is allowed to spend and how much they pay to the treasury. These policies have a massive impact on the government's ability to use oil revenues for development spending. For further discussion, see Patrick R.P. Heller, Paasha Mahdavi and Johannes Schreuder, *Reforming National Oil Companies: Nine Recommendations* (Natural Resource Governance Institute, 2014), 10—11; Paasha Mahdavi, *Power Grab: Political Survival Through Extractive Resource Nationalization* (University of California Santa Barbara, unpublished manuscript, 2019).

After shedding new light on the size and influence of NOCs, this paper summarizes lessons from the data relevant to NOC performance. This section begins by digging into a fundamental factor: not all NOCs are alike, and benchmarking efforts must be tailored to the roles of specific NOCs. We build on existing literature to suggest an NOC typology. We then use the typology in our analysis of two main issues related to policy and performance.

Fiscal transfers between NOCs and their governments

When an NOC collects revenue, not all of that revenue makes it to the treasury. In fact, our data reveal that most NOCs transfer less than 25 percent of their gross revenues to government. We discuss metrics for analyzing how heavily a government should tax revenues that accrue to the NOC, balancing the need for companies to reinvest revenues in their businesses against the opportunity cost of the money that NOCs spend.

Most NOCs transfer less than 25 percent of their gross revenues to government.

Operational performance

The stated goals of most NOCs include contributing to the effective development of the country's petroleum sector and generating strong returns on state investments. We examine several core metrics for assessing company efficiency and the returns that NOCs generate on public investment and provide recommendations on how governments and companies can use these benchmarks to achieve different types of goals.

Finally, this paper analyzes the state of NOC transparency and makes concrete recommendations for improving NOC reporting going forward. We offer insights on areas of persistent weakness in reporting systems that require priority attention, both in individual company disclosure policies and international efforts including the EITI Standard, the International Monetary Fund (IMF) Fiscal Transparency Code and OECD Guidelines on Corporate Governance of State-Owned Enterprises.¹⁰ These critical disclosure gaps include information on disaggregated expenditure, transfers to government and key performance indicators (KPIs).

10 The most recent official versions of these resources are: EITI, *The EITI Standard 2016*; International Monetary Fund, *Fiscal Transparency Initiative: Integration of Natural Resource Management Issues* (International Monetary Fund, 2019); OECD, *Guidelines on Corporate Governance of State-Owned Enterprises*, 2015.

II. The National Oil Company Database

The data that we use in this paper derive from the *National Oil Company Database*, which NRGi launched publicly in 2019. As of the finalization of this paper, the database contained entries for 71 NOCs from 61 home countries and covered the period from 2011 to 2017.¹¹ Our data on NOCs derive exclusively from official government and NOC sources. Companies' annual and financial reports are the principal source of information for most companies in the database. We supplemented these data with information on NOCs from other government reports, including filings by ministries of oil, energy and finance and EITI reports.¹² Our data-gathering and the definition of major benchmarks focuses mostly on the companies' upstream roles in exploration, production and revenue-generation.¹³

Beyond this NOC-specific data, we used data from the IMF and World Bank for contextual indicators on home-country economies and government finances; data from the International Centre for Tax and Development on government resource revenues; data from British Petroleum on national oil and gas production; and the World Bank's Wealth of Nations database on subsoil wealth.

For a detailed description of the project methodology, see *National Oil Company Database: Methodology Guide*.¹⁴ (See Appendix 1 for a complete list of companies in the database.)

11 In developing our sample, we adapted a definition of "state-owned enterprise" derived from the OECD's definition, with slight modifications. We consider the defining characteristics of an SOE to be that (a) the state has a majority ownership stake and/or a "golden share" that gives it effective control over decision-making; and (b) national legislation and/or national practice defines the entity as an enterprise. This definition is deliberately inclusive, incorporating companies that range from 100 percent state-owned to mixed-ownership and with a range of different tasks and mandates. See OECD, *Guidelines on Corporate Governance of State-Owned Enterprises*, 14–15.

12 In some countries, such as Azerbaijan and Norway, detailed information on the company is available both in company annual/financial reports and in an EITI report or other official document. These different reports often use divergent accounting principles. In these cases, we relied on the data from the company reports as our information source. In other countries, such as the Democratic Republic of Congo and Nigeria, the NOC itself produced little or no data for the years in question, but some information on revenue flows are available via EITI. In these cases, we used EITI as the source of information for the database. In a third category of countries—comprising Cameroon, Cote d'Ivoire, Ghana and Liberia—the company produced a small amount of information and there was also information in an EITI or other official document (in the case of Ghana, reporting by the Public Interest and Accountability Committee). In these cases, since the accounting standards among the documents appeared to diverge, we recorded two separate data sheets, rather than merging them into one.

13 In contrast to Tordo, et al., we did not measure downstream (refinery) performance or the share of local content in NOC employment or other inputs, because our early research indicated that standardizing company reporting on such figures would impose large additional costs on this research process with uncertain results. See Tordo, et al., *National Oil Companies and Value Creation*, 41. In an upcoming research project with Valerie Marcel, we plan to develop a more comprehensive approach to help African NOCs benchmark their own performance along various axes that extend beyond their upstream activities. In such a benchmarking, companies would rely initially on their own internal reporting. We hope that in the future public reporting will be sufficient to enable comparative analysis.

14 In building on these measurements and tailoring them to make them relevant to missions and objectives of state-owned oil companies, we drew inspiration and measures from existing research on NOC performance, notably from Tordo, et al., *National Oil Companies and Value Creation* (on state ownership levels, project costs and profitability); Nadeja Victor, *On Measuring the Performance of National Oil Companies—Program on Energy and Sustainable Development Working Paper 64* (Stanford University Program on Energy and Sustainable Development, 2007) (on NOC employment and efficiency); David Manley, James Cust and Georgia Cecchinato, "Stranded Nations?" *The Climate Policy Implications for Fossil-Fuel-Rich Developing Countries—Oxcarre Policy Paper 34* (Oxford Centre for the Analysis of Resource Rich Economies, 2016) (on NOC utilization of public assets); William L. Megginson and Jeffrey M. Netter, "From State to Market: A Survey of Empirical Studies on Privatization," *Journal of Finance* 49 (2001): 403–52 (on financial returns among SOEs); and Wolf, "Does Ownership Matter?" (on various efficiency measurements).

Box 2. NRGi’s National Oil Company Database at a glance, April 2019

Website: www.nationaloilcompanydata.org

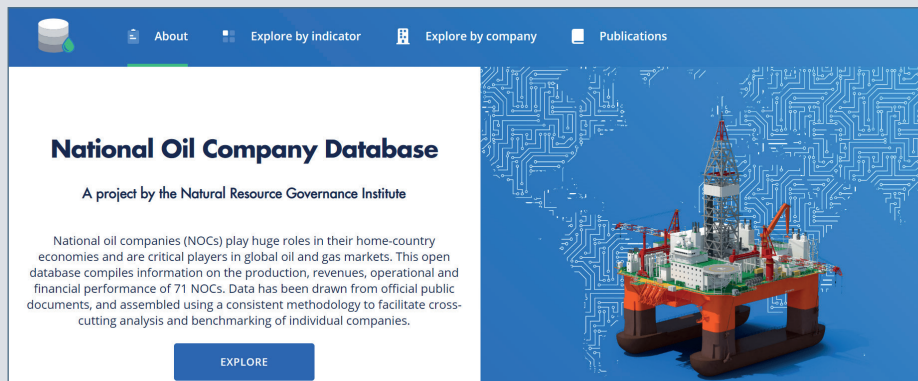
Companies included: 71

Home countries represented: 61, across all regions of the world

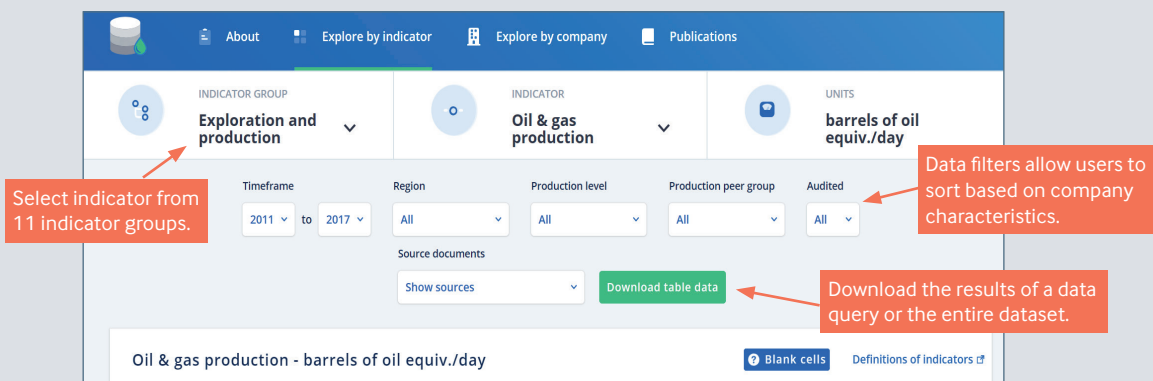
Time period covered: 2011–2017

Indicators measured: 135

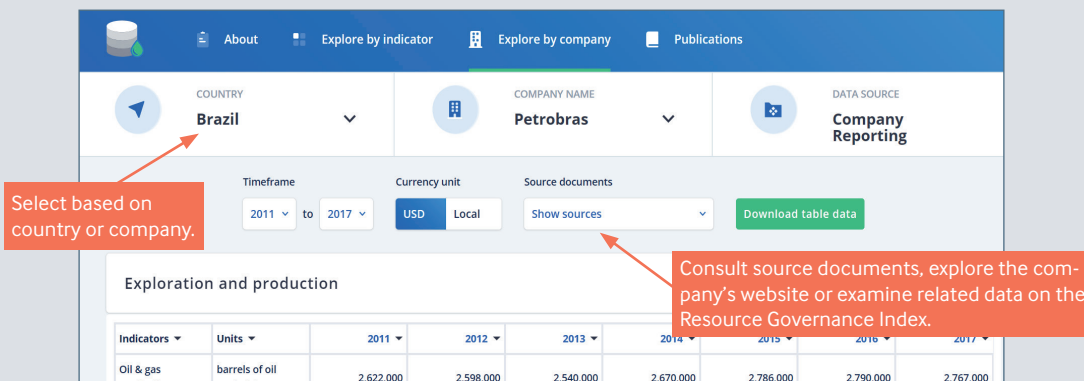
Individual data points: more than 70,000



“Explore by indicator” page (www.nationaloilcompanydata.org/indicator). This page provides users with the opportunity to examine specific data points across different NOCs. It is designed to facilitate comparisons among companies and over time.



“Explore by company” page (www.nationaloilcompanydata.org/indicator). This page allows a user to see all available information for one NOC together in one place.



The data gathering exercise presented four principal challenges, discussed in detail in *National Oil Company Database: Methodology Guide* and summarized in Table 1.

Table 1. Major data challenges

Challenge	Description	Mitigation
Availability	Data disclosure is still poor among many NOCs, including such major companies as the National Iranian Oil Company and the Nigerian National Petroleum Corporation. Data on certain indicators—e.g., expenditures and employment—were generally weak across the dataset. Section V, below, discusses transparency challenges further.	NRGI conducted thorough research of a wide range of official sources in order to capture as much information as possible. The accompanying analysis emphasizes indicators for which a relatively large amount of data is available.
Reliability	Because the data derive exclusively from official government sources, they replicate any false or misleading information in government reports.	The database allows users to filter by whether the report from which data derived was subject to independent audit.
Inconsistent terminology	An inconsistent use of terms creates challenges for cross-company comparisons. NOCs report information to serve different audiences and according to different national traditions and accounting principles. Even where companies are reporting in accordance with international accounting principles, there is significant variation in how they categorize information.	The data-gathering methodology applied consistent approaches to each company, thoroughly examining the detailed notes included in financial reports and other source documents. In some cases, this required NRGI to either aggregate or disaggregate information from the financial reports in order to keep the measurements as consistent as possible. As such, we were able to mitigate the inconsistent terminology challenge, though not eliminate it.
Data interpretation	The variety among NOCs in terms of goals, geology and national context also poses challenges for cross-company comparisons. Unnuanced comparisons between, e.g., a new non-operating NOC such as Timor Leste’s Timor GAP and a global giant such as Russia’s Gazprom, could result in irresponsible conclusions.	To conduct cross-company analysis, NRGI uses various peer groups to compare similar NOCs to one another as much as possible. See Section IV for more.

We were not able to eliminate these data challenges completely, and the weak state of NOC reporting remains an impediment. Reporting on company expenditures and profits was particularly inconsistent. As such, NRGI’s confidence in the consistency of the data is highest for indicators on production, revenues, transfers, cash flows and balance sheets. In the analysis presented in the next sections, we focused our attention to indicators where data consistency was strongest and often limited the sample of companies or used groupings to increase comparability.

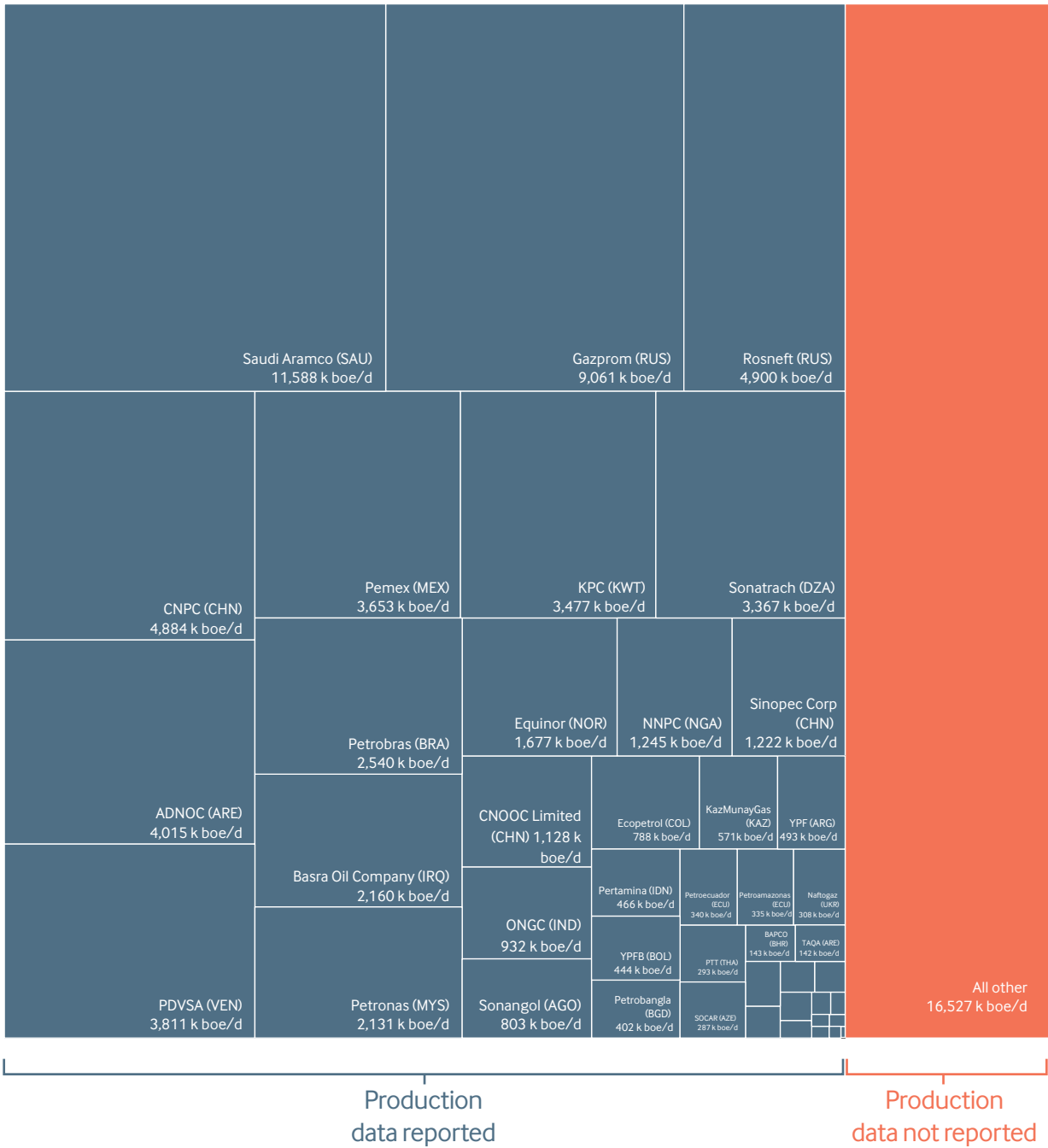
This approach enabled us to derive figures of significant analytical value. We believe that we have assembled the most comprehensive, open and public dataset on NOCs, with more than 70,000 individual data points.

Figures 1 and 2 illustrate the coverage we were able to achieve in the database. Rystad Energy, a proprietary database, estimates that global NOC production totals 85 million barrels per day.¹⁵ As shown in Figure 1, our database has NOC production data that cover 68 million barrels per day, or 80 percent of this total.¹⁶

¹⁵ This includes oil and gas production, expressed in barrels of oil equivalent.

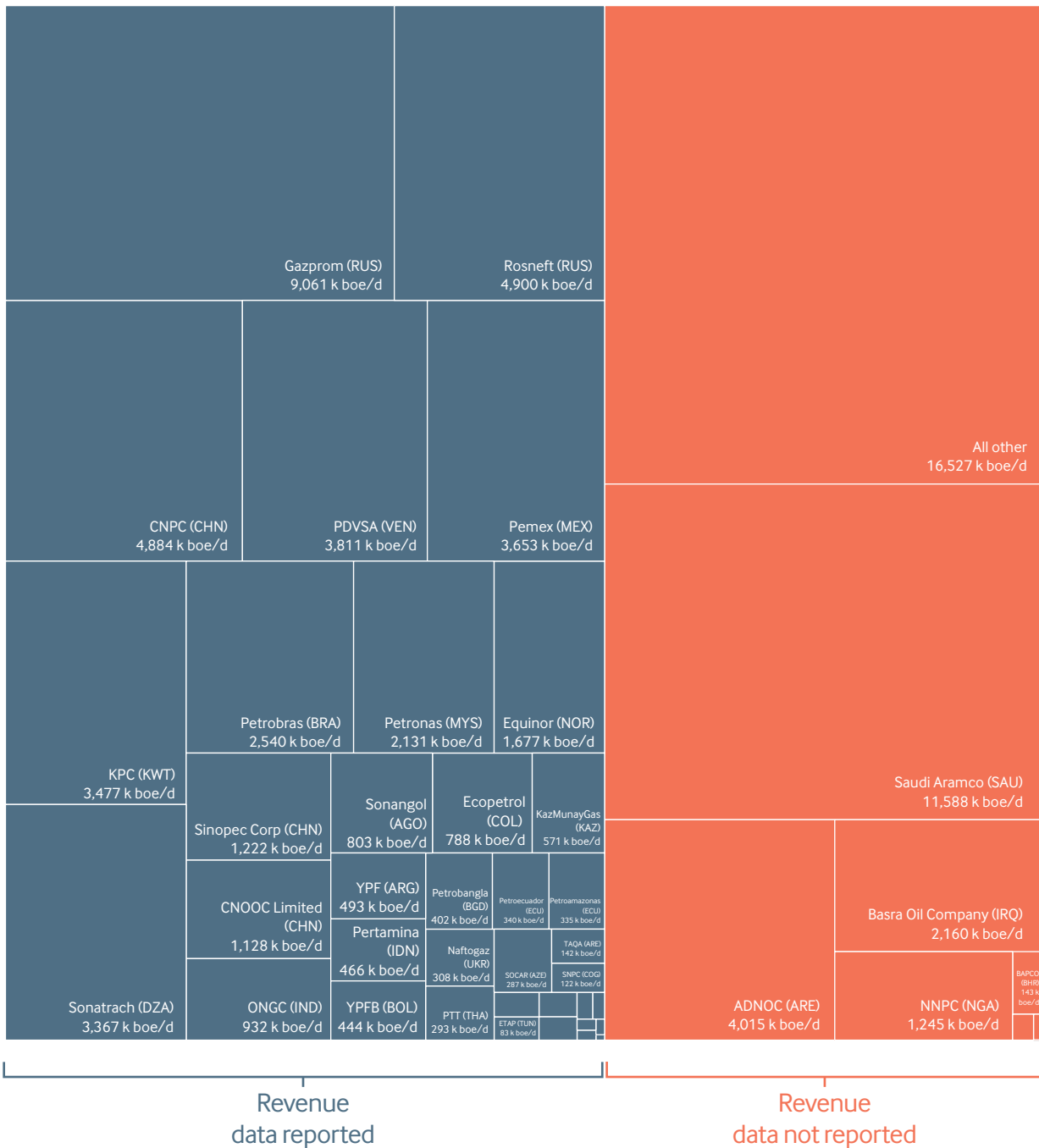
¹⁶ For three large Chinese NOCs with international operations—CNOOC, CNPC and Sinopec—our database includes entries both at a parent company level and at the level of subsidiary companies—CNOOC Limited, PetroChina and Sinopec Corp., respectively. The numbers included in Figure 1 do not feature separate entries for the subsidiary companies, but simply treat them as being included within the total figures of the parent companies.

Figure 1. Coverage of total global NOC production in NRGI database, 2013



Unfortunately, NOCs disclose other data much less often than they disclose production data. Figure 2 provides an example. Taking the same Rystad Energy figures on total NOC production, it shows the share from companies that published sufficient information for us to record their total revenues. Here we have revenue data capturing 58 percent of NOC production. Some major players are including important Middle East producers.

Figure 2. NOC production by companies reporting revenues and those not reporting revenues, 2013



As we update the database in the future, we hope to add more companies to the sample.¹⁷

And as we discuss below, further improvements in NOC reporting and transparency would further enrich the exercise.

17 On April 1, 2019, just before the publication of this report, Saudi Aramco released an investor prospectus including consolidated financial statements detailing the company's revenues for 2016, 2017 and 2018. The company's revenues for 2013 remain unavailable. Additional companies not included in the database include several studied by Paasha Mahdavi, "Institutions and the 'resource curse': Evidence from cases of oil-related bribery," *Comparative Political Studies* (forthcoming). Mahdavi includes in his dataset several NOCs that are not yet captured in our database: Albania (AlbPetrol), Belarus (BelOil), Chile (ENAP), Japan (JOGMEC), Jordan (NPC), Mauritania (SMHPM), Morocco (ONHYM), Pakistan (Pakistan State Oil), Seychelles (Petroseychelles), Syria (Syrian Petroleum Company), and Uruguay (ANCAP). Not all these companies necessarily meet the definition of NOCs for this project.

III. Size and impact of national oil companies

NOCs have a massive impact on the global oil and gas sector and within oil-producing countries. Oil-industry experts have known this basic fact for a long time, but a historical lack of cross-cutting data has made it difficult to fully understand the impact of NOCs on their home country economies. Our data provide a more complete overview of the scale and importance of NOCs than has previously been possible.

In many cases the performance of a country's economy is directly tied to that of its NOC. This section presents several measures of NOC operations and finances—both in absolute terms and relative to their home economies. We examine NOC production, revenues, assets and liabilities. Taken together, these data underscore the centrality of NOCs for the development prospects of billions of people. Successful NOCs can help the oil sector become a driver of development. But the data indicate the major risks that NOC revenue collection and debt can impose and highlight the importance of strong oversight and strategic planning.

In the sections that follow, and indeed in the remainder of this paper, we sometimes divide our sample between “internationalized NOCs”—which operate fields and produce a meaningful share of their oil and gas from countries outside of their home jurisdiction—and “domestic NOCs,” which produce the overwhelming share of oil and gas in their own countries.”¹⁸ This distinction is important because NOCs that produce oil and gas abroad are drawing on a wider asset pool and have a different risk profile than NOCs whose production is concentrated at home. See *National Oil Company Database: Methodology Guide* for a more detailed discussion and Appendix 1 for the categorization of different NOCs.¹⁹

A. NATIONAL OIL COMPANIES' ROLE IN HOME COUNTRY PRODUCTION

Global discourse around NOCs often focuses on their importance for hydrocarbon production. Over the period we covered, NOCs produced more than half (55 percent) of the world's total oil and gas, with an average production rate of 85 million barrels per day.²⁰

Our dataset enables us to further examine the production profiles of many companies. Figures 3 and 4 shows NOC oil production as a share of total national production. Figure 3 includes NOCs with substantial production outside their national borders, the group we call “internationalized operators.” Figure 4 depicts the “domestic NOCs” whose production originates overwhelmingly from domestic

18 Since company reporting on the breakdown of production among domestic and international fields is not systematic, we determine the “meaningful share of their production” abroad based on company and third-party information. The reports of some companies, such as the Kuwait Petroleum Corporation and Angola's Sonangol, include information on overseas activities, but based on our research these appeared to represent minimal shares of their production.

19 The database website, www.nationaloilcompanydata.org, also enables users to filter NOCs based on their “production peer group,” including by the annual production level and whether or not production is internationalized.

20 Rystad Energy, *UCube Database*, 2018.

fields.²¹ For half of the NOCs in the sample, the NOC’s production accounted for more than half of the national production of the relevant home country. For more than two thirds of the NOCs in the sample (70 percent), the NOC’s production was equivalent to at least 25 percent of the total home-country production.

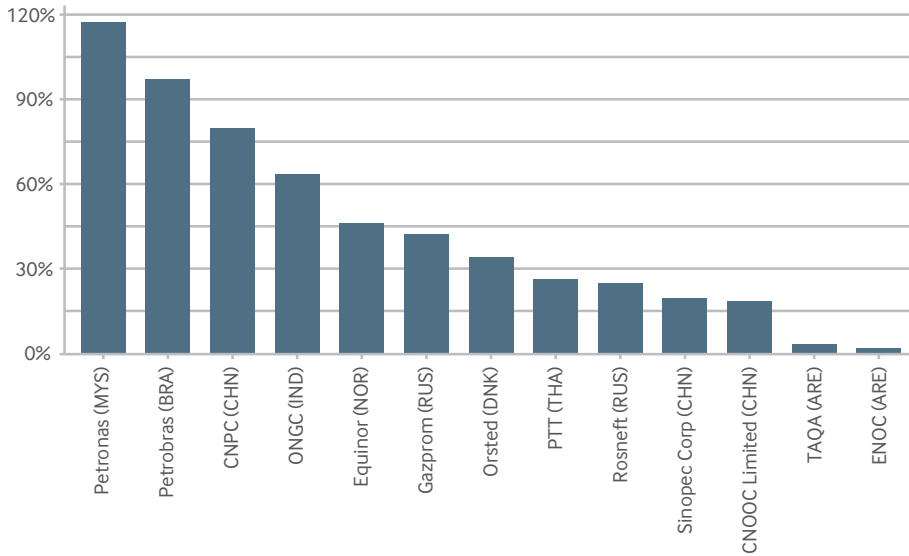


Figure 3. Production of “internationalized operator” NOCs as a percentage of total oil and gas production of home country, 2011 to 2017²²

The data on internationalized operators do not illustrate the share of production they control in their domestic oil sectors, since most companies do not provide detailed data on the location of their barrels. But they illustrate the degree to which many NOCs are producing oil abroad that builds upon their in-country production, by taking on additional projects, risks and opportunities in international oil markets.²³

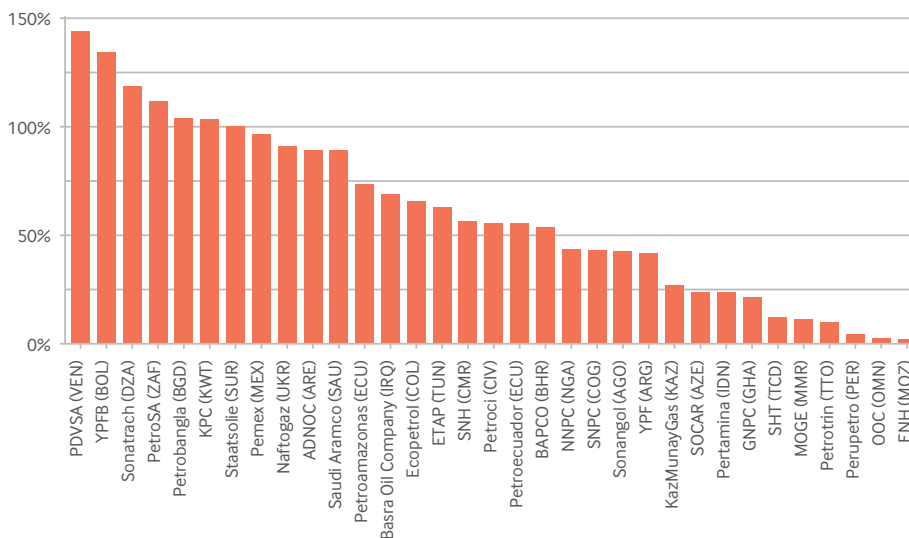


Figure 4. Production of “domestic” NOCs as a percentage of total oil and gas production of home country, 2011 to 2017²³

21 As we note in Section V below, the imprecision in the way that NOCs group their operated production with production that they access through non-operating equity stakes or selling rights via production-sharing contracts means that this figure mixes different types of “NOC production.” Still, it illustrates the centrality of NOCs in the national production mix.

22 Only includes years in which production data for both the NOC and the home-country total were available.

23 Only includes years in which production data for both the NOC and the home-country total were available.

Domestic producers were responsible for 76 percent of total production in their home countries during our data period. Within this total it is worth examining patterns among domestic NOCs. Larger NOCs produced a significantly higher share of the home-country total than did medium or small domestic producers. The dominant role played by domestic NOCs in large-production countries including Saudi Arabia, Venezuela, Kuwait and Mexico, with long histories of oil production and strongly nationalist approaches to the sector, drives this trend in the data. Small producers, on the other hand, often have lower capacity NOCs that do not engage in much production at all, instead leaving it for private companies to handle. The fact that some domestic NOCs register as producing more than the total production of their countries is reflective of statistical inconsistency across reporting mechanisms and varying methods of defining “production.” (See box below.) Nonetheless, the data demonstrate the huge role these companies play in their home markets.

Box 3. What is a national oil company’s “production”?

As is shown in Figure 4, a few NOCs report production figures that exceed the total national production reported by third parties such as the *BP Statistical Review of World Energy*. This highlights continued inconsistency in production data across various sources.

Gathering consistent data on NOC production is complicated by the fact that different companies count “production” as barrels that are extracted in projects in which NOCs have a range of different roles. Some NOC production comes from projects where the NOC is the “operator,” meaning that the NOC is executing the project by itself or is the technical lead responsible for managing the production process in a consortium. Other NOC production figures include barrels that the company sells by virtue of swap arrangements or contractual rights it holds as a minority equity holder or the state’s representative in a production sharing contract. Some NOCs also receive and sell oil and gas as a fiscal agent of the state—if, for example, a private partner pays its royalty obligations to the state in-kind, the NOC may be the recipient of that oil or gas. Most NOCs do not provide detailed reporting on the breakdown of their production figures among these different categories. Section V, below, discusses the impact of this gap on efforts to analyze NOC performance and governance.

The production figures in Figures 3 and 4 and throughout this report reflect the total NOC production figures published by the NOCs or their governments. As such, they replicate the methods used by NOCs and governments for determining “production.” In some cases, these methods introduce challenges into the interpretation of company-specific data. The EITI reports for Myanmar, for example, indicate a more than hundred-fold increase in the gas “produced” by the Myanmar Oil and Gas Enterprise (MOGE) between 2013 and 2014, without providing a detailed explanation of the reasons. MOGE is not an operator, but rather “produces” gas largely by virtue of its receipt of in-kind payments of royalties from the country’s private partners and its role in production sharing contracts.²⁴ We suspect that the dramatic change experienced between 2013 and 2014 may have reflected a change in the contractual or accounting practices governing how Myanmar’s private partners compensated MOGE and the state. The company’s total revenues stayed relatively flat across the two years (\$2.3 billion in 2013, \$2.5 billion in 2014). However, in 2013 the largest portion came via cash royalty payments from international oil companies (IOCs) to MOGE, whereas in 2014, the bulk of payments were delivered in kind through gas that MOGE sold. As such, the huge increase in MOGE “production” likely reflects financial/accounting changes rather than a real growth in the company’s productive capacity.

24 Myanmar Extractive Industries Transparency Initiative, *EITI Report for the Period April 2014 – March 2015*, March 2018, eiti.org/sites/default/files/documents/meiti_report_2014-2015_final.pdf, 13.

Large domestic producers (>500,000 barrel of oil equivalent (BOE) per day, n= 13)	82%
Medium and small domestic producers (<500,000 BOE per day, n = 20)	38%

Table 2. Share of total national production controlled by NOCs among domestic producers, 2011 to 2017

The variety in size and capacity among NOCs is a major reason for these differences in their shares of national production. Fiscal and licensing systems also have a major impact, particularly for domestic producers. The domestic producers producing the highest shares of their national production—including Saudi Arabia’s Saudi Aramco, Venezuela’s PDVSA, Kuwait’s KPC, Mexico’s Pemex and Iraq’s Basra Oil Company—all enjoyed monopoly status or other strong structural advantages in licensing processes within their home countries. Most domestically focused NOCs with smaller shares are either largely non-operating companies that derive their production primarily from partnerships with IOCs—such as Chad’s Société des Hydrocarbures Tchadien (SHT), Azerbaijan’s SOCAR, and the Republic of Congo’s Société Nationale des Pétroles du Congo (SNPC)—or are operating companies subject to extensive competition for access to acreage within their home markets—such as Kazakhstan’s KazMunayGas and Indonesia’s Pertamina.

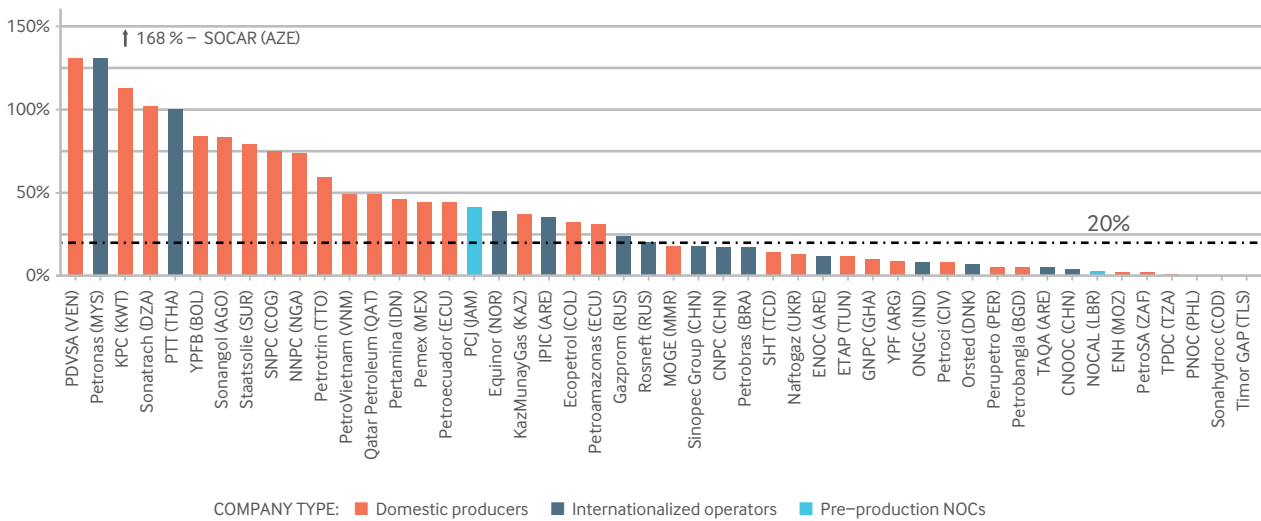
B. NATIONAL OIL COMPANY REVENUE MANAGEMENT

In recent years there has been some attention among international institutions and public officials to the role that NOCs play in national revenue management.²⁵ However, considering the large amount of money that passes through company hands though the fiscal influence of NOCs, the subject has been under-researched and under-emphasized in public policy. Our data underscore that NOCs are critical actors in the public financial management systems of producer countries, and that inattention to how countries govern their NOC funds can pose major development risks.²⁶

- 25 In the 2019 update to its *Fiscal Transparency Code*, the IMF included for the first time a specific recommendation that governments report regularly on the “operations and finances” of national resource corporations, in light of the critical role they play in fiscal management. International Monetary Fund, *Fiscal Transparency Initiative: Integration of Natural Resource Management Issues* (International Monetary Fund, 2019), 25, <https://www.imf.org/en/Publications/Policy-Papers/Issues/2019/01/29/pp122818fiscal-transparency-initiative-integration-of-natural-resource-management-issues>. The EITI has also strengthened its requirements on disclosures by oil and mineral state-owned enterprises, including requirements in its 2016 Standard requiring disclosure of revenue flows between the state and the SOE. Extractive Industries Transparency Initiative, *The EITI Standard 2016*, eiti.org/sites/default/files/documents/the_eiti_standard_2016_-_english.pdf, 25. For examples of a government asking tough questions about how much money NOCs bring in and how much they should be taxed, see Azril Annuar, “Dr M: Petronas Can Afford RM30b Dividend,” *MalayMail*, 2 November 2018, www.malaymail.com/news/malaysia/2018/11/02/dr-m-petronas-can-afford-rm30b-dividend/1689418; Jude Webber, “Mexico to East Pemex Tax Burden,” *Financial Times*, 29 January 2019, www.ft.com/content/c7301f30-23d2-11e9-b329-c7e6ceb5ffdf.
- 26 High-profile scandals with NOCs in Brazil, Mexico and Nigeria have helped draw significant public attention to these risks. Several core elements of NOC management in many countries leave them prone to corruption risks, especially where public oversight and corporate governance checks are weak. For a detailed discussion of various ways in which NOCs are at risk, see Aaron Sayne, Alexandra Gillies and Andrew Watkins, *Twelve Red Flags: Corruption Risks in the Award of Extractive Sector Licenses and Contracts* (Natural Resource Governance Institute, 2017), resourcegovernance.org/analysis-tools/publications/twelve-red-flags-corruption-risks-award-extractive-sector-licenses-and.

Our data illustrate the substantial revenues collected by NOCs. In 2013—the last full year in our sample before oil prices began to fall—we were able to assemble official total gross revenue data for 48 NOCs.²⁷ Of these, 38 had revenues greater than \$1 billion, 15 had revenues greater than \$50 billion, and 10 had revenues greater than \$100 billion. It is important to keep in mind that the sample excludes major NOCs such as Saudi Aramco and the National Iranian Oil Company, which did not make official revenue data available for that year but certainly grossed revenue exceeding \$100 billion. Figure 5 puts these numbers into context, showing NOC gross revenue as a share of total general government revenues.²⁸

Figure 5. NOC total revenues as a percentage of general government revenues, 2013



27 In addition to these 48 companies, three subsidiaries of large Chinese NOCs—CNOOC Limited, PetroChina and Sinopec Corp.—also published information sufficient for us to compute their total gross revenue. We did not include them in Figure 5 in order to avoid creating confusion by listing revenue totals separately for a subsidiary and for the parent company. In some figures elsewhere in this report we include data for these subsidiaries and their parent companies, where there may be differences worth observing between the parent and the subsidiary.

28 The data for all of the NOCs in Figure 5 are calculated as NOC total gross revenues as a percentage of general government revenues, with one exception. The Nigerian National Petroleum Corporation (NNPC) did not publish data sufficient for us to include a figure on the company’s total gross revenues (including its revenues from oil and gas sales plus revenues from other lines of business). But through Nigeria’s EITI reports, we were able to assemble data on the revenues that NNPC collected from sales of oil and gas, which represents the overwhelming share of its total. As such, and because this sales revenue is equivalent to such a sizable amount of the total revenues of the Nigerian government, we opted to include it here. Thus for NNPC the percentage shown in Figure 5 is revenues from oil, gas and product sales divided by general government revenues.

Several caveats apply to the interpretation of these data. First, as noted above, the international operators draw from a larger geological asset base than the overwhelmingly domestic companies. This may explain the large figures that display for companies such as Malaysia's Petronas and Thailand's PTT. Second, our general government revenue figures come from the IMF's World Economic Outlook database, which provides ambiguous guidance about whether to include NOC revenues under general government revenues. It recommends including state-owned companies only when they are not run as commercial entities.²⁹

In practice, it is difficult to make this distinction, and the IMF has been criticized for inconsistent treatment across countries.³⁰ This is likely a major reason that some NOCs (including domestic companies such as Azerbaijan's SOCAR and Venezuela's PDVSA) show up as collecting amounts equal to more than 100 percent of total public revenues. Finally, there are important NOCs absent from the sample because of a lack of public data disclosure.

Despite these caveats, the data offer several important insights. One of the traditional indicators of a resource-dependent nation is that revenues from natural resources exceed 20 percent of total government revenues.³¹ Adapting this definition, we could say that at least 25 countries were *NOC-dependent* in 2013, meaning that the NOC collected revenues equivalent to 20 percent or more of total government revenues.³² This figure includes the 23 countries shown on Figure 5 to have at least one NOC above the 20 percent threshold, plus Saudi Arabia and Iran, which did not officially disclose their 2013 but which play a dominant role in their oil-dependent economies.³³ Of the 43 countries for which we could assemble the relevant information in the database for 2013, 53 percent were NOC-dependent.

This methodology shows that there were at least 38 countries with an NOC that collected revenues equivalent to more than 5 percent of government revenues in 2013. This underscores the frequency with which NOCs handle very significant public revenue flows, often equal or exceeding those generated through foreign aid or other tax-collecting entities. See Box 4 for an illustration from Nigeria.

The data also show that NOCs exert huge fiscal influence even in countries with relatively small production, such as Vietnam (where NOC revenue collection was equivalent to 49 percent of total government revenues in 2013) and Suriname (79 percent of total government revenues).

29 The Government Financial Statistics Manual 2001 which provides the basis of compilation delineates entities by function and not ownership. In this approach, revenues from a market-oriented SOE are not classified as government revenues, only the transfers they pay to government are. If a large share of their activities is done at non-market price (e.g., they provide fuel subsidies or build roads on behalf of government) then they should be consolidated into government accounts similar to government budgetary units.

30 Wilson Prichard, Alex Cobham and Andrew Goodall, *The ICTD Government Revenue Dataset—ICTD Working Paper 19* (The International Centre for Tax and Development, 2014), 10—11.

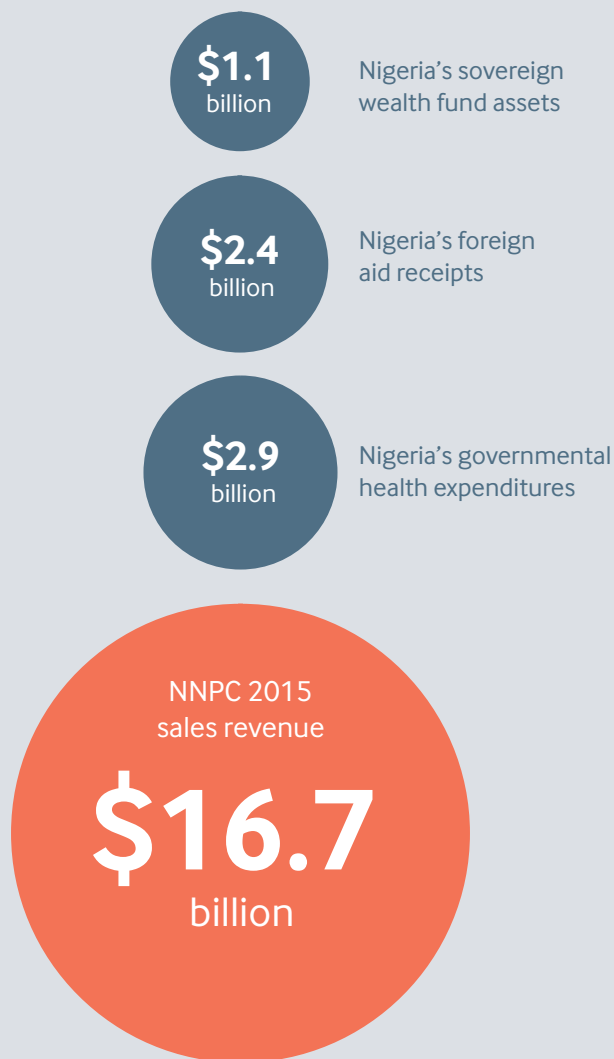
31 Thomas Baunsgaard, Mauricio Villafuerte, Marcos Poplawski-Ribeiro and Christine Richmond, *Fiscal Frameworks for Resource-Rich Developing Countries* (International Monetary Fund, 2012).

32 Note that some countries are home to more than one NOC featured in Figure 5.

33 The financial prospectus and consolidated financial statements released by Saudi Aramco on April 1, 2019 included figures on the company's revenues for 2016, 2017 and 2018, which showed that it was well above the 20 percent threshold for NOC dependency for those years. Both Ecuador (Petroecuador and Petoamazonas) and Russia (Gazprom and Rosneft) are home to two NOCs that each collected revenues equivalent to 20 percent or more of total government revenue in 2013. For purposes of calculating the number of NOC-dependent countries, we include Ecuador and Russia only once each.

Box 4. Putting NOC revenue into context: Nigeria in 2015³⁴

The figure below shows the revenues collected by the Nigerian National Petroleum Corporation in 2015 from its oil and gas sales. These revenues dwarf the amount that Nigeria collects in foreign aid and the accumulated assets in its sovereign wealth fund. These oil sales revenues are more than five times the country's 2015 public expenditure on health.



The foregoing statistics measure NOC gross revenues, from which an NOC must cover its own operational expenditures and investment before remitting revenues onward to the treasury. In Section IV, below, we discuss the choices and practices that influence those transfers.

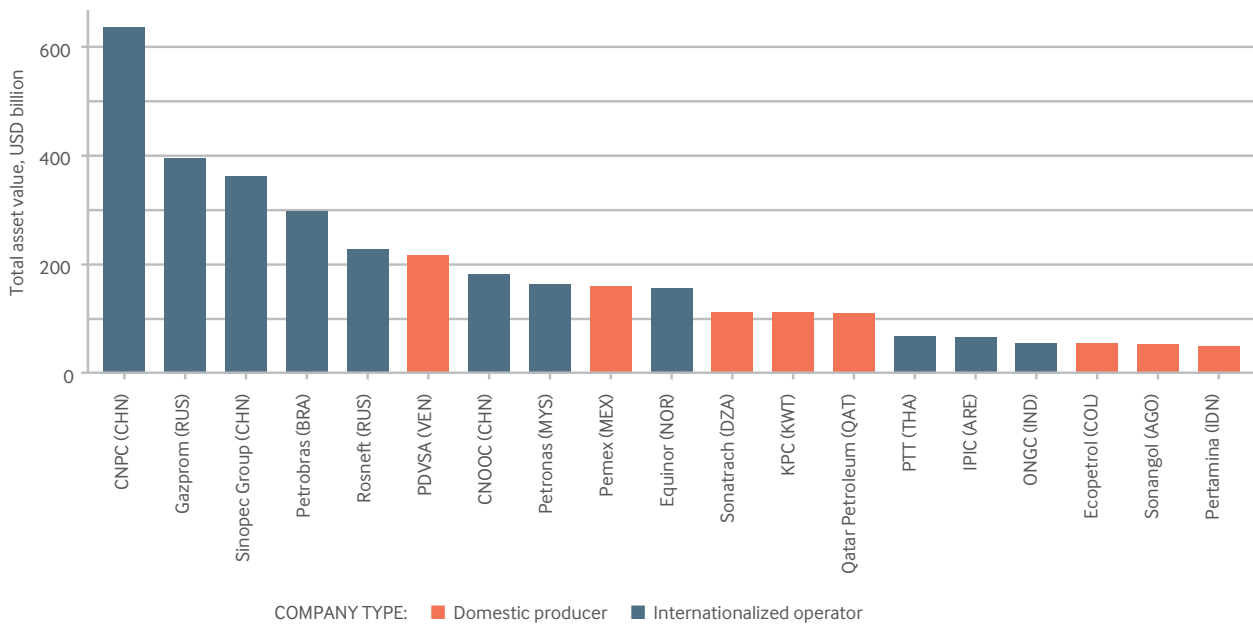
³⁴ Data on fund assets from annual reporting by the Nigeria Sovereign Investment Authority. Data on foreign aid receipts from OECD Development Assistance Committee. Data on government health expenditure from the World Health Organization. All data is for 2015.

C. NATIONAL OIL COMPANY ASSETS AND LIABILITIES

Oil-producing countries have amassed huge national assets in their NOCs. Many NOCs have financed these assets through large debts, sometimes representing a substantial share of GDP.

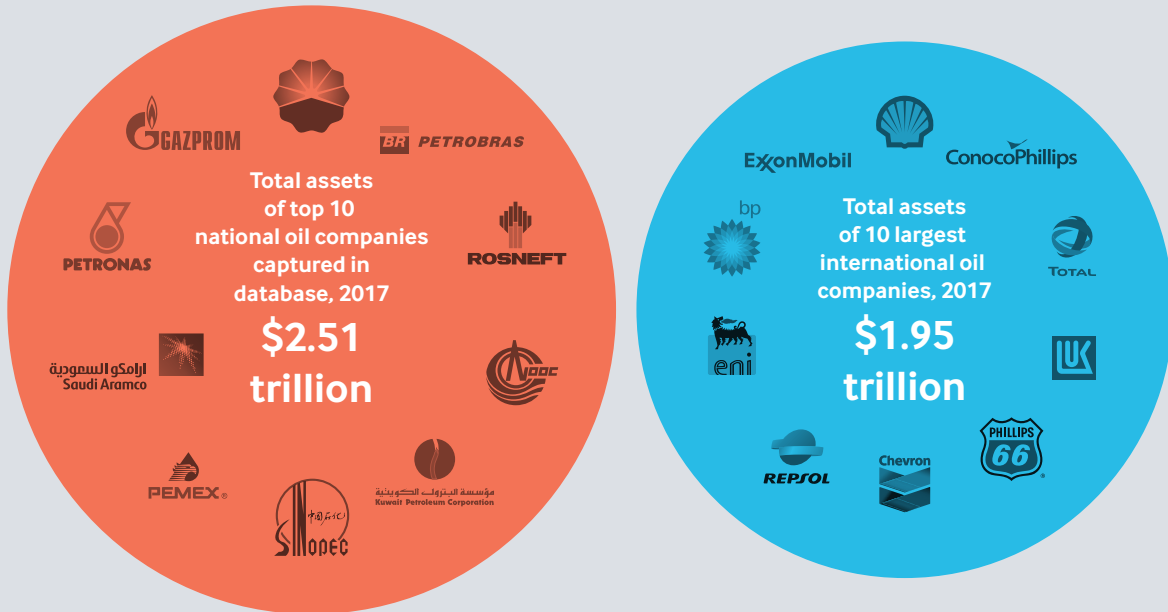
The dataset enables us to more systematically measure the implications of NOC balance sheets for the companies’ home economies. In 2014, before the full impacts of the hydrocarbon price decline had set in, 19 NOCs in our sample reported assets in excess of \$50 billion. (See Figure 6.) Assets can include the estimated value of a company’s oil and gas reserves, as well as its financial investments, infrastructure and equipment, cash, land and intangible assets such as reputation. Companies typically report these assets in their financial statements. Most NOCs with assets this large are internationalized operators that have supplemented their own national resources with investments in petroleum and financial assets abroad. The remainder are large domestic NOCs.

Figure 6. NOCs with total assets greater than \$50 billion, 2014



Box 5. NOC assets in context

For 2017, the combined value of the assets of the NOCs that published sufficient information for us to include them in the database was \$3.1 trillion.³⁵ The top ten NOCs captured in the database reported assets valued at \$2.51 trillion.³⁶ By contrast, the top ten international oil companies reported combined assets valued at \$1.95 trillion for 2017.³⁷



To put these numbers further into context, in 2017 the total assets of multi-lateral development banks were estimated at \$1.5 trillion, and the combined wealth of all U.S. billionaires was approximately \$3.2 trillion.³⁸

35 Some NOCs had not yet reported on key indicators for 2016 and 2017 during the data collection period. As more companies report, we expect these figures for 2017 will rise in future updates to the database.

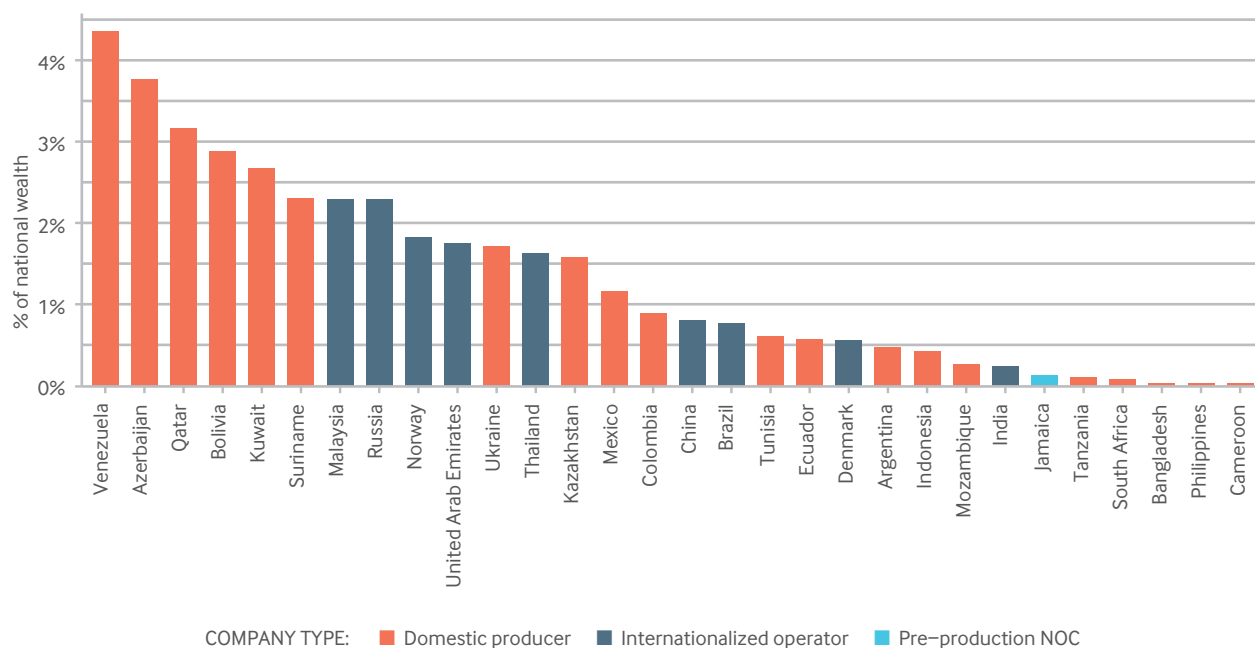
36 The top ten NOCs were China National Petroleum Corporation (headquartered in China), Sinopec Group (China), Gazprom (Russia), Saudi Aramco (Saudi Arabia), Rosneft (Russia), Petrobras (Brazil), China National Offshore Oil Corporation (China), Petronas (Malaysia), Kuwait Petroleum Corporation (Kuwait) and Pemex (Mexico).

37 Data on top ten international oil companies by asset value taken from Fortune, 2017 Global 500, www.fortune.com/global500/2017/list/filtered?sortBy=assets. These companies were: Royal Dutch Shell, ExxonMobil, BP, Chevron, Total, ENI, ConocoPhillips, Lukoil, Repsol and Phillips 66.

38 Data on multi-lateral development bank assets from Scott Morris, *The International Development Finance Club and the Sustainable Development Goals* (Center for Global Development, 2018), www.cgdev.org/publication/international-development-finance-club-and-sustainable-development-goals. This includes assets of the World Bank, European Investment Bank, Asian Development Bank, Inter-American Development Bank, African Development Bank, etc. Data on wealth of U.S. billionaires derived from on Forbes Billionaire List 2017.

The picture changes meaningfully when we look not only at raw asset numbers but at the NOC assets as a percentage of total national wealth, as examined by Manley et al.³⁹ Figure 7 shows NOC assets as a percentage of the World Bank’s estimate of total national wealth, which combines produced capital, natural capital, human capital and net foreign assets.⁴⁰ It suggests that in proportional terms, many countries, such as Azerbaijan, Bolivia, Qatar and Venezuela have concentrated a significant share of their national wealth in domestically-focused NOCs.

Figure 7. NOC assets as a percentage of national wealth, 2014



To a large extent, this concentration of national wealth within NOCs is determined by national dependence on oil and gas reserves themselves. Most of the countries that figure prominently in Figure 7 are heavily resource-dependent. However, these data underscore the magnitude of government decisions about the accumulation of assets and NOC investment strategies, including on NOC spending and investment and reserves booking and license allocation.

NOC spending and investment

NOCs collect large amounts of money, mostly from the sale of crude oil or natural gas. They then decide how to spend this money. Because of their scale, these end up being some of the largest spending decisions made by the state, and yet they usually do not go through typical public sector budgeting process. NOC spending can pay for operations, investment, savings for the future and transfers to the state. Each of these decisions impacts whether the NOCs maximize returns on the public assets

39 Manley et al., *Stranded Nations*, 12—13.

40 World Bank, *The Changing Wealth of Nations*, 30 January 2018, www.worldbank.org/en/news/infographic/2018/01/30/the-changing-wealth-of-nations.

they manage. To the extent that NOC spending reduces the funds that reach the treasury, company expenditure also represents a choice to reinvest in the petroleum sector rather than immediately invest in other public goods.

Reserves booking and license allocation

Governments must make fundamental decisions about how to divide responsibility for bringing oil and gas out of the ground between NOCs and IOCs. Overwhelmingly concentrating natural assets and/or responsibility for developing reserves in the NOC amplifies risks if the company manages assets ineffectively.⁴¹

Many NOCs also take on large debts. This may be surprising to casual observers, since NOCs have access to major flows of funds, accumulate assets through grants by their governments of ownership (free equity) of hydrocarbon resources, and can retain earnings from past operations. But as with many complex businesses, NOCs often borrow, in order to finance their operations or new investments. In other cases, NOCs borrow to meet political agendas, or to maintain large discretionary expenditures. NOC borrowing may be in the form of loans from banks (e.g., Ghana's GNPC),⁴² other oil companies with which they are working (e.g., Nigeria's NNPC), oil-backed loans from other NOCs or traders (e.g., Kazakhstan's KazMunayGas),⁴³ another government entity (e.g., Sonatrach borrows from Algeria's Central Bank) or by issuing corporate bonds (e.g., Russia's Rosneft).⁴⁴

In many cases, NOC debt represents a component of a strategic corporate approach. Analysts, including Chatham House's Valerie Marcel, have found that having to raise debt financing, especially market financing, can provide important incentives for NOCs to develop strong corporate governance practices.⁴⁵ Still, for several reasons, it is important to pay close attention to NOC debt when analyzing the company's and the economy's sustainability. First, these debts represent a future cost that must be kept in mind when evaluating the wealth that the NOC has accumulated. Second, they also add to the overall public debt, and hence may contribute to risk of the country's overall debt sustainability.⁴⁶ Third, they can be complex and opaque, therefore hindering the work of oversight actors who want to evaluate whether these loans advance public interest.

As with many complex businesses, NOCs often borrow, in order to finance their operations or new investments. In other cases, NOCs borrow to meet political agendas, or to maintain large discretionary expenditures.

41 Manley et al., *Stranded Nations*, 12.

42 HSBC, Standard Chartered, Deutsche Bank.

43 Wall Street Journal, "China, Kazakhstan Sign Loan-for-Oil Deal," 18 April 2009, www.wsj.com/articles/SB123996097676128865.

44 CBonds Financial Information, cbonds.com/emissions/issue/11956.

45 For a discussion, see John Mitchell, Valerie Marcel and Beth Mitchell, *Oil and Gas Mismatches: Finance, Investment and Climate Policy* (Chatham House, 2015).

46 From a straightforward legal perspective, governments are not always responsible for repayment of debt that NOCs take on without a sovereign guarantee. Common-law and arbitration decisions, notably in *La Generale des Carrieres et des Mines versus FG Hemisphere Associates LLC arbitration* have found that there is a presumption that state and SOEs should be treated as separate entities not responsible for one another's debt in the absence of "quite extreme circumstances" demonstrating that the SOE has no real identity separate from the state. Donald Robertson and Leon Chung, *Enforcing Awards Against States and State-Owned Entities*, Herbert Smith Freehills LLP, July 27, 2012. Several factors muddy this formalistic distinction between SOE debt and state debt sustainability in the case of NOCs, however. As we discuss in detail in this paper, NOCs bear responsibilities for collecting large shares of public revenue, and the repayment of NOC debts can thus serve to divert important fiscal flows before they ever make it to the treasury. Moreover, in practice some NOCs can become "too big to fail," and can require costly bailouts by the treasury even in the absence of formal sovereign liability.

While governments in theory intend NOCs to generate government revenue, they can also become a drain on public resources. For example, Kazakhstan's KazMunayGas was unable to service its debt and required state support in 2015. Another interesting case is Russia's Rosneft, which borrowed heavily in recent years. Both the Russian government and Rosneft are under international sanctions, but the company was able to acquire credit from abroad using intermediaries.⁴⁷ The debts of even small, non-producing NOCs can create challenges for their governments—Namibia's NAMCOR needed a \$260 million bailout from the Namibian government in 2010 when it was unable to make payments on a fuel import contract the company had signed with Glencore.⁴⁸

In principle, according to the IMF's Government Finance Statistics Manual, NOC debts should be accounted for as off-budget when the company acts as a commercial entity.⁴⁹ In practice, the approach is mixed, reflecting the fact that many NOCs are not solely commercial actors. States sometimes allow their NOCs to run while incurring losses, and companies are either explicitly or implicitly state guaranteed. There are number of countries where the government did not consolidate NOC debt into government accounts and debt statistics for several years, but then included it when the details of the debt was uncovered. For example, in Bolivia the IMF notes: "More than half of the investment by the national hydrocarbon (YPFB) and electricity (ENDE) companies is carried out by their subsidiaries which are not included in the consolidated fiscal accounts. To manage associated risks, the financial operations of all state-owned enterprises (SOEs) should be included in the fiscal accounts of the NFPS and subjected to public audits."⁵⁰ In Chad, it was revealed that the Société des Hydrocarbures du Tchad had accumulated large debt, which was not on the government's books. It was only in requesting financial assistance from donors that the company unveiled its debt.⁵¹

The database allows us to analyze NOC long-term liabilities across companies and time.⁵² Figure 8 examines the size of NOC liabilities in proportion to the overall economy of their home countries. It depicts companies for which data are available and where NOC long-term liabilities exceed 2 percent of GDP. It shows that there are 22 such companies in the sample, and 18 of them with long-term NOC liabilities over 5 percent of GDP.⁵³ This is a very simple measure of the risk NOC liabilities present for overall debt sustainability. Our dataset identifies many such

47 Jake Rudnitsky and Donal Griffin, "Rosneft Takes Irish Detour Around Sanctions with Moscow Bank," *Bloomberg*, 8 May 2018, www.bloomberg.com/news/articles/2018-05-08/rosneft-takes-irish-detour-around-sanctions-aided-by-moscow-bank.

48 Jo-Mare Duddy, "Glencore Takes off Gloves for Namcor," *The Namibian*, 11 November 2010, www.namibian.com.na/index.php?id=72651&page=archive-read.

49 International Monetary Fund, *Government Finance Statistics Manual 2014* (2014).

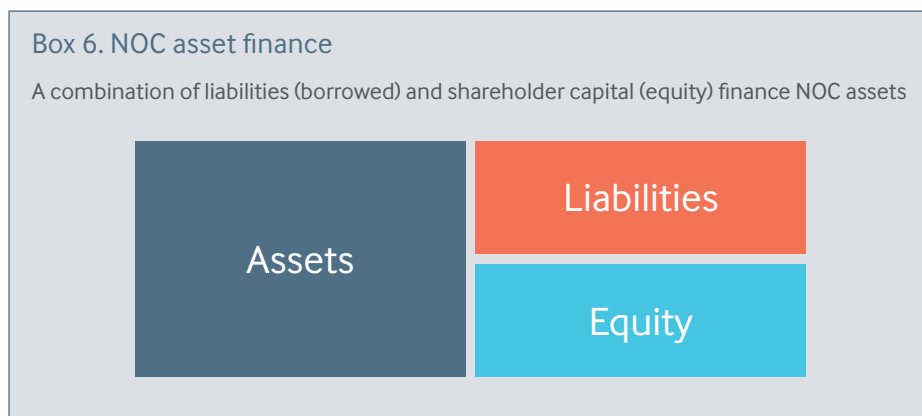
50 International Monetary Fund, *Bolivia: 2017 Article IV Consultation—Press Release; Staff Report; and Statement by the Authorities of Bolivia, Country Report No. 17/395* (2017), 13.

51 Julia Payne and Madjiasra Nako, "IMF Credit to Chad Delayed Over Glencore Oil Debt," *Reuters*, 24 November 2017, www.reuters.com/article/us-glencore-chad-imf/imf-credit-to-chad-delayed-over-glencore-oil-debt-idUSKBN1D0160.

52 Long-term liabilities are obligations with a maturity beyond the given fiscal year, typically loans and bonds. This is in contrast with current liabilities, due within the year, which includes moneys owed to suppliers, traders, etc. that are often matched with similarly-sized current assets (when suppliers, traders owe the NOC) and may accumulate naturally given the time lags involved in these transactions.

53 The total number of NOCs meeting this threshold is almost certainly larger than what the publicly available data that served as the basis for this analysis reflects. We were able to compile a statistic on long-term liabilities for 37 NOCs in 2015.

NOCs, a large majority of them domestic producers, with some companies such as Venezuela’s PDVSA and Angola’s Sonangol having debt in excess of 20 percent of GDP. Though there is no one universal threshold for debt sustainability, these are huge figures given that emerging market and developing countries have on average total public debt of 50 percent of GDP, a level that commentators have flagged as unsustainable.⁵⁴ Figure 8 also depicts the level of equity (the shareholder’s capital invested in the firm) in contrast to liabilities for each of these companies. It allows us to identify companies which are *highly leveraged*, i.e. where long-term liabilities exceed equity.⁵⁵



Examples of such leveraged companies are the United Arab Emirates-headquartered TAQA and Russia’s Rosneft, both internationalized companies able to raise financing on international bond markets. Mexico’s Pemex stands out as a company where equity is negative: liabilities are so large that they exceed assets. In the case of privately-owned firms, this would indicate the company is insolvent and at risk of shutting down, but in the case of state-owned companies it sometimes means that a government financed bail-out will be necessary.⁵⁶ But maintaining a healthy balance of debt to equity is not always enough. PDVSA is undergoing serious financial woes, being unable to service 35 billion in debt, even though it is the holder of much larger assets through equity. Its 335 billion barrels of oil equivalent in reserves is mostly locked under the ground, and the company was unable to access it as oil production fell amidst years of mismanagement and the combined impacts of the economic crisis and sanctions.⁵⁷

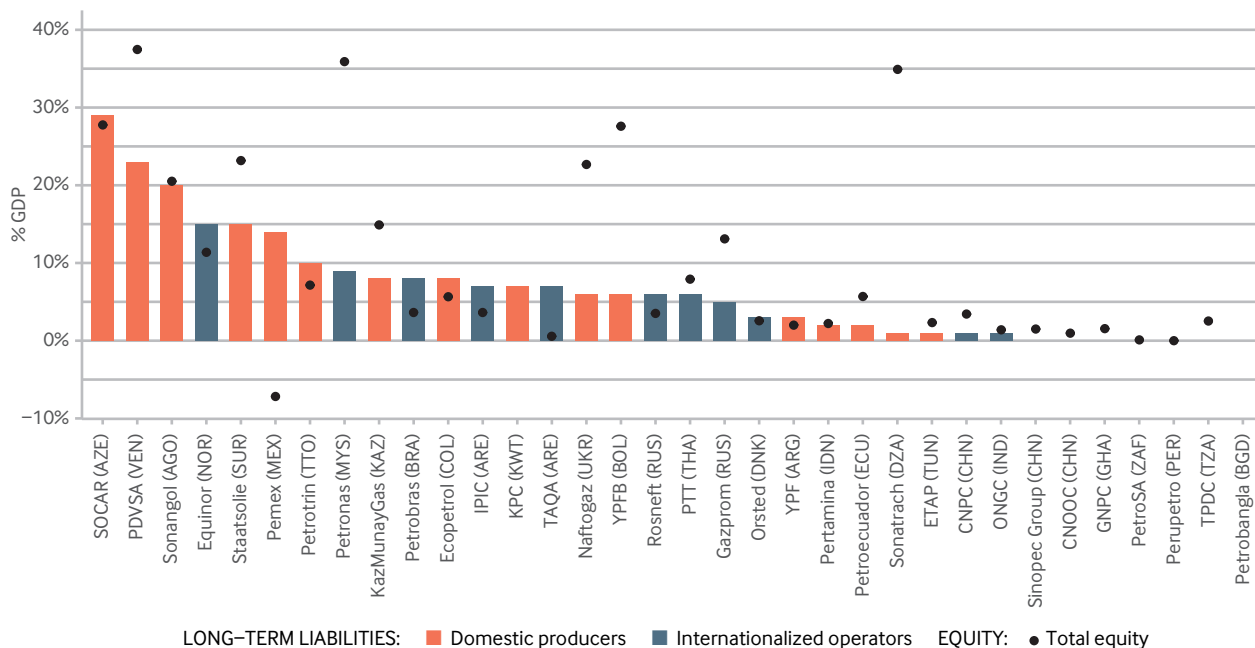
54 International Monetary Fund, *World Economic Outlook Database*, October 2018, www.imf.org/external/datamapper/GGXWDG_NGDP@WEO/OEMDC/ADVEC/WEO_WORLD. A 2018 UNCTAD blog raised alarm bells about the risks associated with heavy national debt levels in low-income countries in particular. UNCTAD, “Debt Warning Lights Flash for Poorest Countries, Experts Say,” 3 May 2018, unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1742.

55 In accounting terms, total assets of a firm are financed from either liabilities (borrowed) or by equity (the shareholder’s capital invested in the firm).

56 In 2016, the Mexican government gave Pemex a \$4.2 billion bailout to help the company manage its debts. Jude Webber, “Mexico Bails Out Pemex, But Is It Enough,” *Financial Times*, 13 April 2016, www.ft.com/content/d2162139-2411-3157-90ee-46e3fa9b7665.

57 As of 2015, the company had the largest level of total reserves of any NOC in our database. As of January 2019, PDVSA appeared likely to default on its \$35 billion debt: “Venezuela’s PDVSA, in default, says total debt fell in 2018” Reuters, 23 January 2019, www.reuters.com/article/us-pdvsa-debt/venezuelas-pdvsa-in-default-says-total-debt-fell-in-2018-idUSKCN1PG2UQ.

Figure 8. Long-term NOC liabilities and equity as a percentage of GDP, 2015⁵⁸



When analyzing the long-term liabilities of an NOC, it is useful to contrast them not only with the size of the overall economy, but also the importance of the oil sector within that economy. This can help us recognize how significant the debts are *vis-à-vis* the amount of money the state earns each year from oil. Most NOCs in our sample generate revenues primarily from domestic upstream activities, where we presume that future domestic oil revenues are expected to repay long-term loans. We therefore calculated the ratio of long-term NOC liabilities to total government resource revenues.⁵⁹ This shows how many years it would take for government to pay down NOC debt if it used all current resource revenues for this purpose.⁶⁰

There are several NOCs whose long-term liabilities are multiple times that of annual government resource revenues, including Colombia’s Ecopetrol (3.8 times), Indonesia’s Pertamina (1.8 times) and Suriname’s Staatsolie (4.6 times). Therefore, Colombia, for example, would need to devote all of the government’s natural resource revenues for four years to pay off Ecopetrol’s debt.

While we have highlighted companies with large debt, some companies have negligible long-term liabilities (e.g., Algeria’s Sonatrach). In order to evaluate the appropriate debt carrying capacity of a company, analysts need to look at how NOCs are using loans, and whether companies invest them into developing resources and operations or in financing quasi-fiscal activities.

58 Displaying companies where long-term liabilities exceed 2% of GDP.
 59 We obtained total government resource revenue data from the International Centre for Tax and Development, *The Government Revenue Dataset*. It includes revenues from oil and mining.
 60 The metric is in some way analogous to the total debt to revenue ratio widely used for overall government debt sustainability analysis.

IV. Benchmarking national oil companies by value addition

In part because NOCs control large amounts of public revenue and spending, it is critical for governments and oversight actors to rigorously benchmark the performance of their NOCs.⁶¹ In many countries where NRGi has worked on SOE governance, governments have struggled to devise consistent benchmarks because their NOCs play a complex set of roles and because of the lack of strong comparative data over time and across companies.⁶² Our dataset enables better-informed benchmarking.

A. NATIONAL OIL COMPANY BENCHMARKING VARIES BY CONTEXT

We begin this benchmarking discussion with a central observation reinforced by our research: the catch-all term “national oil company” encompasses a wide range of entities with varying roles, ambitions, resources and experience. To draw a metaphor, if all NOCs were vehicles, it would be important to distinguish between sedans, cargo ships and spacecraft, and to assess their performance separately. One might measure a cargo ship’s performance by the load it can carry, a sedan by its comfort and a spacecraft based on the distance it can travel. Similarly, all NOCs should have a goal of maximizing value to citizens, but exactly what that means may differ from one company to another. “Success” for the Petroleum Corporation of Jamaica—a non-producing NOC currently managing upstream exploration processes while importing fuel for the domestic market—necessarily looks different than “success” for a global upstream giant such as Malaysia’s Petronas.

Our approach of sorting NOCs into comparable classifications builds on the work of other analysts. David Victor et al. divided NOC responsibilities into “oil functions” (including revenue generation, commercial profit and long-term geological management) and “non-oil functions” (including an array of things such as employment, fuel subsidies, social service provision and funding private patronage).⁶³ Silvana Tordo distinguished between the goals of hydrocarbon value maximization, economic development/linkages and the state’s interests abroad, and argued that effective analysis required context-specific assessment reflecting geography, state context and sector/institutional framework.⁶⁴ Patrick Heller and Valérie Marcel argued that it is important to compare companies in new petroleum-producing countries against each other, rather than comparing new or small NOCs against large, well-established companies.⁶⁵ Several analysts have worked to create specific analyses of NOCs based on whether or not they play a regulatory role in the

61 For a more thorough discussion of the importance of solid benchmarking, see Tordo, et al. *National Oil Companies and Value Creation*, OECD, *Guidelines on Corporate Governance of State-Owned Enterprises*, 41; Natural Resource Governance Institute, *Guide to Extractive Sector State-Owned Enterprise Disclosures* (Natural Resource Governance Institute, 2018). resourcegovernance.org/sites/default/files/documents/guide-to-extractive-sector-state-owned-enterprise-disclosures_0.pdf.

62 In *Reforming National Oil Companies: Nine Recommendations* (Heller et al., 2014), NRGi examines the impact of unclear mandates on NOC performance and governance.

63 David G. Victor, David R. Hults and Mark C. Thurber, “Major Conclusions and Implications for the Future of the Oil Industry,” in David G. Victor, David R. Hults and Mark Thurber, eds., *Oil and Governance: State-Owned Enterprises and the World Oil Supply* (Cambridge University Press, 2012), 899—904.

64 Tordo, et al., *National Oil Companies and Value Creation*, 38—40.

65 Heller and Marcel, *Institutional Design in Low-Capacity Oil Hotspots*.

management of their oil sectors, including Paasha Mahdavi, who has built a sortable dataset that categorized 81 current and historical NOCs based on whether or not they regulate the sector and have the authority to award contracts.⁶⁶

As we analyzed our data, it became clear that categorizing NOCs would be important in order to derive policy-relevant conclusions. In doing so, we sought to take advantage of our data in order to create objective peer groups. Below, we list some of the categories that we use to separate NOCs for comparative purposes, discussed in more detail in the *National Oil Company Database: Methodology Guide*.

- **Production profile** divides NOCs based on the size of production and whether it is internationalized or overwhelmingly domestic.
- **Region** enables comparison of an NOC to others headquartered in same geographic region.
- **Share listing** reflects that some NOCs have listed a portion of their shares on public stock exchanges. Looking at listed versus non-listed NOCs can provide insights into company performance and priorities.
- **Operator status** reflects that some companies serve as the “operator”—the technical lead responsible for managing the production process—on substantial shares of their oil. Others operate very little to none of their production.
- **Audit status** divides NOCs based on whether the report(s) that provided the basis for population of the database was subject to independent audit.

Along with these basic breakdowns, assessing how much value an NOC is delivering to citizens requires a nuanced view of the NOC’s assigned role(s) and how the company and government define (explicitly or implicitly) “value.” Our analysis led us to the typology depicted in Figure 9, which provides a basis for using data to assess NOC performance and the policies governments employ to manage their NOCs.

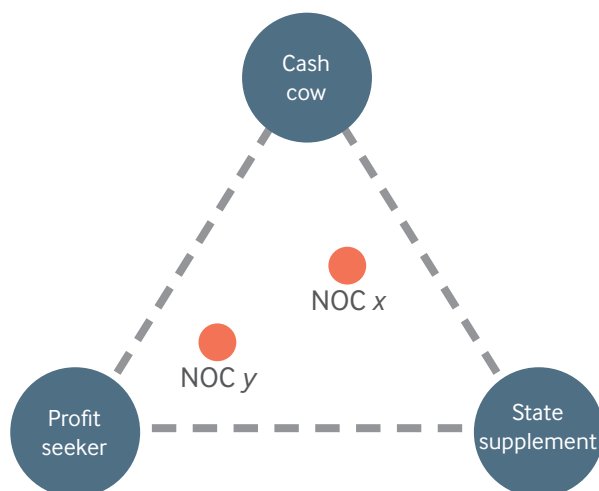


Figure 9. NOC typology

66 Mahdavi, “Institutions and the ‘resource curse.’”

We observe that NOCs pursue three stylized types of goals:

Cash cow

An NOC in this category prioritizes delivering revenues to the treasury. It exists primarily to help the state monetize its oil resources, ensure that the sector runs well and transfers as large a share of oil revenues as possible to the state. Cash cows tend to be more focused on capturing and transferring today's rents than engaging in risk-taking investment that could either consume those rents without return (if the investments fail) or generate long-term company growth (if the investments succeed).

Profit seeker

An NOC in this category prioritizes commercial success, in the form of profit and the development of commercial skills and efficiency. If successful, a profit seeker NOC will deliver long-term financial returns to the state (and its other shareholders, if present) in the form of dividends and income taxes, but its short-term incentives may include a desire to minimize payments to the state in the pursuit of a growth strategy. A profit seeker will likely be interested in increasing its reserves over time. Companies that list some shares on public stock exchanges are more likely to have profit seeker tendencies, since they must appeal to the bottom lines of their non-state investors. Internationalized NOCs may also be more likely to be profit seekers, since their orientation is fundamentally growth-oriented, and they usually need to compete for access to projects outside their home jurisdiction. Listings and international operations can, therefore, serve as rough proxies for this category.

State supplement

An NOC in this category prioritizes delivering public services rather than commercial ones, performing roles similar to those typically played by traditional government ministries. This category includes companies that provide services to citizens in the energy/petroleum sectors—including fuel subsidies, domestic importing and refining and energy. It also includes companies charged with providing other social services, building infrastructure, employing large numbers of citizens and promoting the local private sector. In contrast to cash cows, state supplement NOCs do not prioritize the maximization of fiscal transfers, instead focusing on delivering value to citizens through more direct means.

We do not systematically assign every NOC in our database to one of these categories, because most NOCs do not fit neatly into just one category and in-depth research into the motivations of all 71 in the database was beyond our scope. But we use these categories in the analysis that follows as tools for interpreting the data and use some of the rough proxies as described above which can help in a broad classification of companies along these lines.

A company's location within the triangle of Figure 9 determines how we should interpret data about that company. These different NOC goals impact the results that matter most to states and NOCs. A cash cow should prioritize transfers to the state above other factors. A profit seeker should emphasize traditional commercial performance metrics, including cost efficiency. A state supplement may have a range of goals depending on the priorities of its influencers—from high employment levels (which could impact various productivity measurements) to growing a local

industry or providing cheap fuel to consumers (which could impact cost efficiency and profit measurements). Table 3 lays out some of the implications of these lenses for data interpretation.

Type	Example approaching this type	Priority indicators for measuring performance
Cash cow	SNPC (Republic of Congo)	Total transfers to the state; various transfer ratios (per-barrel, percentage of revenues, etc.); overall government take from the sector (since these NOCs should help regulate/monitor IOCs and maximize revenues collected from them)
Profit seeker	Equinor (Norway)	Traditional financial/operational KPIs (profitability, return on capital employed, cost efficiency, etc.); dividend payments; reserve replacement
State supplement	SOCAR (Azerbaijan)	Depends on specific goals: can be, e.g., employment; total spend in the domestic economy; refinery through-put; growth of local companies; household energy availability (many of these indicators are not reported systematically and thus are not included in our database)

Table 3. Typology of role-based distinctions and their implications for benchmarking NOCs

B. BENCHMARKING NATIONAL OIL COMPANY FISCAL TRANSFERS TO GOVERNMENT

The large space that NOCs occupy in fiscal affairs and national wealth means that decisions and rules on how NOCs transfer money to the state (and, in some cases, vice versa) are important. Many countries receive the majority of their oil revenues via their NOC. As such, decisions about how much an NOC spends and invests versus how much it transfers to the treasury have a huge impact on the development impacts of oil and gas. Due to the variety of NOCs that exist, there is no universal answer to the question of *how heavily an NOC should be taxed*.⁶⁷ But examining the data on the forms and levels of transfers that have occurred can provide substantial insights into the implications of policy choices on revenue flows.

i. Governance of state-NOC transfers

Our research sought to systematically capture the fiscal mechanisms by which NOCs transfer money to the state. We created categories to measure the most common transfer mechanisms. Due to the inconsistency in terminology across countries, this required developing standard definitions and applying them to various country-specific mechanisms, as follows:

Bonus payments

Bonus payments are payments by NOCs to the state for the right to access acreage or upon the achievement of certain upstream milestones. Common in oil and gas contracts with private partners, but our research revealed them to be relatively rare for NOCs.⁶⁸

⁶⁷ We use the term “taxation” broadly, as a shorthand to capture the range of instruments by which an NOC transfers money to the state. This includes forms of transfers that are not taxes in a purely legalistic sense, such as royalties, fees and dividends.

⁶⁸ Bonus payments by NOCs may be rare in large part because NOCs in many countries received privileged or preferential access to oil and gas acreage.

Royalties

Royalties are paid by the NOC to the state in exchange for the right to extract resources from the subsoil. Royalties are often structured as a percentage of the value of gross production, sometimes after deduction of transportation fees or other delineated charges.

Dividends

Dividends are paid by the NOC to the state shareholder out of company earnings or reserves.

Income tax

Income taxes are payments to the state made as a percentage of the company's income, once NOCs have deducted allowable expenses. In some cases, the NOC pays income tax according to a similar set of rules that governs private entities. We also included in this category special profits taxes levied either on the NOC or on oil companies more broadly, if they were levied on net profits.

Proceeds of state profit or equity petroleum

NOCs are often responsible for selling portions of oil and gas production, either via their ownership of equity in joint ventures with private partners or as recipients of the state's share of oil/gas in production-sharing contracts. Some NOCs transfer the proceeds of these sales directly to the state, sometimes after deducting a fee.

Other mechanisms

Some NOC transfers were difficult to classify according our core transfer categories. These ranged from relatively small fees or duties (Venezuela's PDVSA, for example, pays a "surface tax") to larger amounts arising from mechanisms outside the traditional tax tools (Azerbaijan's SOCAR "is periodically mandated to make direct cash contributions of finance construction and repair works for the government").⁶⁹ We also included transfers in this category where the rule or system governing the transfer was not noted in the report.

As Table 4 illustrates, there is significant variety in the relative importance of these different kinds of mechanisms in NOC-state fiscal relationships. It shows the number of companies for which each fiscal mechanism represented the largest single vehicle for NOC-government transfers.

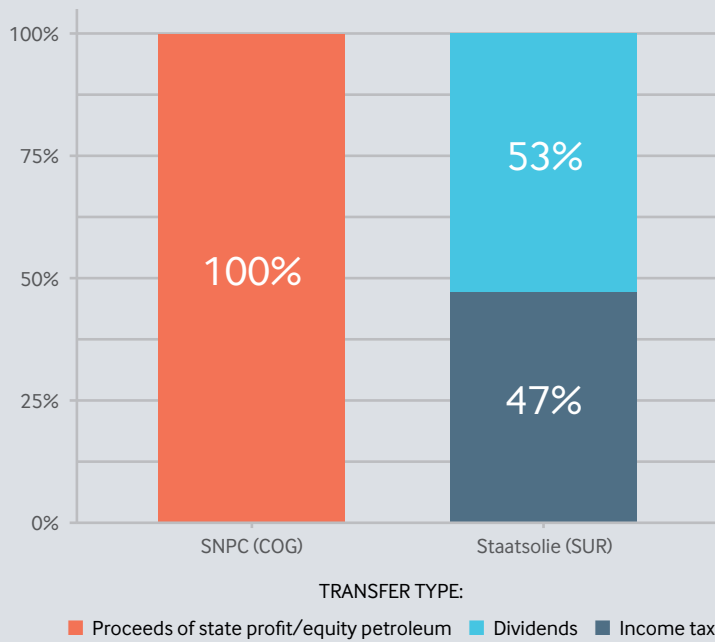
69 SOCAR, *2016 Consolidated Financial Statements*, www.socar.az/socar/assets/documents/en/socar-financial-reports/2016.pdf, 68.

Table 4. Prominence of fiscal mechanisms across NOCs, 2013⁷⁰

Fiscal instrument	Percentage of reporting companies reporting a transfer using the mechanism	Percentage of reporting NOCs for which the mechanism was the single biggest transfer	Notes
Bonuses	2%	0%	Not a major transfer for most NOCs
Dividends	47%	11%	Dividends are most common among listed NOCs and internationalized operators.
Income tax	85%	28%	Income tax payments tended to be most significant among internationalized NOCs and large domestic producers.
Proceeds of state profit/equity petroleum	26%	15%	5 of the 7 companies for which this was the biggest transfer are domestic producers with small (under 100,000 boe/day) production levels, which corresponds in many cases with a cash cow approach. 6 of these 7 companies are from sub-Saharan Africa (partial overlap with small domestic producers), where the cash cow approach has been prevalent.
Royalties	32%	11%	No clear pattern among five companies for whom royalties was the biggest single payment stream.
Other mechanisms	66%	36%	Wide range of mechanisms grouped into this "other" category.

70 We used 2013 (a high-price year) for this table because there were many data points for that year. Measuring the same data in 2015 (a low-price year) did not produce dramatic differences in the prevalence different fiscal mechanisms.

Box 7. Split among fiscal instruments: two examples



These examples highlight the mix of fiscal instruments that can prevail for different kinds of NOCs. The Republic of Congo’s Société Nationale des Pétroles du Congo (SNPC) is an archetypical cash cow, with little operational activity of its own and revenue (overwhelmingly through oil sales) equivalent to 75 percent of all government revenue in 2013. SNPC’s transfers to the state are almost exclusively in the form of direct transfers of sales revenues into various government accounts. Suriname’s Staatsolie produces small quantities of oil (around 16,000 barrels per day in 2013) and aspires to be a profitable commercial entity with management practices mirroring those of the private sector. Suriname extracted revenues from the company exclusively via profit-oriented fiscal tools—income tax and dividend.

Table 4 and Box 7 suggest that rules on transfers match the primary goals for a company in some cases, but not all. In order to maximize NOC success at generating value, it is important that governments tailor these rules to reflect the state’s goals for the NOC and the country’s prioritization among the different value-maximization types. For a cash cow, this may mean an emphasis on sizable gross-basis transfers, including royalties and transfers of the proceeds of state production, which can provide more predictable revenue flows that are less susceptible to being reduced by NOC risk-taking. For profit seekers, the state may emphasize profit-based mechanisms including income taxes and dividends, which reinforce company incentives to invest in profitability and efficiency. For state supplements, the picture is more mixed, but the state may be willing to sacrifice some level of fiscal flows in the pursuit of other priorities. Of course, this is not as simple in practice as it is on paper, not least because many NOCs play

mixed roles and have muddy mandates. In some cases, the failure of an NOC or its government to prioritize among possible goals can result in mismatched expectations and difficult relationships between governments and their NOCs.⁷¹

Digging in to dividend payments illustrates how this kind of mismatch looks in practice. Many NOCs rarely or never pay dividends to their state shareholders. This was true even in high-revenue years such as 2013, when only 47 percent paid dividends and published information on their government transfers (22 of 47).⁷² On its face this figure is surprising, given the high prices and the profit-oriented rhetoric of many NOCs.

Many NOCs rarely or never pay dividends to their state shareholders.

Looking at the presence or absence of a dividend through the lens of our role-based typology provides further insight. One would expect profit seekers to have generated returns on their long-term investments sufficient to pay a dividend in a boom year.⁷³ Indeed, our closest proxies for “profit seeker-ness” appear to suggest that this was the case in 2013. (See Table 5.) Eleven of the twelve partially-listed NOCs—mandated to deliver financial returns to their state and non-state shareholders and generally considered to prioritize corporate governance and efficiency—paid dividends to the state in 2013.⁷⁴ Of the NOCs with no listed shares, only 31 percent paid a dividend. The same pattern holds, though less dramatically, if we treat production profile as a proxy for “profit seeker-ness.” Sixty-three percent of internationalized operators paid a dividend in 2013, versus 39 percent of NOCs overwhelmingly concentrated in their domestic markets.⁷⁵

71 In analyzing “state-NOC interactions” and the principal-agent problems that frequently characterize them, Victor et al. emphasize the importance of clarity of goals and unified transmission of those goals in the control systems that govern NOC actions. Victor et al., “Major Conclusions and Implications for the Future of the Oil Industry,” *Oil and Governance*, 905—911. This analysis finds its echoes in the practically-oriented work led by Chatham House as part of the *Good Governance in the National Petroleum Sector* series, which emphasizes the importance of making difficult decisions around strategic priorities, building intra-governmental and public consensus around those priorities, and orienting rules to those priorities. Lahn, et al., *Good Governance of the National Petroleum Sector*, 5—6; Valerie Marcel, ed., *Guidelines for Good Governance in Emerging Oil and Gas Producers 2016* (Chatham House, 2016), 13—16.

72 Understandably, the incidence of dividend payment declined further as oil prices and company prices declined. In 2015, only 42 percent of reporting companies noted a dividend payment (18 of 43).

73 Note that this does not necessarily hold true for profit seeker NOCs in new oil producers or pre-production countries, which may be investing upfront in developing skills and capabilities in the hopes of future dividends.

74 The only listed NOC in our sample that did not pay a dividend in 2013 was the UAE-based TAQA.

75 The theory behind this use of production profile as a proxy is that internationalized operators have, in many instances, the strongest incentives to develop the kinds of commercial efficiencies that analysts recommend as a principal goal for state-owned enterprises. Because they often must compete for project rights in other countries, internationalized operators face market pressure to develop efficient operations and to avoid too many costly non-core activities. For a good articulation of the value of subjecting SOEs to commercial terms and constraints, see OECD, *Guidelines on Corporate Governance of State-Owned Enterprises*, 47—50. For a specific discussion of the value of commercial incentives for natural resource sector SOEs, see Natural Resource Governance Institute, *Natural Resource Charter—Second Edition*, 23. Among internationalized operators, the only NOCs in our sample that did not pay a dividend in 2013 were China’s CNOOC, CNPC and Sinopec (and each of these companies had listed subsidiaries that did pay dividends), Denmark’s Orsted (then known as Dong Energy) and the UAE-based International Petroleum Investment Corporation (IPIC).

Peer group	Percentage paying a dividend
Listed versus non-listed	
Listed (12 companies)	92%
Non-listed (35 companies)	31%
Production profile	
Internationalized operators (16 companies)	63%
Domestic companies (31 companies)	39%

Table 5. Percentage of NOCs that paid a dividend in 2013, by peer group, among companies reporting data on transfers to the state

Does it matter that many NOCs do not pay dividends, even in times of plenty? For some NOCs, especially cash cows and state supplements, it may not. For a cash cow, various measures of total transfers between the company and the state may be more valuable than whether those transfers represent dividends *per se*. For a state supplement, non-financial objectives for the company may take precedence over profit-determined financial transfers.

However, if an NOC purports to be a profit seeker, as most do, then a persistent lack of dividend payments may mean one of two things. First, it may mean that the company is failing at the goal of becoming a profitable entity, even during high price periods. Second, it may mean that the company is not truly a profit seeker, or at least that profit orientation is not a major priority for the company or its government shareholders. For this latter set of companies, the mismatch between profit seeking rhetoric and reality may require reassessing the company’s role, the fiscal rules to which it is subject or the company’s spending/investment patterns. After all, governments allow many NOCs to retain and spend large portions of their gross earnings because, at least on paper, this spending is supposed to allow them to generate dividends for the state in the long-term. Governments may seek to avoid the scenario in which the NOC claims to be a profit seeker—and can spend public revenues accordingly—but never delivers actual profits.

Box 8. Angola’s Sonangol: Is it a profit seeker?

The website of Angola’s Sonangol highlights the company’s goal to “become a benchmark in the international market and, in particular, the African market and fulfill the dual task of performing as an integrated and competitive company and act as a transforming force in Angola.”⁷⁶ The company’s statements, such as this one, combine the logic of cash cow, profit seeker and state supplement roles. Over the six years for which we had data, Sonangol transferred an average of 64 percent of its annual gross revenues to the treasury. An overwhelming majority of these transfers—91 percent of the total transfers over the period—came in the form of direct transfers by the company of the proceeds it collected via sales of state oil. The company reported no dividends during the period. These data provide an important window into the priorities of the Angolan state vis-à-vis Sonangol. The country’s fiscal mechanisms direct large shares of oil to Sonangol via production-sharing and state equity. Sonangol then transfers most revenues from its sales of that oil directly to the state via a direct transfer minus a seven percent management fee.⁷⁷ The sale revenues constitute a large share of the company’s total revenues and transfers, with its profit seeking activities representing a much smaller share. These data suggest that Sonangol acts more like a cash cow, despite positioning that suggests otherwise.

ii. Variation in NOC payments to government

As is the case when analyzing the mix of fiscal instruments, there is no one-size-fits-all approach to analyzing the overall *level* of NOC fiscal transfers to government. Our dataset includes several core metrics that can help with analyzing how heavily governments tax their NOCs.⁷⁸ We focus on two of these metrics here.

Transfers to the state (in US dollars) per BOE

This measure divides a company’s total transfers to the state by the company’s total production, with gas production converted into barrels of oil equivalent. Its principal advantage is simplicity. It is in some sense the cleanest, most intuitive measure in the dataset. It enables us to see in direct terms how much the treasury received on average for each barrel produced, mirroring more traditional industry measures such as production costs per barrel. This facilitates quick comparison over time and across companies in a way likely to resonate with various stakeholders.

Transfers to the state as a percentage of gross NOC revenues

This metric divides total NOC transfers to the state by NOC gross revenues (variably, all company revenues or all revenues directly from oil and gas). It puts NOC taxation into context, showing the share of funds a company collects that it ultimately transfers directly to the state.

These blunt measures have limitations. They do not automatically account for NOC expenditures or profits, and thus can distort the picture of the tax burden on companies. The metrics also do not on their own reflect variance in the quality of

76 Sonangol, “About Sonangol EP,” www.sonangol.co.ao/English/AboutSonangolEP/Pages/About-Sonangol-EP.aspx, visited 16 July 2018.

77 Sonangol, *Management Reports and Consolidated Accounts 2014*, 121. As per Angolan law No. 13/13, Chapter IV, Art. 8, Sonangol must transfer the proceeds from sales of crude petroleum it gets from its role as the concessionaire, minus a fee that it can keep, which is 7 percent of the value of the crude, with value calculated according to the price per barrel set in the 2014 National Budget.

78 These are transfers per BOE, transfers as a percentage of gross revenues, transfers as a percentage of net income (from core revenues and from all revenues) and transfers as a percentage of cash flows from operations.

the oil or gas produced (which impacts its market value) or the costs of production (which impact the size of net revenues available for distribution). It is reasonable to expect, for example, that an NOC spending heavily on new deep-water fields will have significantly higher production costs and therefore transfer less to the state than an otherwise-similar NOC that is producing from well-established and less costly onshore fields.⁷⁹ Thus any attempt to conduct company-specific benchmarks using this measure should seek to address cost realities, in addition to the foregoing discussion of NOC roles and priorities. Still, these measures offer useful insights into variation in levels of NOC-state fiscal transfers.

Looking across our dataset, *most NOCs transferred less than 25 percent of their gross revenues to the state.*⁸⁰ (See Figure 10.) In the high-price year of 2013, more than half of the 45 NOCs for which we could find the relevant data paid less than 25 percent of their gross revenues to the state, and three-quarters of the companies paid less than 50 percent of their gross revenues. The median NOC in our sample transferred 23 percent of gross revenues to the state in 2013. By 2015, when prices had plummeted, this figure dropped to 17 percent. NOCs use most company revenue that does not go to the treasury for investment or operational expenditures. However, the enormity of NOC expenditures highlights the importance of understanding what NOCs are spending on and whether that spending delivers adequate public benefit.

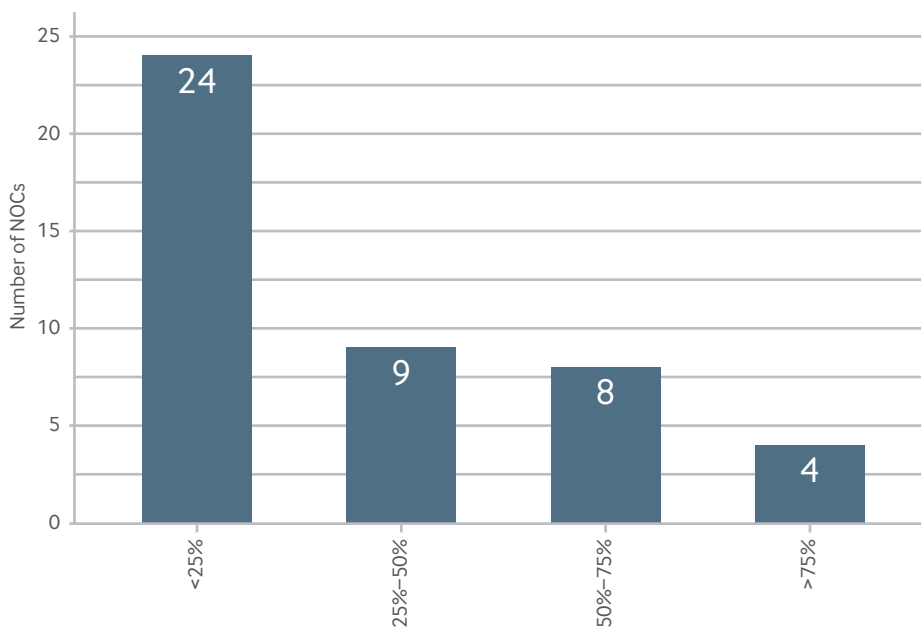


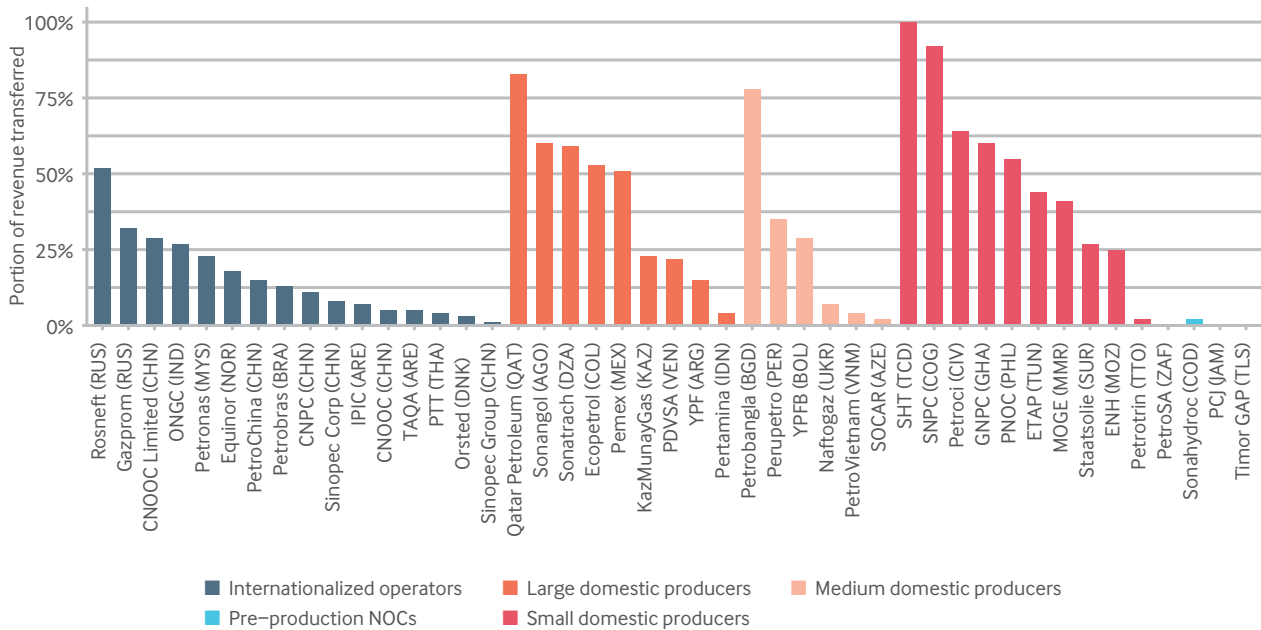
Figure 10. Prevalence of different levels of transfers as a percentage of gross income, 2013

79 Our analysis emphasizes transfers to the state and transfers as a percentage of gross revenues principally because of data shortcomings that impede the optimal use of more sophisticated measures of how much companies transfer as a share of profits. There is a slightly smaller number of NOCs that report sufficient information to enable us to calculate profitability than is the case for gross revenues, so the dataset is less extensive. Because EITI reporting does not generally include information on costs or profits, these measures are unavailable for companies where the EITI report served as our primary data source. Even where we have data, profit measures are significantly “noisier” than the measurements of gross revenues. This is largely because of the inconsistency in company reporting on costs and profits. See *Methodology Paper* for a more detailed discussion. If the consistency of company reporting on costs and profits improves however, these data points will become increasingly valuable as measurements of the tax regimes applied to NOCs.

80 Figure 10 illustrates the groupings for 2013, a high-price, high-profit year. For most NOCs the transfers to the state declined along with prices as the data period progressed.

The figures that follow begin to unpack this finding for different sub-groups of NOCs. Figure 11 shows the measure, by production profile for the 45 NOCs where we were able to assemble data.

Figure 11. Transfers to government as percentage of total NOC revenues, by production profile, 2013



While there is significant variation even within peer groups, some patterns stand out. In keeping with the discussion above, we would expect higher rates of transfer in countries where governments call on their NOCs to play a cash cow role than for profit seeker or state supplement NOCs. While our proxies are imperfect, the data provide some evidence that this may be the case.

On balance, NOCs whose production is highly concentrated in their domestic markets tend to transfer a greater percentage of revenues than internationalized operators. The median domestic operator/pre-production NOC transferred 29 percent of gross revenue to government, versus 12 percent for internationalized operators. There are several possible reasons for this. The internationalized operators are more likely to be profit seekers, prioritizing commercial expansion, diversified portfolios and efficiency and in many cases seeking to minimize their tax burdens. The fact that they must compete for access to acreage abroad increases their competitive incentives to reduce costs—including tax costs—wherever possible. And because they are paying taxes across various jurisdictions, many of them may also have incentives to engage in international tax planning, much as private international oil companies do. By contrast, domestic NOCs are more likely to be called upon to be cash cows as their core mandate, primarily charged with generating regular funds for the state.

The median listed company transferred 17 percent of gross revenues to the government(s), versus 25 percent for non-listed companies. This tracks with our theory on the goals of profit seeker NOCs, which often invest heavily, thereby reducing taxable income in the pursuit of long-term returns. However, the difference between listed and unlisted NOCs is not dramatic, and there is significant variation within each group.

While few NOCs overtly declare themselves to be cash cows, the data suggest that NOCs with cash cow tendencies tend to transfer more than the others. Figure 11 above shows that small domestic producers transfer a higher share on average than other production peer groups. This may be because governments without significant prospects for large-scale oil production have less reason to put today's revenues at risk in the pursuit of the kind of long-term returns that could be generated by a successful profit seeker NOC.⁸¹ This may make the cash cow approach more appropriate in these settings, justifying a higher rate of revenue transfer.

Another metric reinforces the idea that NOCs with complex commercial activities tend to transfer a smaller share of revenues to government. Figure 12 examines transfers through a proxy for the complexity of technical operations in which different NOCs are engaged, looking at transfers per barrel in the high oil price (2011 to 2014) period among companies most focused on upstream oil production and where transfer per barrel data were available.⁸² We split the sample between companies who act as operators on no fields or only small fields (below 25,000 bpd in production) and those that have operatorship of larger fields.⁸³

81 Valerie Marcel has found that developing significant operational capabilities is expensive for an NOC's home-country, requiring at least 100 staff members with highly technical skills and years of intensive preparation. Valerie Marcel, *The Cost of an Emerging National Oil Company* (Chatham House, 2016), 13. Where the state has only small or moderate oil reserves, this kind of investment may not be warranted.

82 This excludes any company where during the period analyzed gas production represents more than 40 percent of total oil and gas production and where company revenue per barrel exceeds \$180/bbl (given that Brent oil price average \$110/bbl during this period, it is unlikely the company was able to sell its oil at such high prices, hence strongly suggests that the company had also other significant sources of income such as downstream).

83 We chose this split, because few companies in this subsample do not operate any producing fields (GNPC and SHT), while many companies in our sample operate some small field (including NNPC, SNH, SNPC or Sonangol) but let IOCs assume operatorship of the larger fields in their home country. In contrast, in the other group are companies who have taken up operatorship of many very large oil fields in their home country or even abroad. We obtained some of our information on operated amounts through additional research in public domain sources. See, e.g., Nigerian National Petroleum Corporation, "Oil Production," consulted 1 February 2019, www.nnpcgroup.com/nnpcbusiness/upstreamventures/oilproduction.aspx.

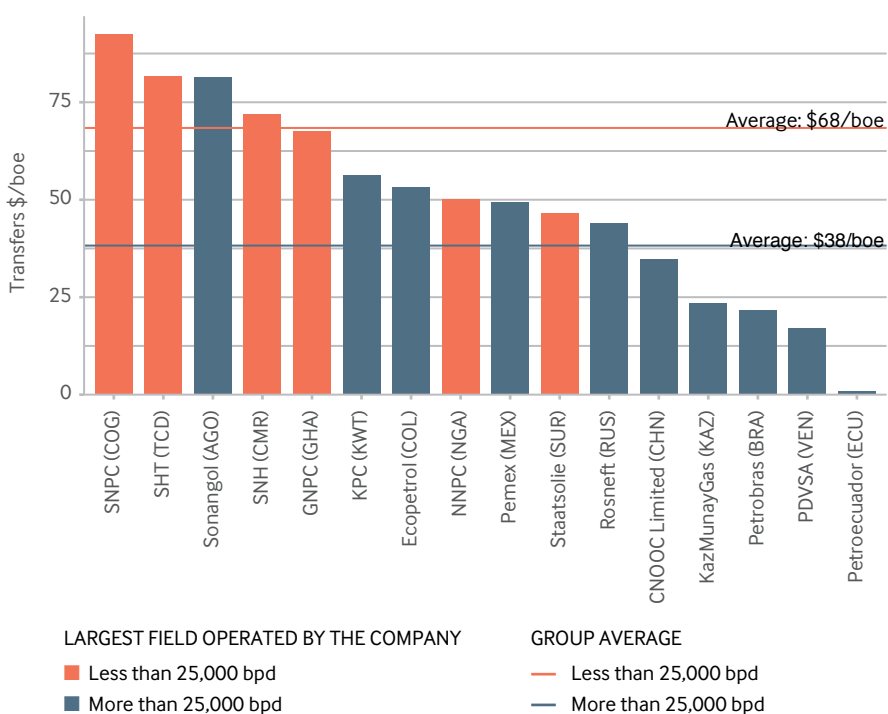


Figure 12. Transfers to government per boe, 2011 to 2014 period average, by level of operated production

Figure 12 shows that there is a large difference in transfer per barrel between companies that operate larger fields compared to those that do not. Whereas operators of large fields transfer about \$38 per barrel on average, the other companies transfer about double the amount, \$68 per barrel. This is not because larger fields are less profitable, in fact, the opposite is generally true. Rather it is likely because cash cows generally take a less significant role in production and instead focus on collecting taxes from private companies who will operate the larger fields. In other words, having a lesser operatorship role may be a proxy for cash cows, or indicate that the country’s oil sector is very small. Being a non-operator on a field also corresponds in many cases with the NOC bearing lower responsibility for covering project costs.

Policy-makers can benefit from looking at their company’s transfer data in comparison to other peer companies, in order to scrutinize the fiscal return that the company is generating for the state. A policy-maker in Côte d’Ivoire, for example, might look at Table 6 and wonder why Petroci is transferring much less to the state for the average barrel of oil equivalent produced than many of its African peers. The data are not the end of the story, of course. The prevalence of gas in Petroci’s production mix is likely one source of the divergence. It may be, as well, that the government and/or the company have prioritized Petroci’s profit-seeking or state supplement roles above fiscal payments. Still, the data provide a valuable comparative starting point for assessing the company’s fiscal contribution *vis-à-vis* its peers.

Country (company)	2011	2012	2013	2014	2015	2016
Angola (Sonangol)	..	91	86	68	35	26
Cameroon (SNH)	80	71	73	63	41	
Chad (SHT)		96	98	51	38	33
Congo (Rep.) (SNPC)	94	109	98	69
Côte d'Ivoire (Petroci)	27	32	27	20	22	
Ghana (GNPC)	59	63	68	79	23	15
Mozambique (ENH)	5	5	2	2
Nigeria (NNPC)	..	53	49	48	22	..

Table 6. Transfers to government per boe, sub-Saharan African NOCs, USD⁸⁴

C. DATA INSIGHTS ON NATIONAL OIL COMPANY OPERATIONAL AND FINANCIAL PERFORMANCE

One of the most significant challenges of NOC governance is holding NOCs and their government shareholders accountable for their performance. This challenge derives in part from structural factors. The fact that many NOCs hold formally privileged positions in the national economy and are not subject to competition weakens the pressure on them to deliver optimal results. The political economy of many oil-rich states and the weakness of non-executive oversight bodies can also weaken performance incentives. The mixed mandates of many NOCs further impede traditional performance monitoring.

However, the increased focus by some NOCs on results-tracking, corporate governance and reporting creates an opportunity for governments and other oversight actors to enhance their approaches to assessing how well NOCs are managing the sector and contributing to the economy. It also provides researchers with a stronger base of information on which to assess trends and identify risks among NOCs.

The dataset provides several routes for measuring how well a company is doing at efficiently extracting upstream resources, converting those resources into revenues and generating returns from their natural endowments and the investments made in them by the state. In addition to helping identify and analyze the sorts of trends discussed below, governments can gain from using these figures to track NOC performance:

- **Over time**, to track NOC progress against stated goals and industry metrics
- **Against peer NOCs**, to assess a company against similarly-situated state-owned entities
- **Against IOCs**, to analyze NOC efficiency against companies with clear profit-seeking motivations⁸⁵

84 Data in table generated from EITI reports for Cameroon, Chad, Congo (Rep.), Côte d'Ivoire, Mozambique, Nigeria. Data for Ghana generated from Public Interest and Accountability Committee (PIAC) reports. Data for Angola generated from Sonangol company reports.

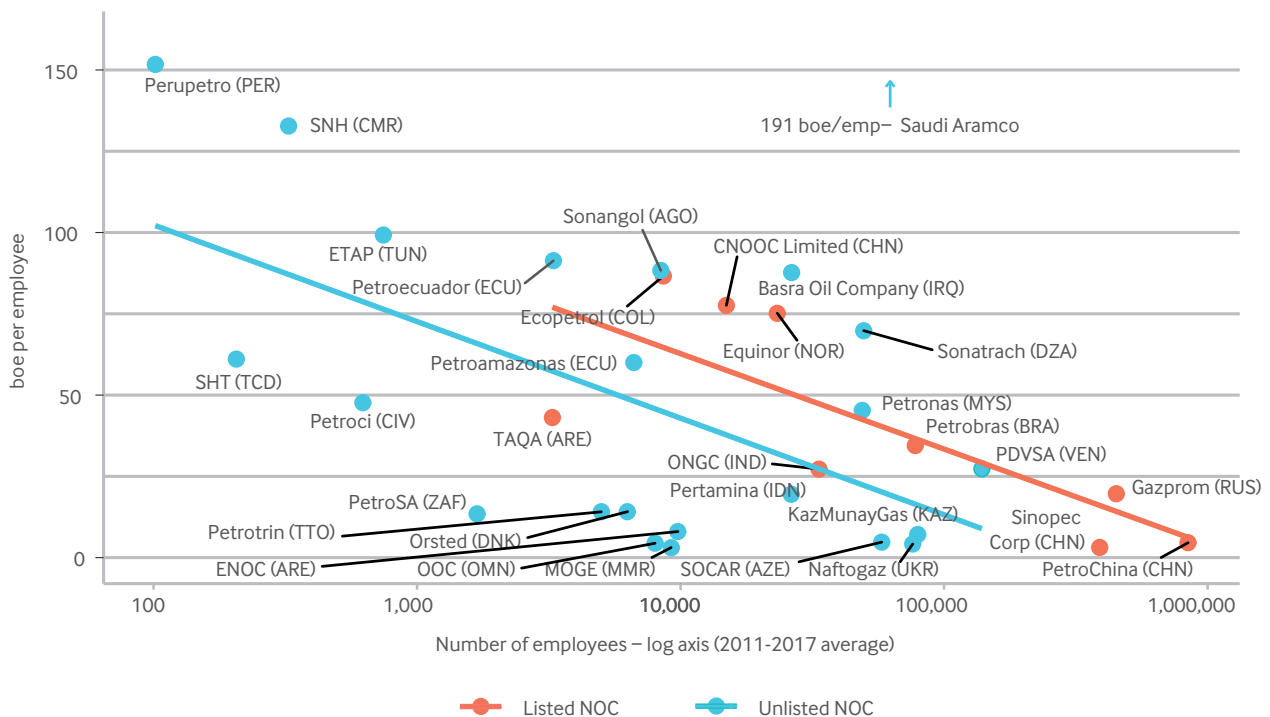
85 Comparing NOC performance against IOC performance requires caution. IOCs usually have purely commercial mandates, in contrast to the varying roles facing NOCs. As such, an unnuanced conclusion along the lines of "NOCs are less effective than IOCs" is rarely warranted, especially for cash cow and state supplement NOCs. IOCs often have more opportunities to diversify their portfolio than NOCs, and many NOCs have had a longer history in which they have developed significant experience and efficiencies. Still, examining IOC performance can be of value for profit seeker NOCs to help with goal-setting, and can be valuable to governments analyzing the trade-offs associated with an NOC-dominated approach to managing the oil sector.

i. Labor productivity

Having large labor forces are a way in which NOCs tend to behave differently from private oil companies. Nadeja Victor studied labor productivity data in 2010 and found that IOCs are roughly twice as efficient on a revenues-per-employee basis as NOCs.⁸⁶ The literature offers two interrelated explanations for this phenomenon. First, NOCs, on average, tend to be less efficient commercial operators than IOCs, owing to a range of factors including their less diversified geological portfolios, weaker corporate governance, more limited technical/commercial experience, more limited access to financing and geopolitical factors that have given IOCs preferential deals to many world-class oil fields with favorable fiscal terms. Second, many NOCs play a broader set of roles than purely commercial oil companies. In some cases, large-scale public employment itself is a core goal of an NOC; in other cases, state supplement NOCs are called upon to execute complex quasi-fiscal projects that require large labor forces.

Figure 13 shows the productivity of labor in production terms (daily barrel of oil equivalent production per employee) and total employment figures for the NOCs in our sample for which data were available. Note that the x axis is measured in log terms, meaning it grows exponentially, so that it can display larger companies more clearly alongside other NOCs.

Figure 13. NOC production per employee versus total employees, 2011-2017 average



86 Victor, *On Measuring the Performance of National Oil Companies*, 13. The mean IOC in her sample earned \$1.8 million per employee, versus \$962,000 for the mean NOC. The median IOC in her sample earned \$1.5 million per employee, versus \$773,000 for the median NOC.

Figure 13 shows that on average, the larger an NOC's labor force, the less productive that labor force is in purely commercial terms. This result tracks with Victor's findings on NOCs in revenues-per-employee terms. It is not clear that this pattern dramatically differentiates NOCs from other oil and gas companies— Victor's data also showed declining revenue productivity for IOCs as their size increased, though at a flatter rate than the decline for NOCs.⁸⁷ However, it should serve as a reminder to governments and NOC leadership that there may be decreasing marginal returns, in purely commercial terms, to growing a company's labor force.

Figure 13 illustrates that listed NOCs exhibit higher production-per-employee than similarly-sized unlisted counterparts.⁸⁸ This may be the result of disciplining pressures exerted by shareholders to maximize returns per employee, or because listed NOCs are more likely to be profit seekers focused on core activities. The graph also shows that the largest NOCs are mostly listed ones, while smallest ones are not, hence the trend can be more meaningfully compared for medium-sized NOCs.

A similar pattern emerged when we examined labor productivity based on revenues per employee (not pictured here).⁸⁹

These labor productivity figures are not only relevant to profit seeker NOCs. Because they are called upon by their governments to maximize fiscal transfers to the state, cash cow NOCs may also be expected to exhibit high production- or -revenue-per-employee figures. Having a lean labor force can enable cash cows to optimize the conversion of oil and gas underground into production and strong fiscal revenues. Indeed, several NOCs to which we would commonly ascribe a cash cow role—including Peru's Petroperu (see Box 9), Angola's Sonangol and Cameroon's SNH—perform well on these per-employee measurements. State supplement NOCs, by contrast, are required by governments to deliver value via a plethora of non-fiscal mechanisms, including public employment in many instances. Figure 13 illustrates that traditional upstream labor productivity has not been a top priority in the management of NOCs such as Ukraine's Naftogaz (which plays a significant state supplement role in the downstream sector and the Ukrainian government has required to furnish energy to citizens at subsidized rates).

87 Victor, *On Measuring the Performance of National Oil Companies*, 13.

88 For display purposes and in calculating the trend line, these figures leave out Saudi Aramco. Saudi Aramco is the largest oil and gas producer in the world and registers an outstandingly large production per employee (an average of 191 boe/day). The differences between listed and unlisted NOCs are less pronounced when including this outlier.

89 Our analysis of revenues per employee showed that Petroperu stood out as registering the highest productivity in the sample on this measure. See Box 9.

Box 9. Perupetro: small staff, circumscribed role

Perupetro plays a quasi-regulatory role the management of the Peruvian oil and gas sector. According to the company’s website, its primary responsibilities are managing contracts and ensuring that private oil companies follow the law and that the country maximizes its returns from the sector. The company is entitled to sell a share of the production generated by these contracts and collects royalties from the partner oil contractors. These royalties represent the overwhelming share of the company’s revenues (between 75 and 80 percent of total revenues in each year in our sample). This modest role means that Perupetro is often seen as the sector regulator, and many Peruvians think of the downstream Petroperu as “the Peruvian NOC.”

In keeping with its cash cow role, at around 100 people depending on the year, Perupetro’s staff is much smaller than the levels exhibited by many NOCs. This sets Perupetro apart from many NOCs—even cash cows—which have staffs that grow into the thousands or tens of thousands. The combination of this lean approach to staffing and the company’s role in oil sales and royalty collection put it near the top of our measures for production-per-employee and revenue-per-employee.

There is no “optimal” level of labor productivity that applies to all NOCs. However, benchmarking an NOC against other companies from a comparable group can help assess whether a company is meeting its stated goals. If an NOC that claims to be a profit seeker or a cash cow consistently exhibits lower efficiency on this measure than other NOCs of similar size, it may be a sign either of poor performance or that the stated goals to not reflect actual priorities.

ii. Cost efficiency

The dataset includes per-barrel measurements of NOC operational (opex) and capital expenditures (capex), calculated simply by dividing the total of these expenditures by the number of barrels that the NOC produced. Our mechanism for measuring these per-barrel costs differs from the costs-per-barrel measurements of industry analyst groups such as Rystad Energy, which build their cost measurements from projections about individual oil and gas fields, then aggregate upwards to calculate company-wide ratios.⁹⁰ Such measures can provide a finer-grained estimation than ours of specific extraction processes and the costs associated with a company’s geological portfolios. Our measurement looks at a company’s (capital and operational) expenditures as a function of how much oil and gas it produces, and thus provides a blunter (and usually higher) but fairly comprehensive picture of *how much the company spent for its upstream petroleum-sector output*.⁹¹

Examining these costs, and how they change over time, is a critical component of analyzing the NOC’s efficiency and what it is doing with public resources. Capex can provide a useful measure of the scale of investment by the NOC in maintaining and replenishing a company’s reserves. It can also provide important insights into the scale of spending by the company—capital expenditures often represent large outlays—and can therefore be important in assessing the opportunity cost of NOC

⁹⁰ Rystad Energy (2016). *UCube Technical Handbook, 2016*.

⁹¹ The nature of our per-barrel cost measurements requires several caveats. Most significant are the caveats on the inconsistency of company cost reporting, as noted in Section V. In addition, our approach to calculating costs-per-barrel is not particularly valuable for companies whose exploration and production activities represent a relatively small share of their overall business (such as Denmark’s Ørsted or South Africa’s PetroSA) or which import oil beyond their own “production” and sell that oil on the domestic market (such as Indonesia’s Pertamina).

investment. After all, funds spent by the NOC are revenues that the government cannot spend on other purposes, from providing social services to developing the non-oil economy.

Our operating expenditure (opex) per barrel measurement shows the general, administrative, marketing, employee, facility and materials costs that a company uses, as a function of its production.⁹² As such, it provides one useful data point for assessing a company's administrative efficiency, both across time and in comparison to its peers. Our estimates of opex per barrel varied widely—they ranged from \$2/bbl to nearly \$200/barrel across companies and years.⁹³ Most companies do not provide a detailed breakdown of their operating costs, therefore understanding key cost drivers requires an in-depth review of company activities and the terminology they use.

To illustrate some of the differences across company costs, Table 7 presents data for three NOCs (Colombia's Ecopetrol, Kuwait's KPC and Mexico's Pemex) for the year 2015 alongside a brief explanation. All three companies are primarily oil (and not gas) producers and operate mainly in their own domestic markets. They also provide reasonably extensive reporting on their activities.

Table 7. Per barrel costs among three NOCs, 2015

	Opex: USD/bbl	Capex: USD/ bbl	Geology/ upstream costs of the national basin ⁹⁴	NOC upstream role	NOC downstream and non-core activities	NOC efficiency
KPC (Kuwait)	\$35	\$9	Low cost- \$8.5/ boe	Main/sole company in charge	Upstream (KOC) dominates	This company is the operator of Kuwait's highly lucrative upstream oil industry. Kuwait is known to have some of the cheapest oil in the world, near the surface of the desert.
Ecopetrol (Colombia)	\$49	\$20	High cost - \$35/boe	Mixed: Operator or partner	Company operates multiple oil fields and is responsible for approximately 60 percent of the country's production	This company aspires to be a prototypical profit seeker NOC, so it invests significantly in capex. Opex per barrel appears low in comparison with others when accounting for geology.
Pemex (Mexico)	\$70	\$13	High cost - \$28/boe	Main/sole company in charge	Significant and costly downstream role, major pension liabilities and other state supplement responsibilities	High opex-per-barrel and low capex-per-barrel reflect the multiple roles drawing on company resources. As Mexico seeks to revitalize its company's upstream success, tension between roles will have an impact.

92 We do not include transfers to the state or financial costs in our measure of opex. See *National Oil Company Database: Methodology Guide* for details.

93 This is already excluding Orsted, PetroSA, PTT, SOCAR and the Chinese SOEs (Cnooc, CNPC, PetroChina, Sinopec) which have very large third-party oil trading activities: that is, they are dealing with oil they do not themselves produce (which results in very high opex per barrel produced).

94 Cost data are from Rystad Energy, *UCube Database*.

In comparing absolute values, geology and NOC roles matter strongly. These brief case studies help illustrate that when comparing NOC per barrel costs (and, potentially, against IOCs) it is important to incorporate the following factors:

Geology

Not every NOC has access to the same geological prospects. Some fields are more technically challenging to develop and manage, because of water depth/terrain, or because they are earlier in a production life cycle than others. Most NOCs produce both oil and gas. Gas may be cheap to extract but be expensive to take to market, depending on its location.

NOC roles and activities

Our measure encompasses all of an NOC's operational expenditures across its portfolio, not just those expenditures directly associated with exploration and production.

- **Extent of mid- and downstream operations.** These activities will add to operational costs without directly increasing production figures. They also typically attract much lower rents, so they will typically shrink operating margins for each dollar in revenue. In fact, some states direct their NOCs to make losses on fuel distribution to make petrol available cheaper for consumers.
- **NOC role.** A company with significant downstream/retail activities or playing other state supplement roles will tend to exhibit higher opex-per-barrel. Similarly, a company playing a cash cow role—especially one doing so by receiving oil at discounted price or in-lieu of taxes from IOCs—should report very low opex-per-barrel.

Noisy data

As mentioned above, because of the inconsistencies with which NOCs classify their costs, there is a high level of variation within our dataset with regard to expenditures. As such different accounting measures impact the per-barrel spending values of different NOCs.

Box 10. Cost reporting by the Kuwait Petroleum Corporation (KPC)

KPC's annual reports provide a window into costs in the world's most profitable oil region. But even though the company's financial statements are International Financial Reporting Standards compliant and externally audited, cost information is rather complicated to interpret. KPC is a holding company which is also in charge of oil sales. Its main subsidiary is the Kuwait Oil Company (KOC), which is responsible for all upstream activities. KPC publishes consolidated financial statements, and simply looking at these alone makes it appear as if the company had very large operating costs (more than 90 percent of all revenues), paid very little income tax as a transfer to the government (less than 1 percent of all revenues), and divided the remainder of its revenues between earnings, financial and capital costs. But a deeper dive into KOC's public reports appears to reveal that the group pays substantial royalties and fiscal levies to the government on upstream activities, which constitute over 50 percent of the group's total revenue. However, KPC's consolidated books mask these transfers to the government and lump them under operating costs. In reality, the group seems to have spent about 40 percent of its revenues (\$20 to \$40/barrel, depending on the year) on operations, a low amount within our sample. This case serves as a reminder that company accounts may not always reveal all transfers to government, which are often only revealed through EITI or additional disclosures. (See Section IV on transparency below).

D. BENCHMARKING NATIONAL OIL COMPANY RESPONSES TO CHANGING CIRCUMSTANCES

After a decade-long boom, global oil prices collapsed in late 2014, falling more than 75 percent from mid-2014 through early 2016 before a partial recovery. Between 2015 to 2017, Brent crude prices hovered at roughly 50 percent of their 2011 to 2014 values.⁹⁵ This drop had a devastating impact on the economies of oil-rich countries worldwide, sparking large-scale decreases in the fiscal contributions of the sector. It also had a huge impact on the financial health of oil companies, sparking industry-wide cutbacks in investment and delays in dozens of major projects.⁹⁶ NOCs were not spared this hardship—most of them saw their balance sheets devastated, leading government and NOC management in many countries to call for dramatic actions, including cancellation of projects, cut-backs in operating expenditures, farm-outs to partners, and the pursuit of new debt to cover expenses.⁹⁷ The financial contributions that NOCs made to their governments also declined dramatically.

We examined how NOCs respond to the large drop and gradual rebound in oil prices. Figure 14 shows the median change over time for NOC revenues, capital and operational expenditures and transfers to the state, for all NOCs where data were available for a given variable, and compares them to the global oil price change. The 2011 value is indexed to 100, meaning that the values in subsequent years reflect increases or decreases from that value.⁹⁸

95 Brent price data taken from www.macrotrends.net/2480/brent-crude-oil-prices-10-year-daily-chart.

96 "Woodmac: Growing List of Deferred Upstream Projects Reaches 68," *Oil & Gas Journal*, 14 January 2016.

97 "Sonangol's rising debt crisis," *Ventures Africa*, 2016, venturesafrica.com/213822-2/

98 Average annual Brent crude price.

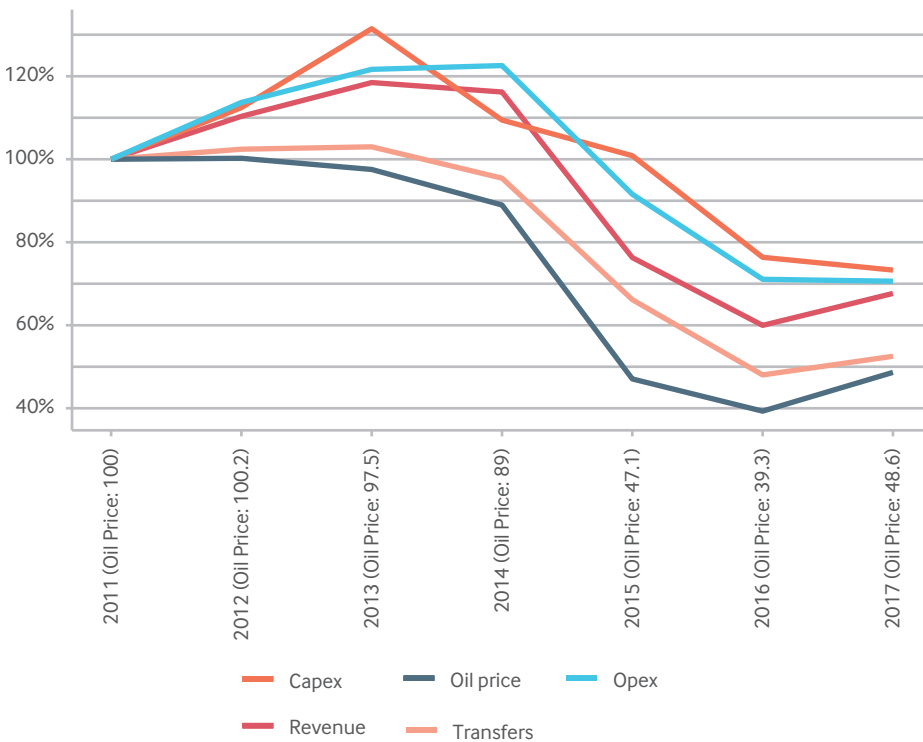


Figure 14. Median annual changes over time, oil price and various NOC indicators (2011 = 100)

As we would expect, the figure illustrates that NOC revenues, and oil revenue-based expenditures, marched largely in lockstep with oil price during the data period. But examining the data reveals important and less obvious findings.

During the high-price years in the sample (2012 to 2014), the median NOC increased its revenues as well as its expenditures (opex and capex) while its transfers to the state remained relatively flat. This suggests that many NOCs directed large shares of boom-time revenues to their own budgets.

When oil prices dropped, total transfers to the treasury roughly fell in tandem (approximately a 50 percent drop). Conversely, total NOC revenues and costs dropped less sharply (approximately a 30 percent drop).⁹⁹ This suggests that many NOCs used additional revenues they generated to cushion their own need for cutting costs.

Figure 15 further illustrates the relationship between changes in revenues and changes in transfers across our sample of NOCs between 2012 to 2017.¹⁰⁰ It highlights the asymmetry between the boom and the bust period. When NOC revenues rose, their transfers to the state tended to rise less than proportionally (illustrated by the blue line being less steep than 45 degrees). When revenues fell, transfers tended to drop more than proportionately (the red line is slightly steeper than 45 degrees). This finding suggests that on average, NOCs remitted slightly less of their upside gains to the treasury and passed on slightly more of their revenue shortfalls. We did not find significant differences in this trend across groups (internationalized versus domestic versus pre-production). Additional research could further unpack the different drivers of NOC response to revenue shocks.

⁹⁹ This matches the results of a study which looked at drilling costs for all companies by Toews and Naumov, *The Relationship Between Oil Price and Costs*.

¹⁰⁰ We measure year on year percentage change for both variables, therefore had to drop the first year, 2011. We also excluded all changes larger than 100 percent.

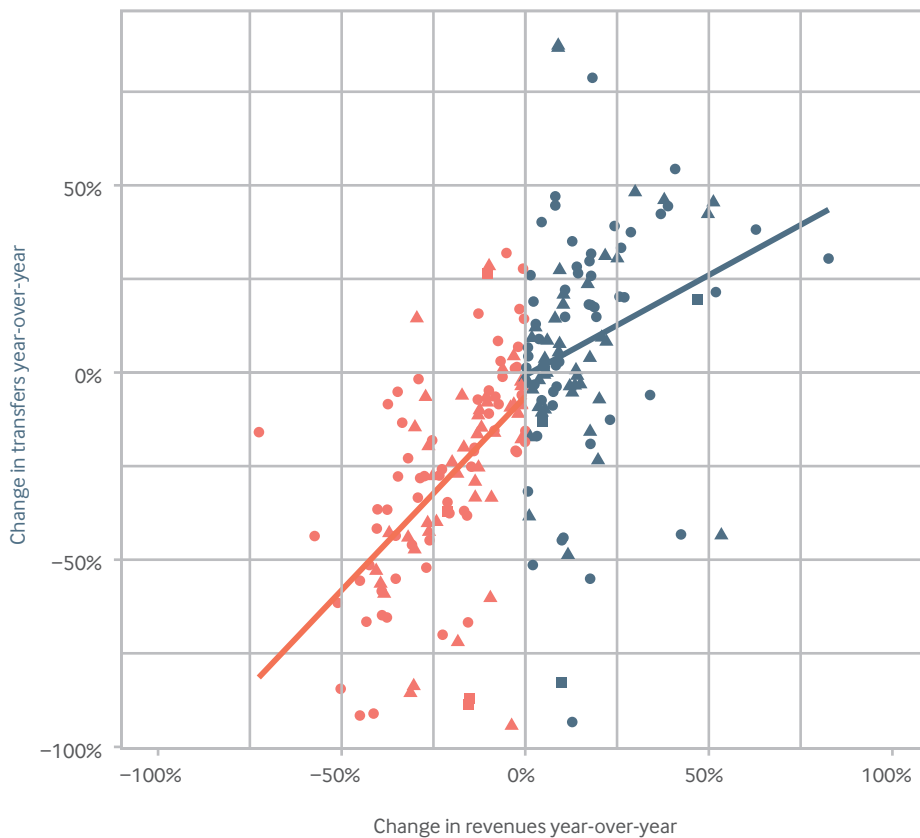


Figure 15. Relationship between change in NOC revenues and change in NOC transfers to government, 2012 to 2017

- | OBSERVATIONS (company+year) | COMPANY GROUP |
|-----------------------------|-------------------------------|
| ● Decrease in revenues | ● Domestic producers |
| ● Increase in revenues | ▲ Internationalized operators |
| | ■ Pre-production NOCs |

There are several possible reasons that boom-time spending by the average NOC may have risen more sharply than boom-time transfers to the government. A large proportion of NOC costs are not discretionary but rather are necessary to maintain participation in operations, and these industry costs rose during the boom years. However, fiscal rules set by government govern NOC transfers to the treasury. It is likely that many governments collected higher revenues from IOCs during the boom, and therefore did not have to prioritize securing dramatic increases in NOC-state transfers. Governments and NOCs may have strategically decided to take advantage of the boom period to increase NOC spending—either by investing for the future among profit seekers or increased social spending among state supplement NOCs. Finally, in some cases, the increase in spending certainly reflects inefficiency, rent-seeking or weak incentives to optimize management during times of plenty.¹⁰¹

¹⁰¹ The actions of NOCs and their governments in the wake of the price crash seems to confirm the theory that at least part of the rise in opex during the boom reflected inefficiency that tighter management could improve. Several countries launched reform efforts in the wake of the crash to improve the operational efficiency among NOCs.

In the wake of the price collapse, it is important to reflect on the apparent finding that NOCs spent a large share of the upside but have passed along downside impact to their governments. For profit seeker NOCs that can convert that boomtime spending and investment into long-term growth, the trade-off may be worth it. But for some countries, especially those with cash cow NOCs, the fiscal revenue sacrificed by NOC spending during the boom may not generate a meaningful return. (See Appendix 2 for a more detailed discussion of the data on changes in revenues, spending and other variables over time.)

Figure 16 offers illustrates the value of tracking how specific companies respond to price changes. When oil prices dropped beginning in 2014, governments across the world called upon their NOCs to trim the fat and reduce administrative costs. Colombia was one such country—citing price pressures and the priorities of its board, the NOC announced in early 2015 that “[e]fficient barrels are [the] main focus of Ecopetrol’s new strategy.”¹⁰² Figure 16 provides a basis for measuring progress against those goals, comparing the changes in Ecopetrol’s opex per barrel and transfers per barrel against those of Pemex.

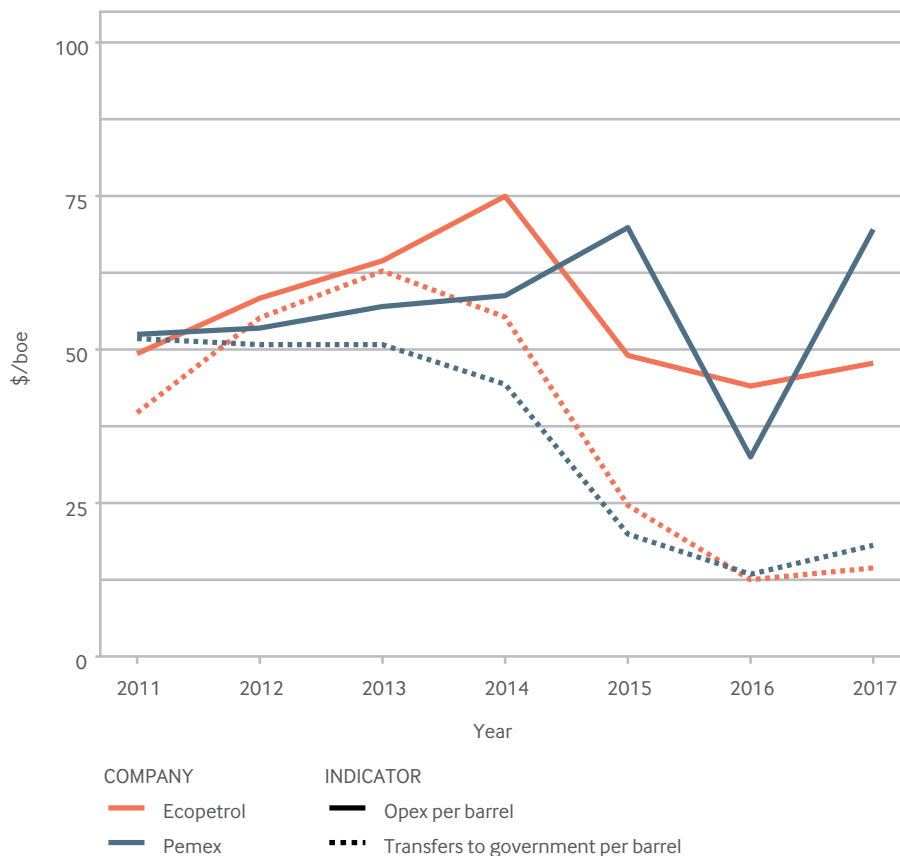


Figure 16. Opex per barrel and transfers to government per boe, Ecopetrol and Pemex

102 “Efficient barrels are main focus of Ecopetrol’s new strategy,” Ecopetrol, May 26, 2015, accessed 6 November 2018, www.ecopetrol.com.co/wps/portal/web_es/ecopetrol-web/our-company/Press-Room/Press-Release/2015/2015/efficient-barrels-are-main-focus-of-ecopetrols-new-strategy/.

The data laid out in Figure 16 enable several observations about Ecopetrol's and Pemex's progress in meeting efficiency goals, analysis that could be replicated for other NOCs.

- Both companies had rising operational costs during the high-price period, followed by a sharp decline after prices fell. This suggests that both companies responded to falling prices by reducing opex, as was a general trend across the industry.¹⁰³
- Pemex exhibited a longer lag in responding to price changes via opex cuts than did Ecopetrol. The “peak” in Pemex's opex-per-barrel and the onset of the decline both came a year later than similar trends for Ecopetrol.
- The patterns of transfers to the state for both companies appeared to rise and fall roughly in conjunction with changes in opex.
- Ecopetrol's opex per barrel stayed relatively flat in 2017, with only a slight increase, while Pemex's rose more sharply. While it is too early to draw definitive conclusions, if this trend continues it could mean that the reforms led to sustainable gains in Ecopetrol's efficiency.

Governments, investors, citizens and other interested stakeholders have a lot of questions about NOC performance, and most are quite difficult to answer. Is the NOC keeping too much of a country's oil revenues? Is it starved of the funds it needs to flourish? Does it help the local economy? Does it operate efficiently? How did the NOC weather the recent dramatic changes in the oil price? This section has presented some initial ideas for how the NOC dataset can provide some useful perspectives. Further analysis will yield additional insights, but more robust NOC data on expenditures are needed to maximize the dataset's utility.

103 Gerhard Toews and Alexander Naumov. *The Relationship Between Oil Price and Costs in the Oil and Gas Industry*, (Oxford Centre for the Analysis of Resource Rich Economies, 2015), www.economics.ox.ac.uk/materials/papers/13819/paper152.pdf.

V. Transparency and national oil company reporting

Our analysis underscores the value of strong public reporting by NOCs. When governments and oversight actors have access to comprehensive, reliable data about their companies, they have a stronger basis to promote achievement of major goals. NOC leaders themselves also benefit from being more transparent, which can help them manage public expectations, and from increasing the availability of data from other NOCs, which can bolster comparative performance assessment. As such, we believe that our data bolster the central argument made by many researchers and advocates that transparency can be an important tool for strong NOC performance.¹⁰⁴ In this section we highlight several reporting gaps whose importance became clearer during our research. Our research has also helped identify major ongoing gaps in NOC reporting.

Box 11. NRG's *Guide to Extractive Sector State-Owned Enterprise Disclosures*

Several strong international standards and guidelines exist as resources to support NOC efforts to bolster their reporting systems, including methodologies developed by the EITI, OECD and various stock exchanges. NRG attempted to compile these resources, along with examples of good practices from state-owned enterprises all over the world, into a single guide to help SOE personnel (and those who oversee them) to improve their reporting practices.

This *Guide to Extractive Sector State-Owned Enterprise Disclosures* provides recommendations and examples on disclosures of sector context, company mission and organization, corporate governance, operational and financial performance, transfers to the state and impact.

A. NATIONAL OIL COMPANY REPORTING PRACTICE

Our research confirms and builds upon the findings of the 2017 Resource Governance Index, which found that public reporting by many NOCs remains insufficient. Of the 52 NOCs studied in the *Index*, 62 percent exhibited “weak,” “poor” or “failing” performance on public transparency.¹⁰⁵

Of the 71 companies in our sample, only 20 (28 percent) produced sufficient information for us to be able to enter data for all ten of the key indicators summarized in Tables 8 and 9 below. Only 43 companies (61 percent) produced enough information for us to be able to fill in data for even half of the key indicators. It is still the case, however, that many NOCs fail to report critical information on a consistent basis. Many NOCs, including several major global players, produced almost none of the

¹⁰⁴ Glada Lahn, Valérie Marcel, John Mitchell, Keith Myers and Paul Stevens, *Good Governance of the National Petroleum Sector* (Chatham House, 2005), 11; Natural Resource Governance Institute, *Natural Resource Charter—Second Edition* (Natural Resource Governance Institute), 23. (NOCs should “face at least the same standards of disclosure as private companies do...” and should “maintain public accounts in accordance with international standards and subject to independent audit”).

¹⁰⁵ Natural Resource Governance Institute, *2017 Resource Governance Index* (2017). The index assessed NOC transparency according to the rules and disclosure practices associated with its operations and finances. Of the 52 countries where an NOC was assessed, only six exhibited what the index categorized as “good” practice.

information that our analysis required. Tables 8 and 9 summarize the coverage in the database of several key data points for 2015, one of the most data-rich years in the set. They underscore that for many issues of critical importance, many NOCs continue to avoid public disclosure.

Table 8. NOC reporting on key indicators, by region, 2015

Indicator	All	Asia-Pacific	Eurasia	Latin America/Caribbean	Middle East/North Africa	Sub-Saharan Africa	Western Europe
Number of companies in sample	71	16	6	13	17	17	2
Total oil and gas production	75%	69%	83%	92%	59%	76%	100%
Revenues from oil, gas, product sales	63%	69%	83%	85%	29%	65%	100%
Total NOC revenues	66%	88%	83%	85%	35%	53%	100%
Net income from core revenues	51%	69%	67%	77%	24%	29%	100%
Total transfers to the treasury	65%	88%	83%	77%	24%	65%	100%
Capital expenditures	48%	63%	83%	69%	24%	24%	100%
Operational expenditures	56%	81%	83%	85%	24%	29%	100%
Cash flows from operations	51%	63%	83%	77%	24%	29%	100%
Total assets	59%	81%	83%	85%	35%	29%	100%
Employees	45%	50%	67%	46%	29%	41%	100%

Table 9. NOC reporting on key indicators, by peer group, 2015

Indicator	Any shares listed on a public exchange?			Production peer group				
	All	Yes	No	Internationalized operators	Large domestic producers	Medium domestic producers	Small domestic producers	Pre-production NOCs
Number of companies in sample	71	12	61	17	17	10	21	6
Total oil and gas production	75%	100%	57%	82%	76%	80%	57%	100%
Revenues from oil, gas, product sales	63%	100%	44%	82%	59%	60%	57%	67%
Total NOC revenues	66%	100%	48%	100%	53%	60%	52%	67%
Net income from core revenues	51%	100%	34%	88%	41%	60%	29%	33%
Total transfers to the treasury	65%	100%	47%	94%	53%	50%	57%	83%
Capital expenditures	48%	100%	32%	82%	53%	30%	33%	50%
Operational expenditures	56%	100%	41%	94%	47%	60%	38%	50%
Cash flows from operations	51%	100%	34%	82%	53%	40%	29%	50%
Total assets	59%	100%	43%	100%	53%	60%	38%	50%
Employees	45%	75%	31%	65%	41%	40%	29%	67%

As Table 8 highlights, companies in the Middle East and North Africa—home to many of the world’s largest NOCs—produced the least information on average. Sub-Saharan Africa—which combines established companies such as Nigeria’s NNPC and Angola’s Sonangol and NOCs in up-and-coming oil producers such as Tanzania—finished second from the bottom, despite more extensive disclosure in some countries such as Ghana.

The tables also illustrate that data on NOC production, revenues and transfers to the treasury are slightly more available than the other indicators, especially in sub-Saharan Africa. The EITI appears to be a factor here as it requires the publication of data on revenue flows and key contextual information about the sector. EITI reports are the source of information on NOC revenues and transfers to the treasury, for example, in Cameroon, Côte d’Ivoire, Congo-Brazzaville and the Democratic Republic of Congo.

Tables 8 and 9 show that disclosure is weakest on the company’s total number of employees. This opacity has potentially serious consequences for the public’s ability to scrutinize NOC efficiency and company contributions to public employment. The shortcoming may be particularly serious for NOCs that purport to deliver significant value to the state through a state supplement role. Disclosure of expenditure data—both capex and opex—is also notably weak, making it difficult for the public to scrutinize how much money NOCs are spending, and what they are spending it on.

Table 9 supports the argument that market-based reporting requirements stimulate a meaningful increase in transparency. One hundred percent of listed companies reported on most of the major indicators listed on the table. NOCs seeking financing on the debt market, such as Mexico’s Pemex and Indonesia’s Pertamina, have also disclosed key operational and financial information in order to maximize interest from would-be lenders and value risk appropriately.¹⁰⁶ The most prominent recent evidence of these links have come in Saudi Arabia, where in April 2019, as part of an effort to raise billions of dollars on the international bond market, Saudi Aramco released an unprecedented amount of information on its revenues, balance sheet transfers to government and other key metrics.¹⁰⁷

¹⁰⁶ Heller et al., *Reforming National Oil Companies*, 13; John Mitchell, Valérie Marcell and Beth Mitchell, *Oil and Gas Mismatches: Finance, Investment and Climate Policy* (Chatham House, 2015), 13.

¹⁰⁷ Saudi Aramco, *Base Prospectus Dated April 1, 2019*, https://www.rns-pdf.londonstockexchange.com/rns/6727U_1-2019-4-1.pdf. For earlier discussion of the challenges around the reporting requirements associated with a potential Saudi Aramco IPO, see Anjali Raval, “Saudi Aramco Called Upon to Improve Data Disclosure Ahead of IPO,” *Financial Times*, 27 June 2017, www.ft.com/content/924ebd36-5a7e-11e7-b553-e2df1b0c3220; Samantha Gross, “The Saudi Aramco IPO Is A Game-Changer for the Saudi Economy,” *Brookings Markaz Blog*, 6 June 2017, www.brookings.edu/blog/markaz/2017/06/06/the-saudi-aramco-ipo-is-a-game-changer-for-the-saudi-economy/

Box 12. Putting transparency into action in Ghana and Myanmar

Government oversight bodies and non-governmental actors have taken advantage of growing transparency to promote regulation and policy-reform. In Ghana, for example, reporting done by the Ghanaian National Petroleum Corporation (GNPC) and by the statutorily-created Public Interest and Accountability Commission have enabled the legislative Public Accounts and Energy and Minerals Committees to engage in pointed scrutiny of the corporation's budgets and strategies.¹⁰⁸ Myanmar's 2016 EITI report released previously-unavailable figures on the cash holdings of the opaque Myanmar Oil and Gas Enterprise (MOGE), which led to intense scrutiny of the company's finances that helped spur the government to launch a major SOE reform initiative.¹⁰⁹

B. GAPS IN NATIONAL OIL COMPANY REPORTING REFORMS

The process of creating our dataset has highlighted several specific indicators that have not attracted much attention in global transparency initiatives, but which are essential for strong citizen oversight of NOCs.¹¹⁰

Operated production

NOCs “produce” oil and gas via a variety of different mechanisms. A company may “operate” oil and gas fields, meaning that the NOC either runs the field exclusively or is the lead company responsible for managing the finances and the operations of a project with partners, playing the role that many people colloquially think of “what an oil company does.” Alternatively, an NOC may partner with another oil company that plays the operating role. It then may receive oil that it is entitled to via its role as a non-controlling equity participant in the joint venture. Alternatively, the NOC may access oil because it represents the state in production-sharing contracts, or because it receives in-kind payments that cover a contractor's royalty or tax obligations. All of these are customarily counted towards production. Some NOCs, particularly those in new producer countries, are not operators at all.¹¹¹ Most companies, including large and experienced ones such as Equinor and Petrobras, produce both operated and non-operated oil.

Knowing an NOC's operated production is important in order to truly understand the scope of its role and to analyze its costs, efficiency and contributions to the state. However, we were only able to compile clear figures of operated production for 23 percent of companies in our database in 2015 (16 of 71). Moreover, half of these are companies whose operated production is zero.

¹⁰⁸ Ghana: Articles documenting this increasingly robust legislative scrutiny include “GNPC Must Not Be Cash Cow—Energy Minister,” *Daily Graphic*, 15 August 2017, www.graphic.com.gh/business/business-news/gnpc-must-not-be-cash-cow-energy-minister.html.

¹⁰⁹ NRGI has worked with the Renaissance Institute and other stakeholders in Myanmar to help the government analyze the fiscal role and governance of MOGE. See, e.g., Andrew Bauer, Arkar Hein, Khin Saw Htay, Matthew Hamilton and Paul Shortell, *State-Owned Economic Enterprise Reform in Myanmar: The Case of Natural Resource Enterprises* (Natural Resource Governance Institute and Renaissance Institute, 2018), resourcegovernance.org/sites/default/files/documents/state-owned-economic-enterprise-reform-in-myanmar_0.pdf.

¹¹⁰ Some of the insights gained from the development of this database are reflected in Natural Resource Governance Institute, *Guide to Extractive Sector State-Owned Enterprise Disclosures* (Natural Resource Governance Institute, 2018), resourcegovernance.org/sites/default/files/documents/guide-to-extractive-sector-state-owned-enterprise-disclosures_0.pdf.

¹¹¹ Companies that we determined are not operators of any production included Tunisia's Entreprise Tunisienne d'Activités Pétrolières (ETAP) and Ghana's Ghana National Petroleum Corporation, among others.

Non-tax transfers to the state

NOCs with detailed financial statements usually list what they paid to the state in the form of income taxes and dividends. But practice regarding non-tax transfers including royalties, fees, and the direct transfers to state coffers of the proceeds of sales from equity or profit oil is inconsistent. Some companies list these clearly as transfers to the state. Others include them in operating costs (as is common in the private sector) but provide a disaggregated description that shows the size of these transfers. Still others do not report on non-tax transfers, leaving us to wonder whether the company made these kinds of transfers or simply folded them into operating costs. This makes it difficult to assess the full value of the NOC's contribution to public revenues.

The EITI-implementing countries in our sample, including Congo-Brazzaville and Côte d'Ivoire, provided the most thorough breakdowns of how much the NOC was paying to the state, and via what mechanisms.¹¹² This is in keeping with Section 4.5 of the *2016 EITI Standard*, which requires reporting that “comprehensively addresses the role of state-owned enterprises (SOEs), including material payments to SOEs from oil, gas and mining companies and transfers between SOEs and other government agencies.”¹¹³ Our data gathering process has highlighted the value of this standard, and we recommend that other NOCs seek to adapt it for maximum clarity in their reporting practices.

Transfers to the state among companies operating in several jurisdictions

In a similar vein, many NOCs that operate internationally, such as Malaysia's Petronas, list income taxes and other payments, but do not clearly break down what share of these payments they made to their own governments, as opposed to the host countries of their overseas activities. We recommend that companies attempt to make their reporting clear on the following to dimensions.

- Which payments are made to NOC home governments
- The amount of oil and gas production done domestically

This first metric would allow for a distinction between payments to home countries and host countries, which will allow for clearer analysis of internationalized operators. The second metric would enable governments and citizens to assess transfers to their home governments on a per-barrel basis.

The inclusion of clear requirements on jurisdiction-by-jurisdiction payments by NOCs would also serve to strengthen the *EITI Standard*. This would subject internationalized NOCs to a reporting standard similar to the one required by the European Union and Canada for oil companies that are listed on their stock exchanges.¹¹⁴ Norway's Equinor is one example of a company that reports under the European Union requirements, detailing its payments by jurisdiction and by project.

¹¹² These EITI reports detail how much the companies are earning from various different revenue streams, including from the sales of oil that they received from production sharing agreements and from the company's own at-risk capital. They also detail the various streams according to which they transfer money from the company's own accounts to the treasury and other special government accounts. See, e.g., République du Congo Initiative pour la Transparence des Industries Extractives, *Rapport ITIE 2014* (2016), 72-76; ITIE Cote d'Ivoire, *Rapport ITIE 2014* (2016), 8, 133.

¹¹³ Extractive Industries Transparency Initiative, *The EITI Standard 2016* (EITI International Secretariat, 2017), 25, eiti.org/sites/default/files/documents/the_eiti_standard_2016_-_english.pdf.

¹¹⁴ NOCs listed on European Union stock exchanges, such as Norway's Equinor, are already subject to these EU standards, and thus break down their payments by jurisdiction in their reporting under mandatory disclosure regimes.

Other internationalized NOCs would greatly strengthen the value of their reporting if they developed internal standards matching those established in the EU and Canada. One example of a company approaching this standard is the Abu-Dhabi-based energy and water company TAQA, which has worldwide operations and disaggregates its tax and non-tax payments according to geography and business segment, making it possible to see what TAQA pays within the UAE and abroad.¹¹⁵

Cost reporting

In most cases, NOC reporting on expenditures does not provide a clear picture of how companies are spending their money. Our data template sought to divide both capital and operational expenditures into subcategories that could be easily understood by key stakeholders, including upstream versus downstream, core versus non-core and business-related versus quasi-fiscal spending on behalf of government. This effort proved largely fruitless. For 2015, for example, only nine out of 65 NOCs provided sufficient information for us to assess how much they spent on upstream opex in core activities. Other disaggregated spending indicators yielded similarly paltry results.¹¹⁶

This weak coverage results from both a lack of standardization and an absence of reporting. Therefore, our research points to two recommendations. First, international organizations such as EITI and the OECD could recommend comparable formats or measurements for extractive SOEs to include in their reporting systems. Second, NOCs themselves should prioritize publication of expenditure information sufficient for informing the public, including breakdowns as follows (for both capital and operational expenditure).

- Upstream, midstream and downstream
- Research and development
- Expenditure by business unit
- Oil-sector operations versus quasi-fiscal expenditure

C. ESTABLISHING AND PROMOTING EFFECTIVE BENCHMARKING

The indicators described in the above sections constitute the foundations of a comprehensive public reporting system for NOCs. Comprehensive reporting facilitates data-driven analysis as a tool for business decisions and oversight. However, for a company to formulate and execute a strategy which will maximize value generation, data alone are not enough. NOCs play different roles in different contexts and each of these roles is associated with different performance measures.

In order to execute a successful strategy, each NOC needs first to clearly define its role. Company roles differ across contexts and they are most often a combination of the archetypes described in Section IV. They can also evolve over time, especially as a result of new discoveries or changing business opportunities. Defining these roles is by no means straightforward, various stakeholders may have different priorities

¹¹⁵ See, e.g., TAQA, *Annual Report 2015*, 50, 60, [www.taqa.com/sites/default/files/TAQA Annual Report English Final.pdf](http://www.taqa.com/sites/default/files/TAQA%20Annual%20Report%20English%20Final.pdf).

¹¹⁶ The data for this disaggregated expenditure information were so sporadic, and so inconsistent, that we ultimately opted not to include the data in the published dataset.

and visions. The case of Sonangol (as discussed in Box 8) illustrates this difficulty. While the company's vision signals a mixed role with strong emphasis on profit seeking, its financial statements show the primacy of transferring funds to the state.

Once the role is clearly defined and articulated, NOC management should select KPIs that best match that role and put those KPIs at the center of performance reporting. IOCs also regularly use KPIs in their own reporting. For example, British Petroleum has 15 KPIs listed in its annual report including shareholder return, multiple metrics of upstream production efficiency and employee safety.¹¹⁷ Analysts have argued that the most important KPI for an upstream IOC is the reserve replacement ratio.¹¹⁸ However, the KPIs used by IOCs may not be appropriate for NOCs. If the NOC has only a limited or no operatorship over production, then it will have less control over costs and worker safety. If the NOC is focused on tax collection, it should not be measured against private companies operating in its home country, rather it should be evaluated on how effective the NOC is in growing the overall revenues to government (and sometimes in ensuring that there is enough private investment in the sector taxed at the appropriate level). NOCs playing a state supplement role may not realistically aspire to make very large profits, rather they might want to monitor more closely the costs and benefits of the various quasi-fiscal activities they undertake to ensure that they are cost-effective. NOCs which play an important role in providing employment may want to focus more on employee skills development or diversity.

Once an NOC selects appropriate KPIs, it can provide rigorous and continued assessment on performance over time. For example, as described in section IV.D., several governments announced in the wake of the price fall that upstream cost reduction would be a priority. The implementation and monitoring of a cost reduction strategy would be greatly supported by detailed data on operational expenditure, dividing it between core and non-core activities and showing costs for fields which the company operates and those it does not. This may enable NOCs to set more tailored KPIs, such as shrinking the share of spending on non-core activities or achieving greater savings on operated fields.

117 BP, *Annual Report 2017*, www.bp.com/content/dam/bp-country/de_ch/PDF/bp-annual-report-and-form-20f-2017.pdf, 18.

118 Salman Ghouri, "The Single Most Important KPI for Oil & Gas Companies," *Oil Price*, 6 September 2017, oilprice.com/Energy/Crude-Oil/The-Single-Most-Important-KPI-For-Oil-Gas-Companies.html.

VI. Conclusions and steps for further research

Our analysis reinforces three fundamental points about NOCs. First, the size and scope of NOC activities means that for anyone who cares about development and governance in oil-rich countries, they are impossible to ignore. NOCs sit at the center of public policy in their home countries, and decisions about how they are governed, how much they invest and their strategic priorities have a huge impact on the economic health of their countries. Second, there is no single archetype of what an NOC is; the term encompasses a wide range of companies with different goals, resources and competencies. Many governments put their NOCs into impossible positions when they saddle NOCs with contradictory goals or ask them to achieve results beyond their means. Conversely, some NOC leaders foment confusion by seeking to build empires where their governments envision a narrower role. The state and the NOC need to be honest, forthright and in agreement about the company's goals. Setting ambitious goals is important, but many countries fail when they set goals beyond their capabilities. Third, better benchmarking is crucial. This requires more transparency among NOCs, so that people inside resource-rich countries can fully understand what their companies are doing and that NOC leaders can compare themselves to others. It also requires political leaders to set goals clearly, establish metrics to measure performance against those goals and to hold company leadership accountable for results.

We hope that the NRGi's National Oil Company Database can be a valuable resource for researchers, activists and public officials seeking to help enhance NOC planning and performance. This paper includes one set of findings derived from the data, but we hope that our analysis here will be the tip of the iceberg. We intend to follow up this piece with deeper analysis of the topics addressed here and hope that analysts with diverse skills and interests can probe the dataset for additional insights about how NOCs perform and how they can continue to evolve. We believe the following topics may warrant additional examination.

- Comparative analysis of financial performance indicators such as return on capital employed and profit margin
- The implications of NOC assets and liabilities on the ability of oil-producing economies to diversify as a result of a possible global transition away from fossil fuels¹¹⁹
- NOC performance at exploration, especially via reserve addition, which is critical for long-term government efforts at managing the oil sector.

If the state of NOC reporting continues to improve, our collective ability to respond to these and other questions will grow. As such, we can better understand the tendencies and incentives driving the actions and performance of NOCs and develop stronger policy approaches to help companies, their shareholders and the public maximize the value they derive from the oil sector.

¹¹⁹ NRGi has begun to examine this question in the context of debates around supply-side policy shifts in oil-dependent states. Additional analysis forthcoming.

Appendix 1. NOCs in the National Oil Company Database

(all figures 2017 or most recent)

Company (short name)	Company (full name)	Home country	Production peer group	Total oil and gas production, boe/day	Total revenue, USD million	Total assets, USD million	Total transfers to government, USD million
ADNOC	Abu Dhabi National Oil Company	United Arab Emirates	Large domestic producers	4,666,000	-	-	-
BAPCO	Bahrain Petroleum Company	Bahrain	Medium domestic producers	153,973	-	-	-
Basra Oil Company	Basra Oil Company	Iraq	Large domestic producers	2,910,903	-	-	-
CNOOC	China National Offshore Oil Corporation	China	Internationalized operators	-	81,480	167,077	2,080
CNOOC Limited	China National Offshore Oil Corporation Limited	China	Internationalized operators	1,288,128	27,578	91,321	5,024
CNPC	China National Petroleum Corporation	China	Internationalized operators	5,515,728	349,391	606,431	36,404
CUPET	Cuba Petr�leo Union	Cuba	Small domestic producers	-	-	-	-
Ecopetrol	Ecopetrol	Colombia	Large domestic producers	715,000	19,100	40,888	3,766
EGPC	Egyptian General Petroleum Corporation	Egypt	Small domestic producers	-	-	-	-
ENH (company reporting)	Empresa Nacional de Hidrocarbonetos	Mozambique	Small domestic producers	-	115	545	23
ENH (EITI)	Empresa Nacional de Hidrocarbonetos	Mozambique	Small domestic producers	3,333	-	-	3
ENOC	Emirates National Oil Company	United Arab Emirates	Internationalized operators	83,952	16,415	18,248	-
Equinor	Equinor	Norway	Internationalized operators	1,888,795	61,000	111,100	9,885
ETAP	Entreprise Tunisienne d'Activit�s P�troli�res	Tunisia	Small domestic producers	57,596	507	2,111	154
Gabon Oil Company	Gabon Oil Company	Gabon	Small domestic producers	-	-	-	-
Gazprom	Gazprom	Russia	Internationalized operators	9,727,260	133,115	312,614	45,049
GEPetrol	GEPetrol	Equatorial Guinea	Small domestic producers	-	-	-	-
GNPC (company reporting)	Ghana National Petroleum Corporation	Ghana	Small domestic producers	-	444	824	262

Company (short name)	Company (full name)	Home country	Production peer group	Total oil and gas production, boe/day	Total revenue, USD million	Total assets, USD million	Total transfers to government, USD million
GNPC (PIAC)	Ghana National Petroleum Corporation	Ghana	Small domestic producers	43,638	-	-	319
IPIC	International Petroleum Investment Company	United Arab Emirates	Internationalized operators	-	35,809	58,044	3,300
KazMunayGas	KazMunayGas	Kazakhstan	Large domestic producers	606,095	7,542	37,660	2,045
KPC	Kuwait Petroleum Corporation	Kuwait	Large domestic producers	3,295,290	65,078	126,315	38,830
MOGE	Myanma Oil and Gas Enterprise	Myanmar	Small domestic producers	69,811	1,944	-	906
Naftogaz	Naftogaz	Ukraine	Medium domestic producers	320,953	8,744	27,189	1,939
NAMCOR	National Petroleum Corporation of Namibia	Namibia	Pre-production NOCs	0	62	51	1
National Oil Kenya	National Oil Corporation of Kenya	Kenya	Pre-production NOCs	0	-	-	-
Nilepet	Nile Petroleum Corporation	South Sudan	Small domestic producers	-	-	-	-
NIOC	National Iranian Oil Company	Iran	Large domestic producers	-	-	-	-
NNPC	Nigerian National Petroleum Corporation	Nigeria	Large domestic producers	1,208,217	-	-	9,516
NOC Libya	National Oil Corporation of Libya	Libya	Large domestic producers	-	-	-	-
NOCAL (company reporting)	National Oil Company of Liberia	Liberia	Pre-production NOCs	0	27	-	.
NOCAL (EITI)	National Oil Company of Liberia	Liberia	Pre-production NOCs	0	-	-	4
ONGC	Oil and Natural Gas Corporation	India	Internationalized operators	871,146	21,828	44,721	5,699
OOC	Oman Oil Company	Oman	Small domestic producers	38,000	-	-	-
Orsted	Orsted	Denmark	Internationalized operators	58,630	11,454	21,790	477
PCJ	Petroleum Corporation of Jamaica	Jamaica	Pre-production NOCs	0	1,349	242	3

Company (short name)	Company (full name)	Home country	Production peer group	Total oil and gas production, boe/day	Total revenue, USD million	Total assets, USD million	Total transfers to government, USD million
PDVSA	Petróleos de Venezuela, S.A.	Venezuela	Large domestic producers	3,819,685	48,002	189,663	5,450
Pemex	Petróleos Mexicanos	Mexico	Large domestic producers	2,700,000	74,320	112,646	17,861
Pertamina	PT Pertamina (Persero)	Indonesia	Large domestic producers	599,501	42,959	51,214	1,891
Perupetro	Perupetro	Peru	Small domestic producers	16,075	1,048	410	318
Petroamazonas	Petroamazonas	Ecuador	Medium domestic producers	425,000	11,213	-	-
Petrobangla	Petrobangla	Bangladesh	Medium domestic producers	464,831	1,319	845	956
Petrobras	Petróleo Brasileiro	Brazil	Internationalized operators	2,767,000	92,374	204,235	11,722
PetroChina	PetroChina	China	Internationalized operators	3,993,300	299,908	355,777	35,230
Petroci (company reporting)	Société Nationale d'Opérations Pétrolières de la Côte d'Ivoire	Côte d'Ivoire	Small domestic producers	-	539	2,223	75
Petroci (EITI)	Société Nationale d'Opérations Pétrolières de la Côte d'Ivoire	Côte d'Ivoire	Small domestic producers	24,224	297	-	198
Petroecuador	Petroecuador	Ecuador	Medium domestic producers	212,929	9,230	11,583	113
PetroleumBrunei	PetroleumBrunei	Brunei	Medium domestic producers	-	-	-	-
Petronas	Petroleum Nasional Berhad	Malaysia	Internationalized operators	2,320,000	53,559	139,486	10,332
PetroSA	PetroSA	South Africa	Small domestic producers	15,715	796	1,287	0
Petrotrin	Petroleum Company of Trinidad and Tobago	Trinidad and Tobago	Small domestic producers	67,230	2,917	5,987	265
PetroVietnam	PetroVietnam	Vietnam	Medium domestic producers	-	19,400	33,895	829
PNOC	Philippine National Oil Company	Philippines	Small domestic producers	-	11	807	3
PTT	PTT Public Company Limited	Thailand	Internationalized operators	299,206	59,635	65,773	1,989
Qatar Petroleum	Qatar Petroleum	Qatar	Large domestic producers	-	46,335	110,031	42,326
Rosneft	Rosneft	Russia	Internationalized operators	5,718,000	103,886	209,572	46,393
Saudi Aramco	Saudi Aramco	Saudi Arabia	Large domestic producers	13,100,000	264,594	294,014	133,823
SHT	Société des Hydrocarbures du Tchad	Chad	Small domestic producers	31,082	377	-	377

Company (short name)	Company (full name)	Home country	Production peer group	Total oil and gas production, boe/day	Total revenue, USD million	Total assets, USD million	Total transfers to government, USD million
Sinopec Corp	China Petroleum and Chemical Corporation	China	Internationalized operators	1,229,562	349,205	236,065	35,931
Sinopec Group	China Petroleum and Chemical Corporation—Group	China	Internationalized operators	-	355,142	333,893	2,847
SNH (company reporting)	Société Nationale des Hydrocarbures	Cameroon	Small domestic producers	-	-	150	-
SNH (EITI)	Société Nationale des Hydrocarbures	Cameroon	Small domestic producers	45,651	956	-	682
SNPC	Société Nationale des Pétroles du Congo	Congo (Rep.)	Small domestic producers	74,548	3,351	-	2,907
SOCAR	State Oil Company of Azerbaijan Republic	Azerbaijan	Medium domestic producers	251,915	53,925	35,643	814
Sonahydroc	Société Nationale des Hydrocarbures	Dem. Rep. of Congo	Pre-production NOCs	0	6	-	0
Sonangol	Sonangol Group	Angola	Large domestic producers	630,400	14,982	45,881	6,054
Sonatrach	Sonatrach	Algeria	Large domestic producers	3,465,582	43,767	95,248	20,077
Staatsolie	Staatsolie	Suriname	Small domestic producers	16,384	368	2,237	8
Sudapet	Sudan National Petroleum Corporation	Sudan	Small domestic producers	-	-	-	-
TAQA	Abu Dhabi National Energy Company	United Arab Emirates	Internationalized operators	126,200	4,609	28,055	332
Timor GAP	Timor GAP	Timor-Leste	Pre-production NOCs	0	14	8	0
TPDC	Tanzania Petroleum Development Corporation	Tanzania	Small domestic producers	-	35	1,264	-
Turkmengaz	Turkmengaz	Turkmenistan	Large domestic producers	-	-	-	-
YOGC	Yemen Oil and Gas Corporation	Yemen	Small domestic producers	-	-	-	-
YPF	Yacimientos Petrolíferos Fiscales	Argentina	Large domestic producers	576,700	16,570	30,534	1,090
YPFB	Yacimientos Petrolíferos Fiscales Bolivianos	Bolivia	Medium domestic producers	403,466	6,812	14,439	2,310

Appendix 2. Changes in NOC economic data as revenues changed

This appendix dives deeper into the analysis in section IV. D., looking at the correlations between changes in NOC revenues and other NOC economic data across the period. The approach we use is to run a regression between NOC revenues and various other variables on a logarithmic scale.¹²⁰ This allows us to calculate the percentage change in various indicators associated with a given percentage change in NOC revenues. This approach puts companies on the same scale irrespective of their size,¹²¹ and allows us to observe impact for each year for each company or on a total of more than 200 observations for each variable.¹²²

Table A2. Relationship between changes in NOC revenues and changes in other indicators

NOC indicator	Coefficient	Statistically significant relationship?	Number of observations
Net income from all revenues ¹²³	1.46 (on average, a 10% change in revenues is associated with a 14.6% change in income)	Yes (P-value = 0.00)	249
Operational expenditures	0.66 (on average, a 10% change in revenues is associated with a 6.6% change in opex)	Yes (P-value = 0.00)	287
Capital expenditures	0.60 (on average, a 10% change in revenues is associated with a 6.0% change in capex)	Yes (P-value = 0.00)	248
Transfers to the treasury	0.89 (on average, a 10% change in revenues is associated with a 8.9% change in transfers)	Yes (P-value = 0.00)	316
Total equity	0.18: (on average, a 10% change in revenues is associated with a 1.8% change in equity)	Yes (P-value = 0.02)	276
Total assets	0.16 (on average, a 10% change in revenues is associated with a 1.6% change in assets)	Yes (P-value = 0.00)	291
Long-term liabilities	-0.19	No (P-value = 0.05)	270

The above table of regression results show that NOC profits is the indicator that has the most pronounced response to changes in revenues. A 10 percent increase (decrease) in revenues is associated with an 15% increase (decrease) in profits. This confirms that NOC profits are heavily affected by swings in revenues.

120 We run a regression of $\log(\text{rev})$ on $\log(y)$, where y values are the different NOC indicators listed in the table, measured in USD. We use a model incorporating company fixed effects to capture the heterogeneity in company size. We apply these transformations following econometric good practice in order to have normally distributed variables measuring changes in values. We dropped 43 observations where the variables values were zero or negative (mainly on net income, but also some on transfers, liabilities and equity).

121 Note that very small new producers are more likely to experience larger swings.

122 This method also takes into account that not all companies experienced the same revenue impacts across years. For example, companies that expanded production during the period may have seen overall revenues rise in spite of the price fall.

123 Note that net income values were derived by us from the revenue and opex indicators.

The relationship between changes in NOC revenues and changes in key flows—opex, capex and transfers to the treasury—are also all large, positive and statistically significant. Capex and opex respond somewhat less than proportionately to changes in revenues—for each \$1 change in revenues, opex and capex changed by 66 and 61 cents, respectively. This may be explained by the fact that it may take some years to adjust expenditures on projects that have already been started. Transfers to the treasury are impacted more than that, changing by 88 cents for every \$1 change in revenues. Though as is illustrated by Figure 15 of the report, the response to booms and busts was not symmetrical.

It is no surprise that total assets and total equity are less impacted than previous variables, given that they represent stocks accumulated over time, rather than yearly flows. But it is interesting to note that there does not appear to be any statistically significant correlation between changes in NOC revenue and the way that NOCs handled their debt. There is no evidence of a consistent impact of lower revenues on NOC decisions about whether to increase or reduce debt. Some companies responded to the tougher environment by taking on new loans to finance costs, while others reduced their liabilities. Further work could explore whether any of the company attributes can explain which strategy they select.

ACKNOWLEDGMENTS

The authors wish to thank the team responsible for the development of the National Oil Company Database and accompanying analysis. Anna Fleming led the project's data management, including developing the data architecture and analytical tools. Alexandra Gillies led the overall quality control of this paper and other publications. Lee Bailey, Suneeta Kaimal and Liz McGrath provided guidance on research and publication strategy.

The original data collection template for the database was developed by Giancarlo Lazzáro. Researchers responsible for data collection and review included Nour Berro, Lidia Cano Pecharromán, Rose Davis, Charlotte Huebner, Naoko Takahashi, and Felix Wei Xin Tan.

A network of reviewers and advisors provided invaluable inputs and feedback on the data template, associated analysis and drafts, including Aisha Adam, Tony Addison, Theo Ahwireng, Frian Aarsnes, Andrew Bauer, Carlos Bellorin, Jim Cust, Galib Efendiev, Audrey Gaughran, Alonso Hidalgo, Charlotte Huebner, Poppy Ismalina, Daniel Kaufmann, Thomas Lassourd, Marie Lintzer, Paasha Mahdavi, Alexander Malden, David Manley, Valérie Marcel, Keith Myers, Fernando Patzy, Zira John Quaghe, Laura Robinson, Khin Saw Htay, Amir Shafaie, Alina Skripets, Berit Tvedt, Claudia Viale and Armando Zamora.

The group responsible for conceptualizing and developing the online database platform included Thomas Morrison, Anders Pedersen, Adina Petrean (and her team at Vitamin Software), Alexander Podsechin (and his team at SoftGrad Solutions), Andriy Privalov and Hari Subhash.

The team at the Center for Law, Energy & Environment, U.C. – Berkeley, including Jordan Diamond and Luke Sherman, provided intellectual and logistical resources of great value to the development of the project.

ABOUT THE AUTHORS

Patrick R.P. Heller is an advisor at the Natural Resource Governance Institute (NRGI) and a senior visiting fellow at the Center for Law, Energy & Environment, U.C. - Berkeley. David Mihalyi is a senior economic analyst at NRGI.

The Natural Resource Governance Institute, an independent, non-profit organization, helps people to realize the benefits of their countries' oil, gas and mineral wealth through applied research, and innovative approaches to capacity development, technical advice and advocacy.

Learn more at www.resourcegovernance.org

