The World Bank Group

CEE CENTER FOR ENERGY ECONOMICS

Bureau of Economic Geology, Jackson School of Geosciences
The University of Texas at Austin

A CITIZEN'S GUIDE TO NATIONAL OIL COMPANIES

Part A

Technical Report

October 2008

This paper is an informal document intended to provide input for the selection of a sample of representative national oil companies to be analyzed within the context of the *Study on National Oil Companies and Value Creation* launched in March 2008 by the Oil, Gas, and Mining Policy Division of The World Bank. The manuscript of this paper has not been prepared in accordance with the procedures appropriate to formally edited texts. Some sources cited in this paper may be informal documents that are not readily available.

The findings, interpretations, and conclusions expressed herein are those of the author(s) and do not necessarily reflect the views of the International Bank for Reconstruction and Development/The World Bank and its affiliated organizations, or those of the Executive Directors of The World Bank or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work.

Oil, Gas, and Mining Policy Division The World Bank 2121 Pennsylvania Avenue, NW Washington DC, 20433 Telephone: 202-473-6990 Fax: 202-522 0395 Email: ogmc@worldbank.org Web: http://www.worldbank.org/noc.	Center for Energy Economics Bureau of Economic Geology Jackson School of Geosciences The University of Texas at Austin Telephone: +1 281-313-9753 Fax: +1 281-340-3482 E-mail: energyecon@beg.utexas.edu Web: www.beg.utexas.edu/energyecon

ACKNOWLEDGMENTS

This *Citizen's Guide* presents the results of a survey intended to provide input for the selection of a sample of representative national oil companies to be fully analyzed within the *Study on National Oil Companies and Value Creation* (launched in March 2008) by the Oil, Gas, and Mining Policy Division of The World Bank.

The task manager for this report was Silvana Tordo (lead energy economist, Oil, Gas and Mining Division of the World Bank). The research was led Michelle Michot Foss, chief energy economist and head of the Center for Energy Economics, Bureau of Economy Geology, Jackson School of Geosciences at the University of Texas at Austin, and her team—Gurcan Gulen, senior energy economist; Miranda Ferrell Wainberg, senior researcher; Ruzanna Makaryan, senior energy analyst; Dmtry Volkov, energy analyst; Mariano Gurfinkel, former Assistant Head (now Unconventional Resources and New Ventures, Hess Corporation); Omar Valdez, Columbia University, School of International Public Affairs; Jim Starr, University of Richmond. Input and comments were also provided by a number of advisors and mentors, including: Bhamy Shenoy, consultant; Alfred Boulos, Boulos International; Poten & Partners; Jonathan Stern, Oxford Institute of Energy Studies; Javier Estrada, Analytica Energetica; Ernesto Marcos, Marcos y Asociados. The comments of World Bank reviewers—Olivier Fremond (country manager, AFMGA), Jonathan Walters (sector manager, MNSSD), Clive Armstrong (lead economist, COCSC), and Michael Levistky (lead economist, COCPO), and the contribution of the task manager are gratefully acknowledged. Special thanks go to Stephen Spector for editing the report and Esther Petrilli-Massey for coordinating its publication.

LIST OF ACRONYMS

BOE	Barrels of oil equivalent
CEE	Center for Energy Economics at the University of Texas-Austin
DA	Data attribute
EBIT	Earnings before interest payments on borrowings and taxes
EITI	Extractive Industries Transparency Initiative
ESMAP	Energy Sector Management Assistance Program (World Bank)
GDP	Gross domestic product
IOC	International oil company
LNG	Liquefied natural gas
R/P	Reserves-to-production
ROA	Return on assets
ROCE	Return on capital employed
SOE	State-owned enterprise
USEIA	United States Energy Information Administration

Contents

List of Tables

List of Figures

A CITIZEN'S GUIDE TO NATIONAL OIL COMPANIES

OVERVIEW OF THE GUIDE

At the request of the World Bank, the Center for Energy Economics at the University of Texas–Austin (CEE) undertook a broad survey of national oil companies (NOCs) to assemble background information in support of further analysis (the upcoming *Study on NOCs and Value Creation*, due to be completed in 2010). The Bank's ultimate goal is to improve the understanding of these organizations and the role each plays within its country's economic development trajectory. This will lead to improved policy recommendations in a sector that has major political, social, and developmental impacts.

This guide presents a collection and preliminary analysis of data on a large group of NOCs, and provides a starting point for discussion in resource-rich countries among policy makers, civil society, and other stakeholders to engage on these issues with the objective of strengthening and improving the contribution of NOCs to economic and social development.

Why a *Citizen's Guide to NOCs*?

NOCs control the dominant share of worldwide hydrocarbon resource endowments as well as many of the major oil and gas infrastructure systems. This can be overtly, as actual producers, or as the "gatekeepers" for exploitation access by international energy companies. As such, NOCs are of great consequence to hydrocarbon sector performance.

Even the smallest NOCs are powerful organizations within their nation-states. They are charged with serving the public interest in a number of ways: supplying essential energy fuels and associated services, generating revenue streams that contribute to economic development, responsibly managing environmental and other risks, and performing well in many other regards.

NOCs differ from each other in many respects: some rely on a monopolistic position in their home country while others face competition; some participate in joint ventures while others operate on a sole risk basis; some operate internationally while others remain in their home country, some concentrate on particular segments of the value chain while others are fully integrated, etc. Each NOC faces distinct challenges and has a different economic, social and political impact. A systematic collection of data on NOCs is a first steps towards improving the understanding of these differences.

Organization of the Guide

The analysis presented in this *Citizen's Guide to National Oil Companies* (hereafter, the Guide), focuses on the drivers and measures of NOCs' performance along a variety of measures. The Guide's analysis is entirely based on information drawn from public domain sources, rather than private and proprietary documents that are not accessible by wide audiences.

The Guide is composed of two parts: Part A, a technical report and Part B, a data directory.

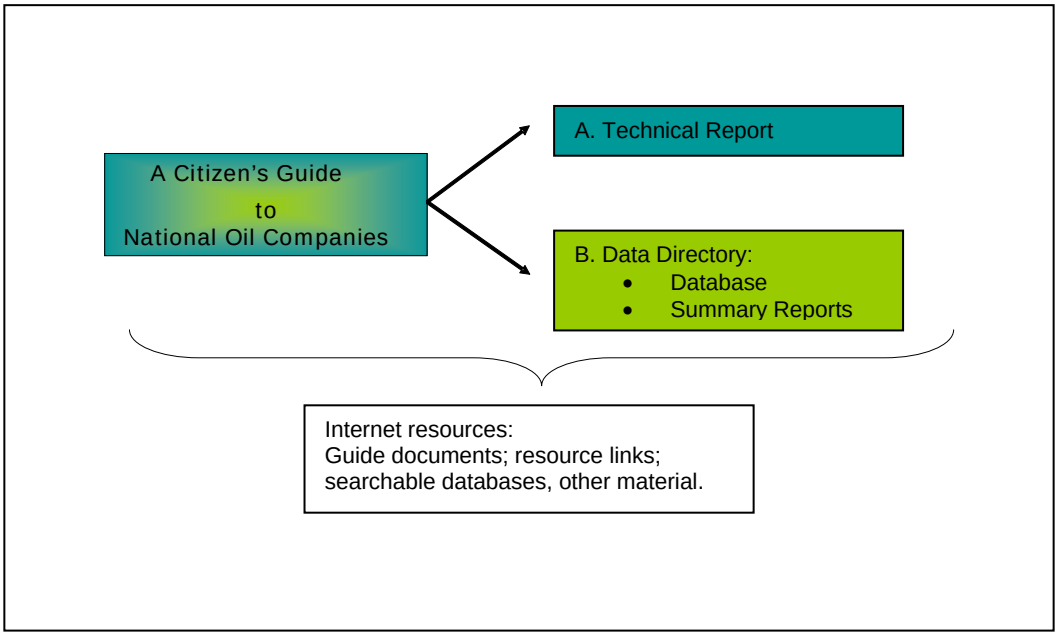
Part A, a technical report, is divided into several sections.

- **Part I** provides a more detailed explanation of the purpose of this Guide along with background information and methodology used for its compilation
- **Part II** summarizes the key aspects of the NOC directory
- **Part III** suggests possible grouping of NOCs based on similarities in institutional and other factors observed through cluster analysis
- **Part IV** offers suggested categories for further analysis, including case studies and other approaches
- **Part V** references the sources of information used to compile the Guide

Part B, a data directory, contains the database and summary tables on all the NOCs presented in the Guide.

The Guide is available and can be downloaded via the Internet on both the World Bank and CEE-UT websites. Interested readers should check http://www.worldbank.org/noc and www.beg.utexas.edu/energyecon for updates.

An illustration of the components of the Guide is shown below.



PART I. GENERAL BACKGROUND AND METHODOLOGY

In March 2008, the Bank released a concept note outlining the objectives and key components of the *Study on National Oil Companies and Value Creation*, which is expected to be completed by March 2010. These are summarized below.

NOCs and Value Creation[1]

NOCs control approximately 90 percent of the world's oil reserves and 75 percent of production (similar numbers apply to gas).[2] *Petroleum Intelligence Weekly* ranks 17 NOCs among the top 25 holders of oil and gas reserves, and a similar proportion is found among top producers. In addition, approximately 60 percent of yet-to-be-discovered reserves are estimated to lie in countries where NOCs have privileged access to reserves. Thus, future production is likely to come primarily from NOCs. Moreover, new NOCs have been created (as in Chad and Mauritania) or are being considered (as in Uganda).

On the other hand, few NOCs have integrated upstream and downstream operations for refining and distribution. Very few of them hold downstream assets or are present in key, premium consuming markets. The high level of energy prices in the past few years, and renewed fears of supply disruptions associated with a variety of internal and geopolitical factors, have discouraged many governments from modernizing their NOCs or instituting reforms, such as opening the hydrocarbon sector to private investors.

NOCs and Domestic Agendas

NOCs, especially in developing countries, are often the instrument for achieving a broad range of national, social, and political objectives that go well beyond their original purpose of maximizing revenues for their governments. While some consider it a positive way to leverage oil revenue for domestic needs, other industry observers have suggested that the pursuit of these noncore, noncommercial objectives imposes additional costs on NOCs, reduces their incentive to maximize profits, and hinders their ability to raise capital on the financial market, leaving state treasuries to bear the burden of inefficient capital allocation. As the experience of some leading NOCs seems to indicate, this conclusion cannot be generalized. But given the high risk and capital-intensive nature of the hydrocarbon sector, there is a need to better understand the growing importance of NOCs and the political, social, and developmental consequences of their actions.

Objectives of the Study on National Oil Companies and Value Creation

The objectives of the study are:

[1] This section was drawn directly from the concept note for the "Study on NOCs and Value Creation," March 2008, Oil, Gas and Mining Policy Division, the World Bank.

http://www.worldbank.org/noc

[2] The NOCs of OPEC member countries hold about two thirds of world oil reserves and produce nearly 40 percent of the world's oil and gas.

- *To help governments make informed policy decisions concerning their NOCs, including how best to create them* (if they don't already have one) and provide effective and efficient management and oversight over them. There is a long history of governments' attempts to organize their NOCs in pursuit of efficiency, improved governance, greater control, and other political or economic objectives, with sometimes mixed results. The study will analyze the outcomes from these different efforts, incorporate recent developments in state-owned enterprise (SOE) governance, and suggest which approaches have the best prospects for success. The study will enable governments that are considering the restructuring of their hydrocarbon sector to learn from international experience, thus avoiding costly experiments.
- *To provide the foundations for the World Bank's policy advice on the management and oversight of the petroleum sector.* Drawing from the experience of well-established NOCs with different histories and functions, and taking into account recent developments concerning the governance of SOEs, the study will aim to develop a reference framework for the World Bank's technical assistance and advisory work on the role of NOCs, their effective management and oversight, and their interaction with their countries' sector and macro-fiscal policies.

Expected results from the study would include:

- Improved understanding of the petroleum sector value chain and of the policy options that are best suited to maximize the benefits to the state at each link of the chain.
- Improved awareness by policy makers of the relative effectiveness and suitability of alternative policies for the management and oversight of the petroleum sector, with particular reference to the role and functioning of NOCs.
- Consistency in the Bank's advice on petroleum sector governance and NOCs.

The Contribution of This Guide to the Study on NOCs and Value Creation

The *Study on NOCs and Value Creation* aims to determine the factors that explain the creation of value by NOCs and test their relative importance by analyzing the experience of a selected sample of NOCs. Although the study will concentrate on the relationship between corporate governance structure and value creation, the impact of other factors will also be investigated. These will include:

- Access to the resource;
- Access to the final market;
- The level of efficiency and good governance of the public sector;
- The existence of investment opportunities in other sectors;
- The county's fiscal sustainability;
- The geological settings;
- The operating conditions; and
- The strategy of the NOC.

In addition, the Study will look at policies that governments have used to influence the behavior of their NOCs, and investigate their outcomes, and their relative success.

This Guide is intended to inform the selection of the sample of NOCs that will be further analyzed in the study. To this end, the Guide aims to identify NOCs that span the range of experience in the dimensions of analysis chosen for the study. By providing a collection of readily accessible data while the study is underway, the Guide will also foster additional research on NOCs by interested organizations.

Selecting the NOCs and Countries Profiled in This Guide

Table 1, below, was compiled on the basis of a review of publicly available data. The goal of this exercise was to identify as many of the world's NOCs as possible without consideration of their size, resource endowments, data availability, longevity, location, or organization. The color coding used in the table has been applied consistently throughout this report to reflect different world regions. The Guide contains data on 49 NOCs for which sufficient data are publicly available (shown in bold below).

Table 1. Universe of World Bank Regions, Countries, and NOCs

East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa
Brunei (BNPC)	Azerbaijan (**SOCAR**)	Argentina (**Enarsa**)	Algeria (**Sonatrach**)	Bangladesh (**Petrobangla**)	Angola (**Sonangol**)
China (**Petrochina**)	France (**Gaz de France**)	Bolivia (**YPFB**)	Bahrain (BAPCO)	India (**ONGC**)	Cameroon (**SNH**)
China (**CNOOC**)	Kazakhstan (**Kazmunaigas**)	Brazil (**Petrobras**)	Egypt (**EGPC**)	India (Gas Authority of India)	Chad (**SHT**)
China (**Sinopec**)	Norway (**StatoilHydro**)	Chile (ENAP)	Iran (**NIOC**)	India (IOC)	Congo (**SNPC**)
Indonesia (**Pertamina**)	Russia (**Gazprom**)	Colombia (**Ecopetrol**)	Iraq (INOC)	Pakistan (**OGDCL**)	Cote d'Ivoire (**PETROCI**)
Japan (JOGMEC)	Russia (**Rosneft**)	Cuba (Cupet)	Kuwait (**Kuwait Petroleum Corp.**)		Equatorial Guinea (**GEPetrol**)
Malaysia (**Petronas**)	Russia (**Transneft**)	Ecuador (**Petroecuador**)	Libya (**Libya National Oil Co.**)		Gabon (SNGP)
Philippines (PNOC)	Turkmenistan (TurkmenNeft)	Mexico (**Pemex**)	Mauritania (SMH)		Ghana (**GNPC**)
So. Korea (KNOC)	Turkey (Turkish Petroleum Corp.)	Peru (**PetroPeru**)	Oman (**PDO**)		Nigeria (**NNPC**)
Taiwan (Chinese Petroleum Corp.)	Ukraine (Naftogaz Ukrainy)	Trinidad and Tobago (National Gas Co.)	Qatar (**Qatar Petroleum**)		Sao Tome and Principe (Petrogas)
Thailand (**PTT**)	Uzbekistan (**Uzbekneftegaz**)	Trinidad and Tobago (Petrotrin)	Saudi Arabia (**Saudi Aramco**)		South Africa (**PetroSA**)
Vietnam (**Petrovietnam**)	Belarus (**Belarusneft**)	Venezuela (**PDVSA**)	Syria (**SPC**)		Sudan (**Sudapet**)
	Italy (Eni)		Tunisia (**ETAP**)		Mozambique (**ENH**)
			United Arab Emirates (**ADNOC**)		Kenya (NOK)
			Yemen (Yemen General Corp.)		Tanzania (EPDC)
			Morocco (Onaret)		Uganda (Natoil)

As more information becomes publicly available, additional NOCs may be included in future editions of the Guide.

Framework for the Guide

The framework for data collection presented in this Guide is organized along the primary dimensions of analysis (DAs) outlined below.

(a) **Corporate governance**

Corporate governance captures the structure and organization of an NOC, its decision making, budgetary autonomy and authority, sources of capital, disclosure and transparency, and the human resource capacity of its workforce. In analyzing the mission and objectives of NOCs, the team looked for explicit statements of noncommercial objectives, a key consideration for NOCs.

(b) **Value creation**

Value creation captures the performance of NOCs as measured by operating and financial parameters normally used in the oil sector.

- **Operating performance** refers to the upstream, midstream, and downstream operations of an NOC.[3]
- **Financial performance** refers to profitability and sustainability of an NOC.

(c) **Other factors**

A wide range of factors affect the corporate structure and value creation of NOCs:

- **Public sector governance** refers to a country's institutional and legal framework that governs the petroleum sector (sector policy, institutional responsibility, legal and regulatory framework), and the presence of a culture of accountability.
- **Oil dependency** refers to the importance of the oil sector vis-à-vis the rest of a country's economy.
- **Fiscal regime** refers to the effect of the fiscal regime on both the entry/access and competitiveness of a country's hydrocarbon sector as well as on NOC financial sustainability.
- **Resource endowment** refers to the estimated size of oil and gas reserves and their audit status.
- **Operating conditions** refers to factors that affect an NOC's ability to operate, such as the geology, the type of petroleum-related infrastructure, and so on.

[3]For the purpose of this Guide, the following definitions shall apply: (a) upstream refers to oil and gas exploration, development, extraction, and production activities; (b) midstream refers to transportation (pipelines, tankers, and so on.) and storage of oil and gas, the processing of natural gas, and liquefaction and shipping of liquefied natural gas; and (c) downstream refers to the refining, distribution, and marketing of petroleum and petroleum products and petrochemicals; and the distribution and direct marketing of natural gas.

- **Access to reserves** refers to whether the NOC has exclusive access to reserves, preferential access, or competes on an even basis with national and international oil companies.
- **Business integration** refers to the extent of horizontal and vertical integration as reported by NOCs and their governments.
- **International presence** refers to the extent to which NOCs operate beyond their home borders as reported by NOCs and their governments.
- **Commercialization** refers to the extent to which, as reported by NOCs and their governments:
    - equity (such as stock ownership) in the NOC is available to the public
    - noncore commercial activities are carried out by an NOC
    - an NOC operates in association with other national or international oil companies and the form of such associations, and the level of competition both in an NOC's home country and in the international markets where it operates
- **Regulation** refers to the presence and quality of hydrocarbon regulation and whether this function is independent of the NOC or other government entities tasked with policy or oversight responsibilities.
- **NOC noncommercial objectives** refer to the extent to which noncore, noncommercial activities are carried out by an NOC (and as reported by NOCs and their governments), including the direct or indirect provision or funding of social programs and the existence of price subsidies and/or associated charges.

In addition, the following elements were considered:

- ***The availability of information***
- ***The longevity of the NOC*** (history and persistence)
- ***Whether the NOC belongs to a consumer or to a producer country.*** For instance, Nigeria, Equatorial Guinea, and Saudi Arabia are net exporters of oil and gas, whereas Malaysia, Mozambique, and Thailand consume more oil and gas than they produce.

A detailed set of specific indicators and metrics was devised to describe and measure each DA for the 49 NOCs included in the Guide. Indicators and metrics were discussed with World Bank staff and industry experts, including current and former senior managers in NOCs. This resulted in the creation of a data template composed of 121 indicators and an additional 68 raw data variables. CEE's working paper on *Commercial Frameworks for National Oil Companies*, published in March 2007, provided additional input.[4] **Appendix 1** provides a description of each indicator used in the Guide and its mapping to the relevant DA.

The template was populated using publicly available information drawn from various sources including but not limited to: NOC publications and websites; country ministries and regulatory

[4] Michelle Michot Foss, Miranda Ferrell Wainberg, and Dmitry Volkov, *Commercial Frameworks for National Oil Companies*, March 2007, CEE-UT. For information, contact energyecon@beg.utexas.edu.

bodies involved in the hydrocarbon sector; and websites that provided data ranging from resource endowment to operating activity and other measures. Part V of this report discusses sources in more detail and provides links and other information in support of this study.

PART II. THE NOC DATA DIRECTORY

The NOC Data Directory is a companion document of the Guide. It incorporates the main table that aggregates all data and information collected on the NOCs (distilled in the Guide). In addition, two-page summaries on each NOC are provided. The two-page summaries incorporate the World Bank Governance Indicators to provide context on each country in the sample. All together, the data directory encompasses a large amount of information on the 49 NOCs and their home countries.

Highlights from the Directory

The Guide provides a preliminary analysis and possible interpretation of the data collected in the Data Directory. What follows are a series of charts that feature some of the most interesting observations that have emerged from analyzing the data collected for the Guide. The charts and underlying information are relevant for understanding the NOCs presented in the Guide, and what may affect their strategies and performance.

Data on macro variables—such as oil and gas reserves and production, country gross domestic product (GDP) and so on—are the most recent available (2006–2007). Operational and financial performance results are calculated as average of data reported by NOCs in the period 2004–2007. Financial ratios, such as returns on assets, are compiled using the averages. The reader should note that not all NOCs and/or government data are reported for all years in the 2004–2007 time frame.

We also add a caveat: a problem that clearly emerged during our analysis was the need to deal with the ample variation in the quality of data made publicly available by NOCs and their governments. The methodology for collecting the data and constructing the metrics described in Part I above only partially addresses this limitation because experts' opinions are no substitute for lack or poor quality of data. It is therefore important to remind the reader that the analysis presented in this Guide, although indicative of general trends or cause-effect relationships, clearly implies a certain level of judgment and subjectivity.

A convenient chart on the next page shows the figures contained in the Guide and provides hyperlinks to navigate directly to them.

Table 2: Directory of Figures and Graphs

NOC Overview

Preliminary Clusters

NOC Overview (Figures 1–4)

Figure 1. Categories Reported by NOCs

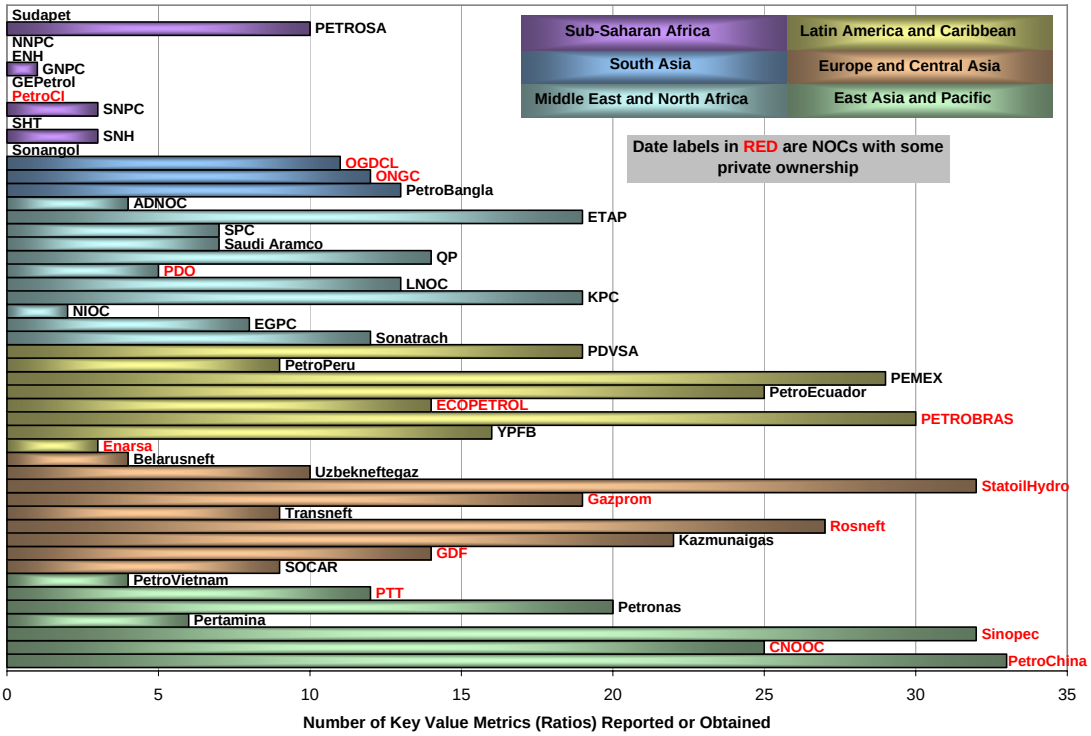


Figure 1 illustrates the wide variability in reporting provided by NOCs. The categories are all of those that capture key operating and performance measures or ratios, such as reserve replacement rate, return on assets (ROA), number of employees, and the like. Not all of the metrics collected are readily available in annual or other operating and financial reports provided by NOCs.

The data-collection process included a range of sources and some data points, such as number of employees, which required extensive searching (or do not seem to be available in the public domain). Generally speaking, a wide range of data are publicly available on partially privatized NOCs (Petrobras, Petronas, StatoilHydro, Petrochina, and so on), whereas stronger state ownership seems to permit a lower level of public disclosure. It should be noted that a number of NOCs and governments are working toward disclosure, such as Nigeria and the Democratic Republic of Congo, which have an active Extractive Industries Transparency Initiative (EITI) effort, and Angola.

Figure 2. Resource Endowment Shares for NOC Countries

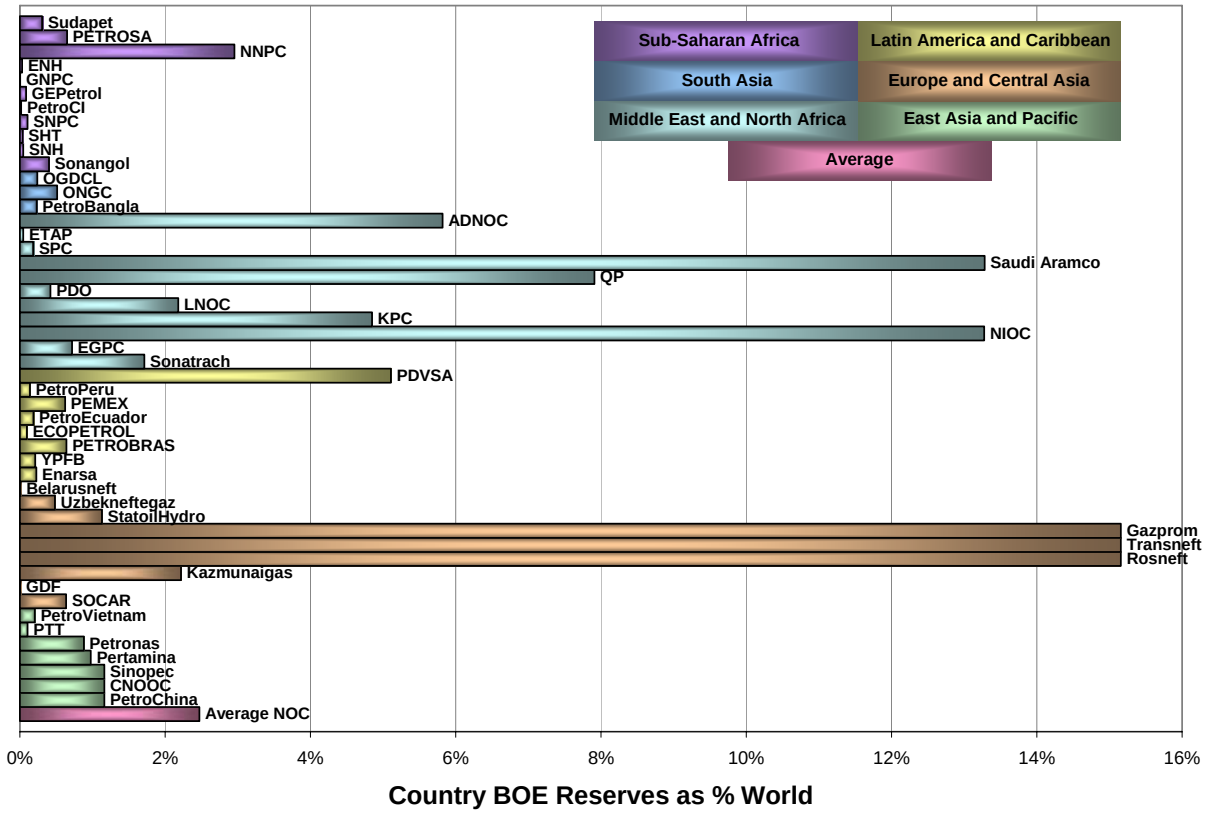


Figure 2 shows the shares of respective countries' resource endowments (in barrels of oil equivalent, or BOE) relative to total estimated global BOE. The Guide incorporates a wide range of positions with respect to resource endowments, with the Middle East and Russia leading the pack of resource-rich countries. A variety of sources was used to compile country resource endowment data (see Part V on sources).

Figure 3. R/P Ratios for NOC Countries

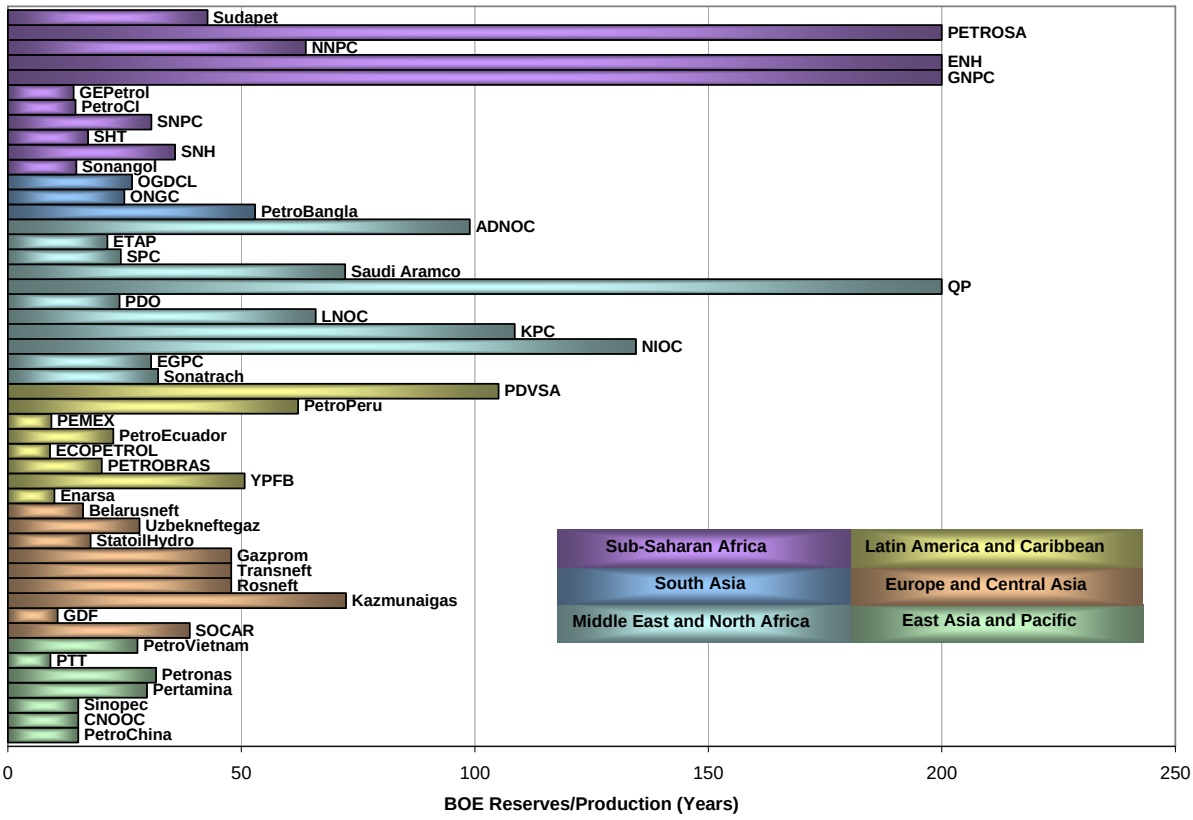
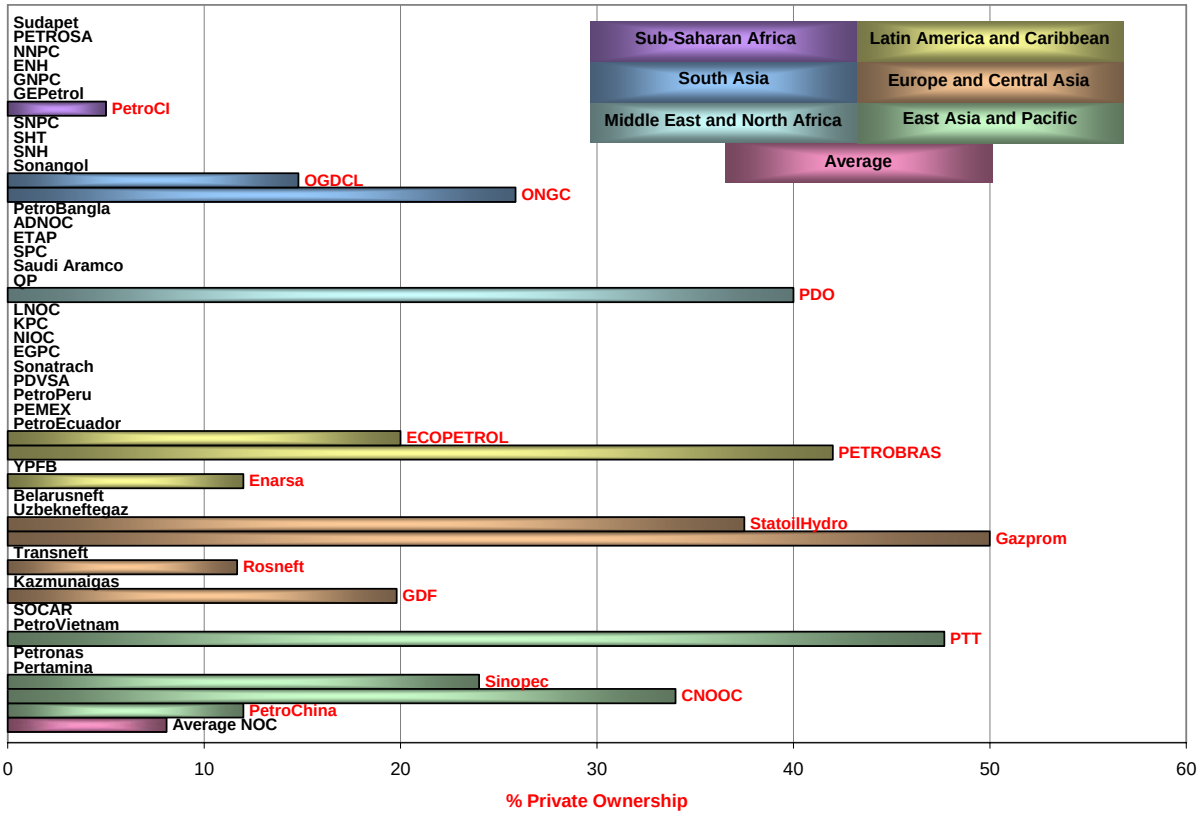


Figure 3 shows the reserves-to-production (R/P) ratios[5] for NOC countries. The R/P ratio is an indicator of below-ground wealth for producing countries, NOCs, and international oil companies. Not all NOCs report their own reserves (or production). Four countries in the sample—South Africa (PetroSA), Mozambique (ENH), Ghana (GNPC), and Qatar (QP)—either have recent reported discoveries relative to domestic production or extraordinary resource endowments relative to production, and so yield very high R/P ratios. A maximum of 200 years is used for charting purposes.

[5] The reserves to current production rate is a theoretical indicator conventionally used to measure the number of years current reserves would last if a country had as much reserves as projected and could produce them at a steady constant production rate. The limitation of this indicator resides in the uncertainty surrounding the level of reserves, which cannot be estimated with certainty, as well as the production rate, which is unlikely to be a fixed number due to economic and technical factors. Both reserve estimates and production rates are a function of oil and natural gas prices and available technology.

Figure 4. NOCs with Partial Private Ownership



The Guide includes both NOCs that are fully state owned as well as those that have partial equity offerings in place or underway. **Figure 4** shows the variation in private ownership (or government retention) across the NOCs.

The NOC with the largest share of private ownership is Gazprom (49.998 percent). Petrobras (Brazil); StatoilHydro (Norway); Gazprom and Rosneft (Russia); and Sinopec, CNOOC, and PetroChina (China) are all listed on international stock exchanges (New York and London), while others, such as Ecopetrol (Colombia) are moving in that direction. As can be observed, the majority of NOCs remain 100 percent owned and controlled by their governments.

There is a wide range of arrangements for for allowing the NOC to administer the resources of the State: some are given a total vesting of petroleum rights (such as Petronas), other are given a partial vesting (such as LNOC), while others are given the exclusive right to develop and exploit resources directly or in association with others (such as Sonangol). These arrangements have a bearing on the capital structure of the NOC, its mandate, and its organizational and financial autonomy.

Usually NOCs are established as a commercial public corporation, with separate legal entity, perpetual succession, a common seal, and a board of directors subject to ministerial control and parliamentary accountability. The independence and composition of the board is also quite variable among NOCs. Few wholly state owned NOCs have independent directors in their boards. Often NOCs that are partially owned by the private sector have stronger corporate governance arrangements than NOCs that are totally owned by their government.

Key Features of the NOC Data Set (Figures 5–16)

The next series of charts illustrates key features of the NOC data set contained in the Guide.

Figure 5. NOC BOE Production as Share of Total Country BOE Production

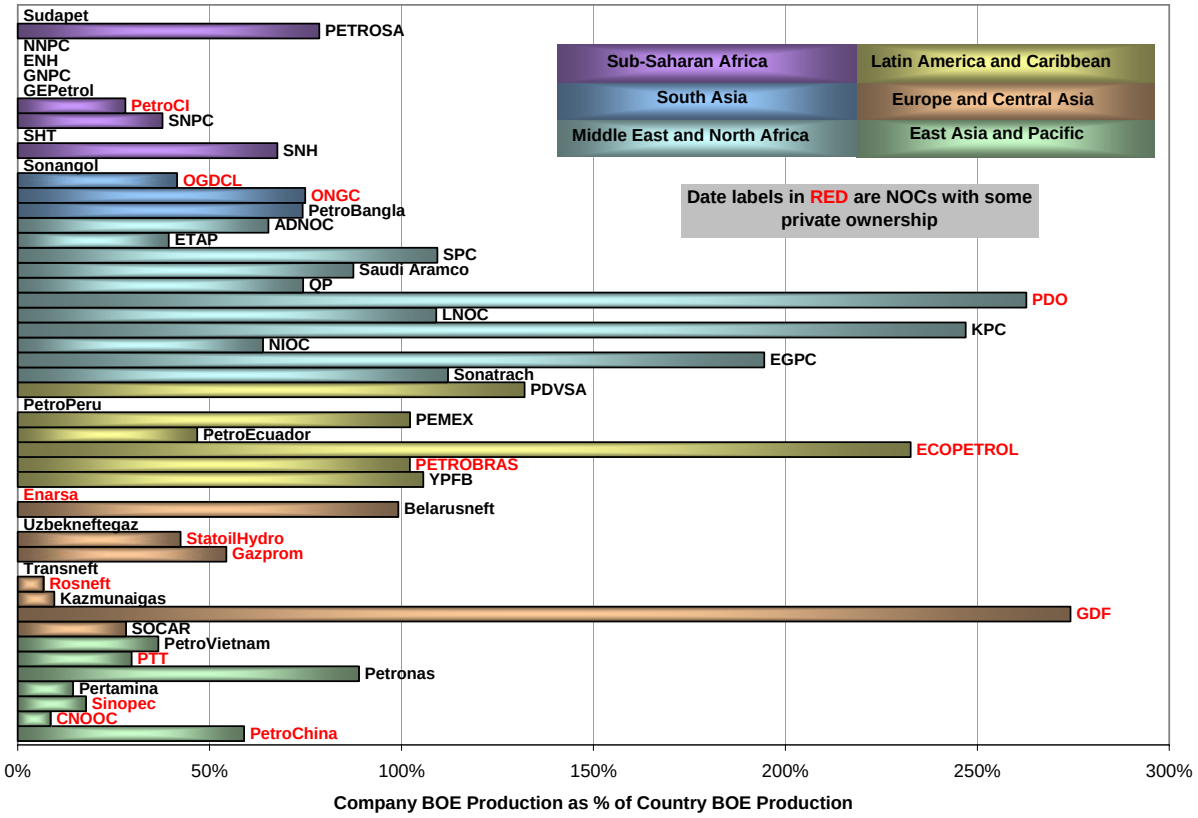
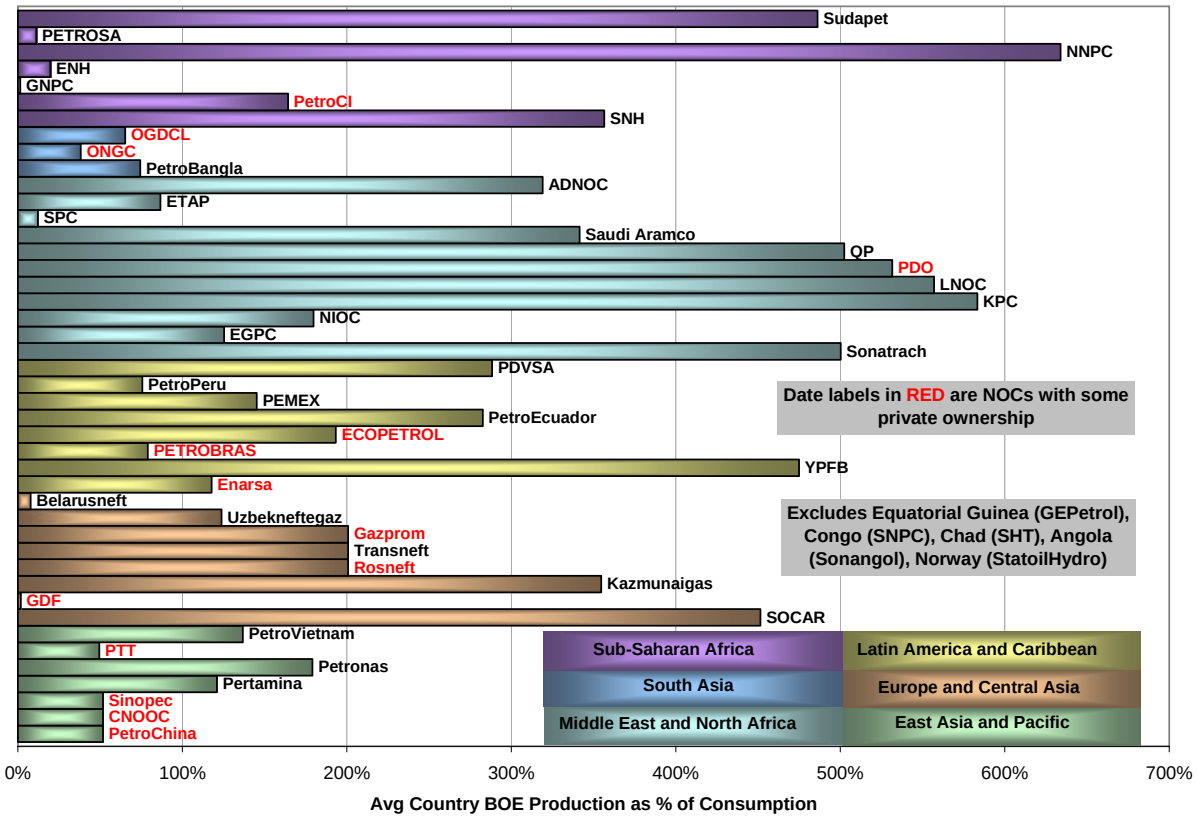


Figure 5 illustrates the share of NOCs' production expressed in BOE relative to total country production. Oil and natural gas production reported by NOCs relative to what the sovereign governments report is an indication of data quality as well as NOC dominance in their respective markets. NOCs report production both from their own operated interests as well as volumes produced through joint ventures and other arrangements (non-operated interests).

Some NOCs show production levels in excess of 100 percent of the oil produced in their countries because they report their production from both their international and their national operations. Oman (PDO) and Kuwait (KPC) produce from shared areas, so that their reported production exceeds their individual country totals.[6] For all other NOCs that report production shares in excess of 100 percent, NOC data quality must be questioned.

[6] On the other hand, France (GDF), Brazil (Petrobras), Norway (StatoilHydro), China (CNOOC), and Malaysia (Petronas) all have meaningful international operations, but total production of their NOCs does not exceed total country production.

Figure 6. Country BOE Production Relative to Consumption



A question underlying the Guide is whether NOC operations and performance may vary with a country's resource endowments relative to internal consumption. That is, some NOCs are based in countries that are net oil and gas exporters, while others mainly serve their home countries' energy security by reducing import requirements. **Figure 6** illustrates the distribution of NOC home countries as either net exporters or net importers.

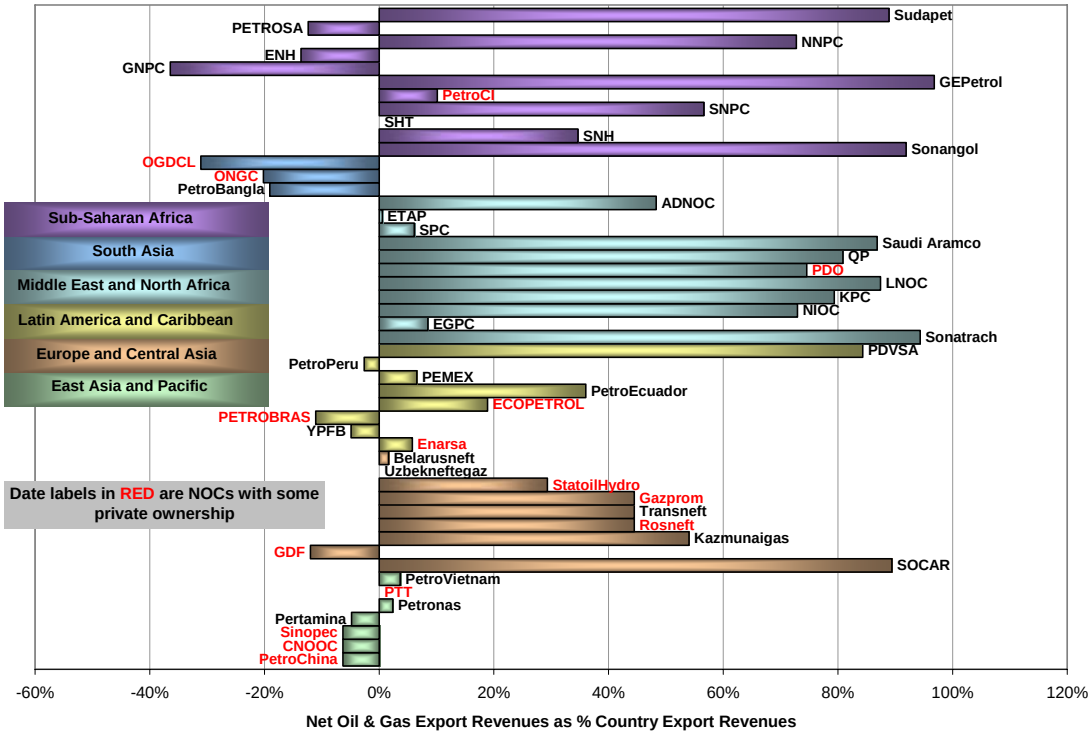
In several cases, domestic production does not satisfy consumption even though resource endowments may exist and may be substantial: Brazil (Petrobras), and China (Sinopec, CNOOC, and Petrochina) are examples in this sense. In other cases, production levels are well above local consumptions needs, whether because of exceptional endowment (as is the case for many Middle Eastern producers) or because of the level of local economic development (as for many African producers).

Several countries and companies are excluded from **Figure 6** because of the substantial difference between production and domestic consumption: Equatorial Guinea (GEPetrol), Congo (SNPC), Chad (SHT), Angola (Sonangol), and Norway (StatoilHydro). All of these countries export well more than ten times their internal consumption. The reader should note that, for all charts where such exclusions are made, they are only for purposes of graphical presentation. All data are included in the Guide.

The Production/Consumption Profile

The implications of a country's production/consumption profile on the oil trade balance, total export revenues, and GDP are shown in Figures 7 and 8. These indicators provide context with respect to *oil dependency*, *energy security*, and *economic vulnerability to oil shocks*. Net importers exhibit negative values.

Figure 7. Oil Trade as Share of Total Country Exports of Goods and Services



As shown in **Figure 7**, export revenues from oil and natural gas sales are a significant portion of total export revenues for many countries represented in the Guide. Indeed, *petroeconomies* are defined by the dominance of oil and gas export sales and their dependence upon these sales. A typical challenge for these economies is diversification, especially to provide a buffer against commodity price cycles.

Countries that are net importers of oil and gas have negative trade balances (deficits). Conventional wisdom is that countries with stronger dependence on oil and gas export revenues may also have stronger policies with respect to NOCs. But later charts will demonstrate that this is not the case; government policies toward NOCs are highly variable and driven by many other factors.

Figure 8. Oil Trade as Share of GDP

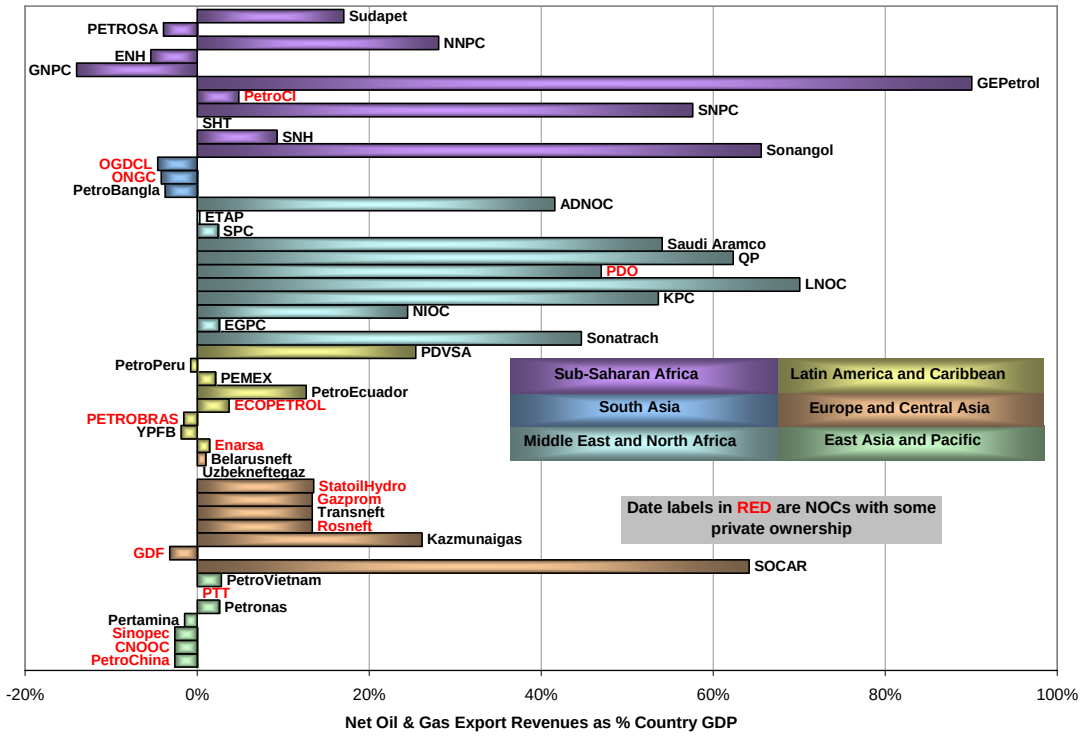
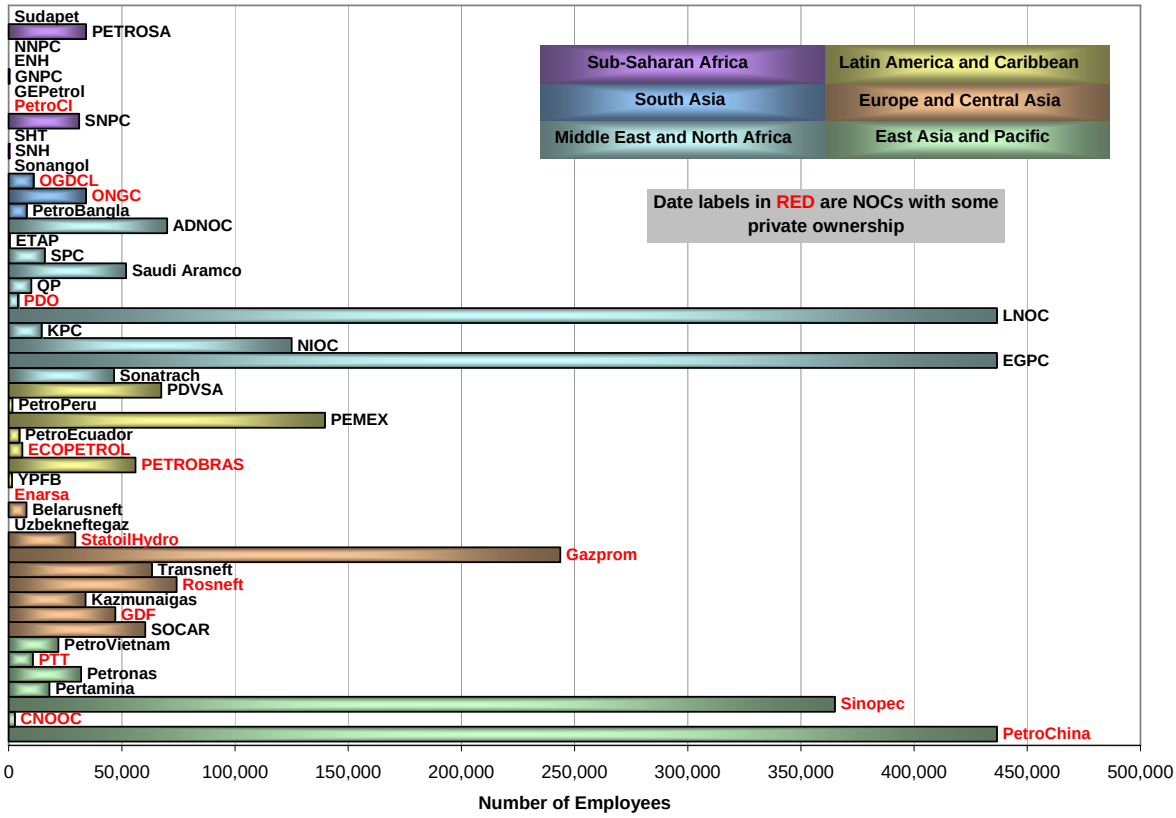


Figure 8 provides another perspective on relative country dependence on oil and gas export revenues. In this chart, net revenues (the balance of export earnings from external trade and spending on imports) are compared to country gross domestic product (GDP). In similar fashion to Figure 7, countries that are more dependent on exports of oil and gas are also countries for which net export earnings are a larger share of GDP. Countries that are net importers must spend a portion of their national incomes to acquire oil and gas supplies for economic sustainability.

NOCS and Their Workforce (Figures 9–12)

Figure 9. NOC Employees



Even NOCs with some private ownership still retain large numbers of employees, as shown in **Figure 9**. Few NOCs report the size of their workforces, and these are generally (although not always) NOCs with private ownership and that provide audited reporting. Because most NOCs often are not required to publish their financial accounts and other general information documents, a great deal of effort is usually required to locate public domain sources for employment data for the majority of NOCs in the Guide. These sources are indicated in the Guide, and vary widely.

Labor productivity is generally not relied upon for NOC performance research. But, Figures 10–12 are useful to illustrate data availability and provide a high-level picture of NOC operations.

Figure 10. Average BOE Production per Employee

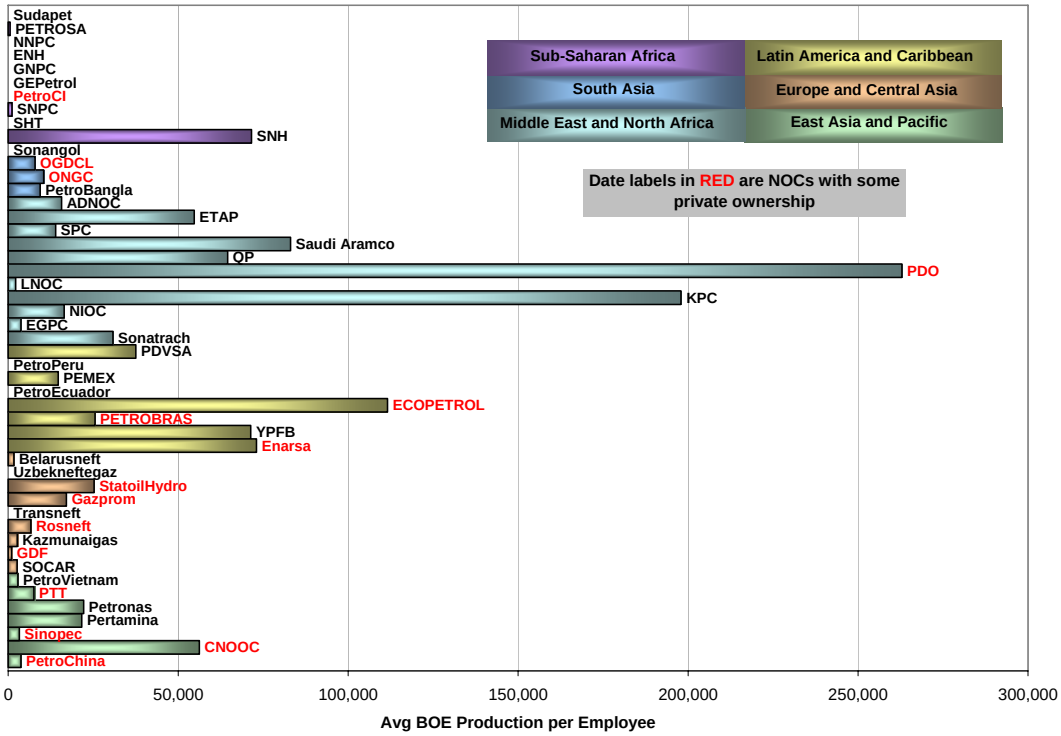


Figure 10 shows the average production per employee expressed in BOE. BOE production per employee is a rough measure of productivity. It demonstrates the clear dominance of resource endowments. It also shows some outliers,[7] such as Ecopetrol, that reflect how an NOC is organized (for instance as a holding company managing all sovereign interests) can yield a very large ratio of BOE production per employee.

[7] An outlier is an observation that is numerically distant from the rest of the data. Statistics derived from data sets that include outliers may be misleading. Generally, in large samplings of data, some data points will be further away from the sample mean than what is deemed reasonable. Outlier points may indicate faulty data, erroneous procedures, or areas where a certain theory might not be valid. A small number of outliers not due to any anomalous condition is to be expected in large samples. There are no rigid mathematical rules to define an outlier, although some practical rules of thumb can be applied. Outliers can make it more difficult to graphically discern variability among data points. For this reason, in some charts outliers have been excluded

Figure 11. Average Total Assets per Employee

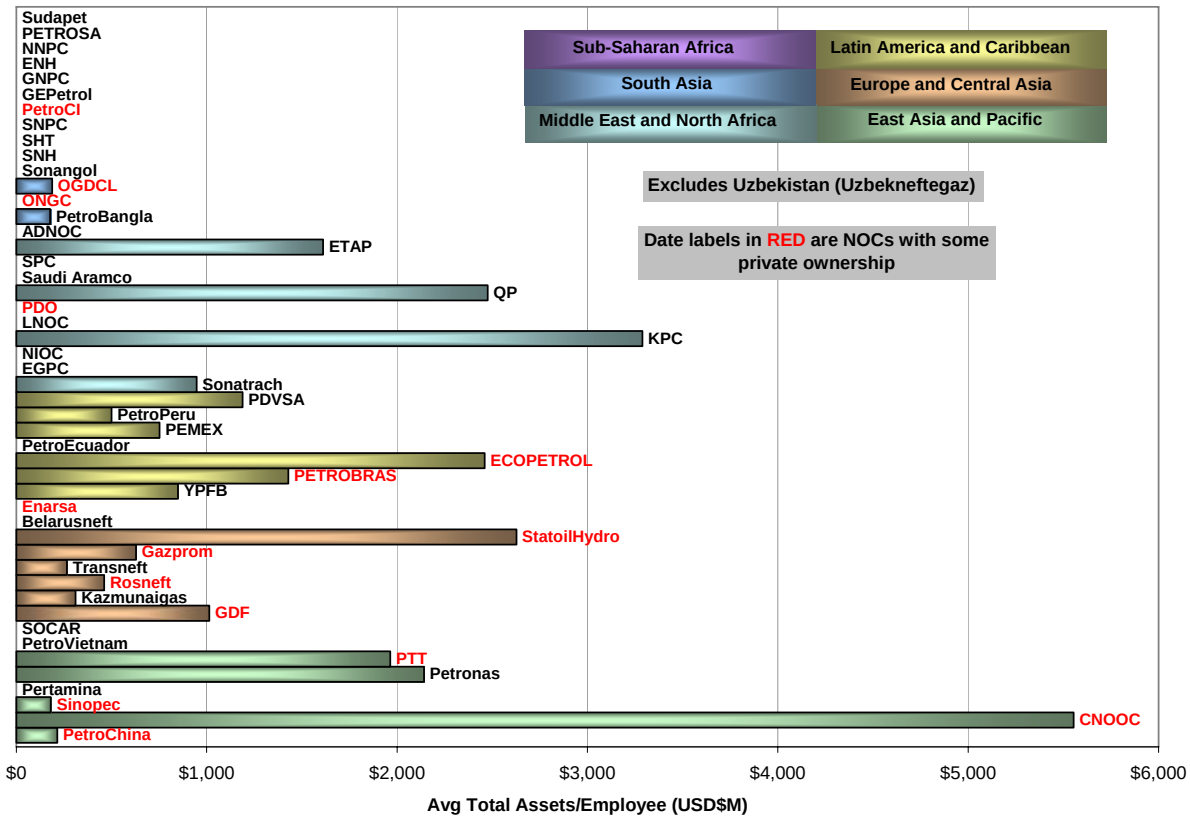


Figure 11 shows the average total assets per employee expressed in millions of U.S. dollars. This ratio is an indication of working capital available to a company's workforce. NOCs with higher ratios of assets per employee are well positioned to achieve higher productivity and stronger returns.

CNOOC is notable for its small workforce relative to assets. PetroChina employs a very large workforce relative to its asset base. The two companies are an example of a divergent policy approach within the same country. For charting purposes, Uzbekneftegaz is excluded, where average total assets per employee are in excess of $10 billion.

Figure 12. Total Revenue per Employee

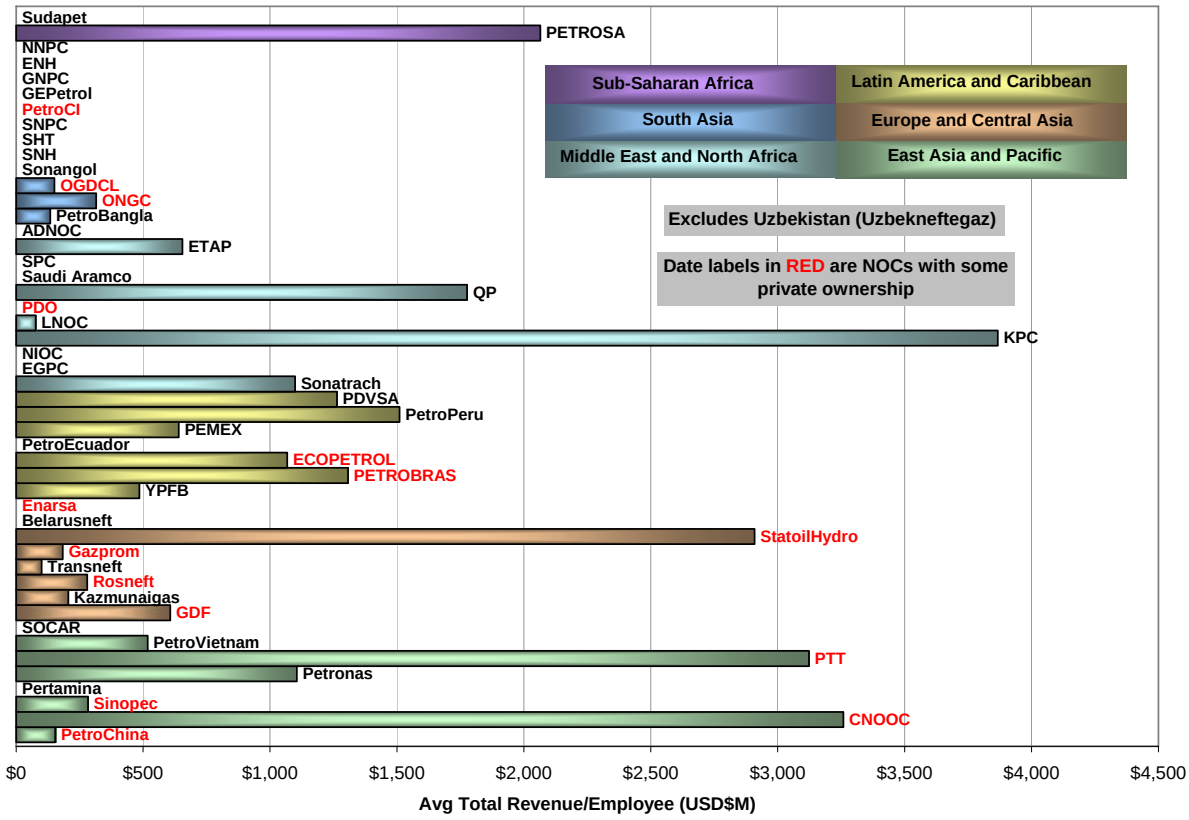


Figure 12 shows the average total revenue per employee expressed in millions of dollars. Companies that yield more revenue per employee are those that are generally more productive at deploying their working capital most efficiently.

KPC (Kuwait) stands out because of the generally large resource base and BOE production relative to demographics in that country and thus the smaller workforce (this includes production and revenue booked from the shared production areas with Oman; PDO does not report revenues). As with Figure 11, the companies based in China provide interesting contrasts since CNOOC, with its smaller, leaner workforce, outstrips PetroChina and Sinopec in revenue production per employee.

Additional Factors Affecting NOCS (Figures 13–16)

Figure 13. NOC Reserve Replacement Rate

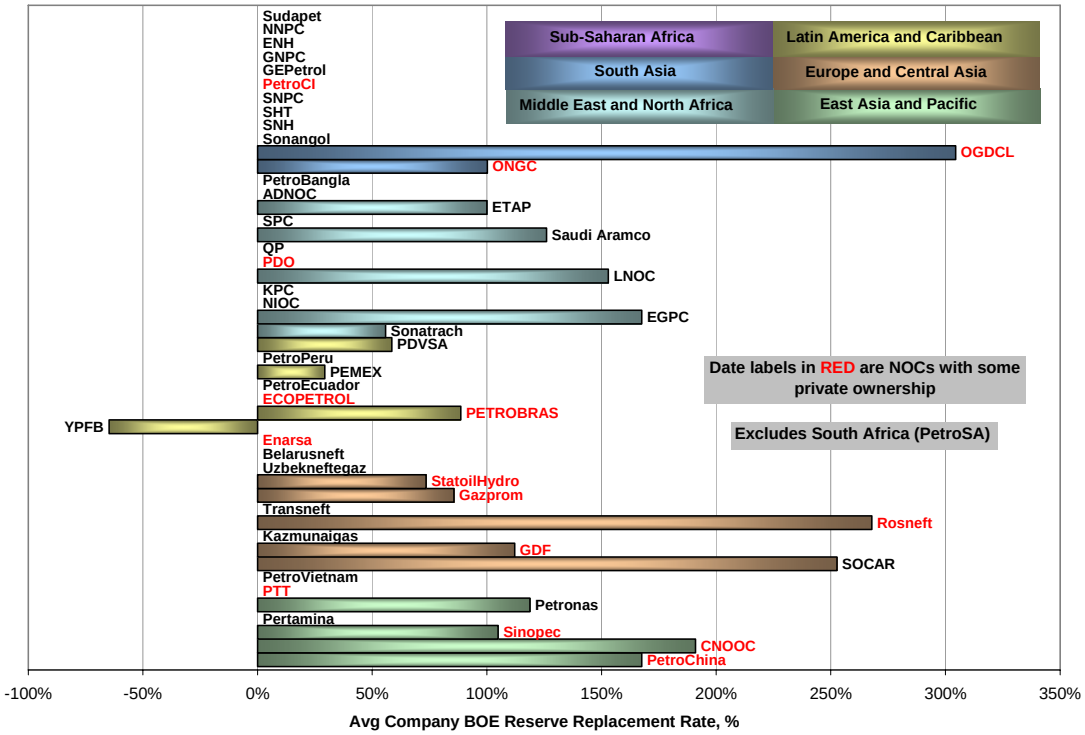


Figure 13 shows the reserve replacement rate as measured by the ratio between net BOE additions relative to BOE production (in this example, South Africa (PetroSA) was excluded from the chart because the size of reported additions relative to production is so large as to make the rest of the chart unreadable).

YPFB (Bolivia) stands out for the difficulty in replenishing its reserves. PEMEX's (Mexico) position in the chart could be explained by the limited amount of after-tax net cash flow available for reinvestment (see Figure 16 for a measure of effective tax rates). This situation is likely to affect the company's production profile going forward.

The Chinese companies (Sinopec, CNOOC, PetroChina) have achieved certain success with international upstream investment but at a high cost, as will be shown in the next figure. Rosneft (Russia) has mainly benefited from mergers, in particular the combination with Yukos. Petrobras (Brazil) is exhibiting strong results with giant new discoveries recently announced: a result of technical and management proficiency.

Of interest is OGDCL (Pakistan)—that country has been a net importer of oil (see previous Figure 6 and Figure 7). As OGDCL begins to reap the benefits from recent discoveries, Pakistan could find itself in a much improved energy security position. Few NOCs or governments report reserve replacement costs.

Figure 14. Total Upstream Expenses per BOE Production

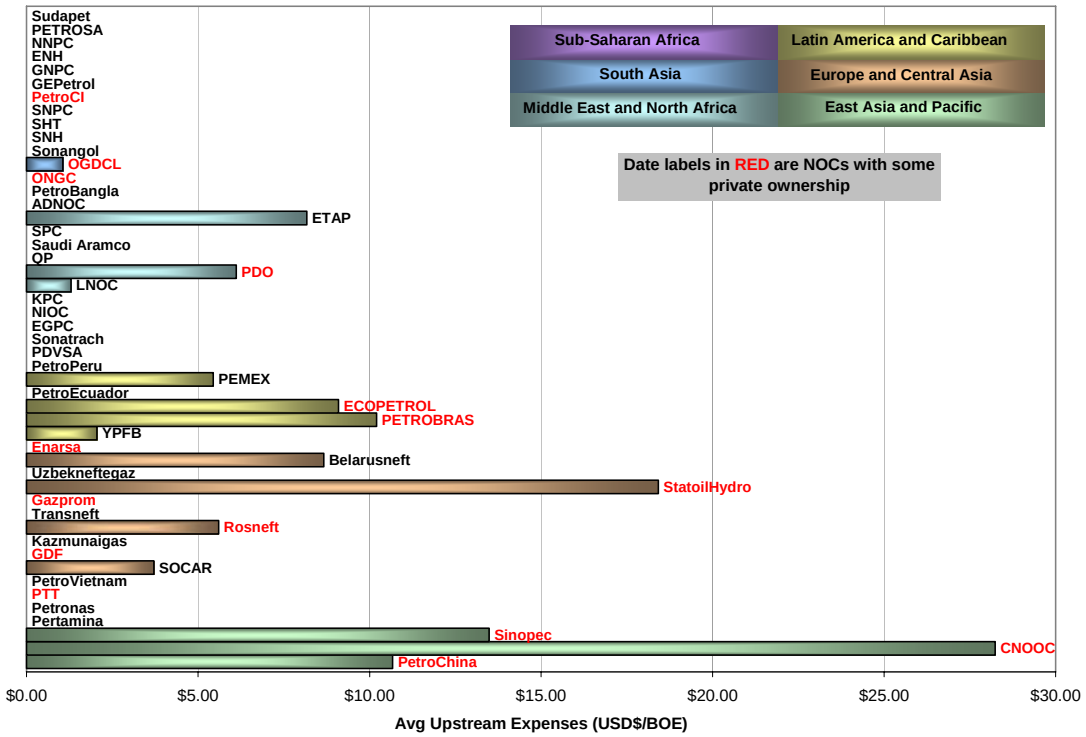


Figure 14 shows the average upstream cost per BOE that is required to explore, develop, and produce oil and gas. These costs include finding the resources; lifting/extracting; general and administrative overhead; depreciation, depletion, and amortization; and other costs, both in the home country and abroad.

Costs vary widely among NOCs due to several factors: the prevalence of oil or gas in their portfolio, geological factors, technical solutions including the presence of infrastructure, and so on. In addition, different reporting criteria affect the significance of comparisons among NOCs. For these reasons, the information shown in Figure 14 only provides a very general idea of the relative competitiveness and efficiency of each NOC.

StatoilHydro and Petrobras offer interesting points of contrast with regard to cost structure. Petrobras has achieved a higher overall reserve replacement rate at a lower cost (see **Table 3**), a reflection of comparative advantages with respect to Brazil's resource base, technical competence, and perhaps other factors, including the way partnerships are structured. A large number of NOCs do not report upstream costs.

Should NOCS be compared to IOCs? A persistent question is whether NOCs can and should be compared to international oil companies (IOCs). Using information from a public domain

source, the U.S. Energy Information Administration (USEIA) Financial Reporting System,[8] a rough comparison between the information shown in Figures 13 and 14 and the correspondent averages for IOCs can be made. The 2006 average worldwide reserve replacement rate for companies in the USEIA's sample is 59 percent for crude oil and natural gas liquids (NGLs, reporting for which NOCs also include in their data). For natural gas, the replacement rate is 88 percent.

As would be expected, some, but not all, NOCs from countries with large resource endowments exceed this rate. Most are comparable with respect to this performance measure. With respect to total upstream cost (as defined above and shown in Figure 14), USEIA data indicate an average cost per BOE of production in 2006 of $18.38. This is higher than most of the NOCs in the Guide sample, but could be explained by the tendency of NOCs to underreport or not report their costs. Moreover, often IOCs operate in several countries and their cost structure reflects a variety of operating conditions, while most NOCs operate in their home country alone.

Four of the NOCs in the Guide—StatoilHydro, Petrobras, CNOOC, and Petronas—are "globalized," that is, they seek and compete for international opportunities as part of their overall strategy. A key question is whether NOCs that are emerging or established global players exhibit fundamental differences across their domestic and international operations. In **Table 3**, domestic and international reserve replacement and costs are separated in order to compare performance at home and abroad for these four companies. Except for Petronas, the NOCs in **Table 3** do not differ strongly from the companies in USEIA's sample; also like those companies, the costs associated with international operations are higher (in StatoilHydro's case, considerably so).

Table 3. Reserves Replacement and Cost Structure for Selected NOCs (2004–2007)

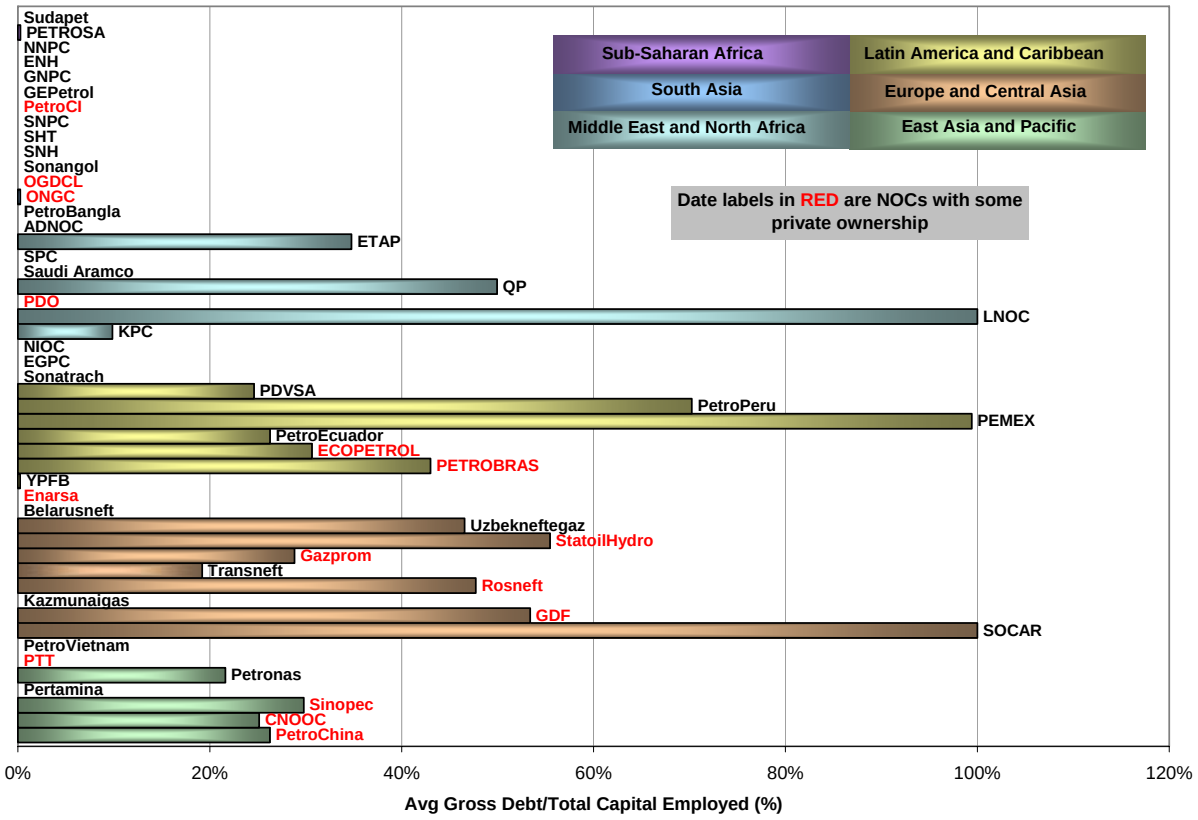
	Petrobras	StatoilHydro	CNOOC	Petronas	IOCs[9]
Reserve Replacement Rate % (BOE)					
Domestic	109%	66%	131%	150%	73%
International	-61%	107%	684%	110%	73%
Reserve Replacement Cost (RRC) $/BOE					
Domestic	$8.87	$15.40	$10.93	NA	$15.62
International	$23.60	$56.32	$18.32	NA	$19.51
Combined Domestic/International					
RRR %	89%	73%	191%	119%	68%
RRC $/BOE	$11.51	$25.06	$14.78	$2.50[10]	$17.23

[8] See USEIA's *Performance Profiles of Major Energy Companies 2006*, http://www.eia.doe.gov/emeu/perfpro/020606.pdf. The main website, http://www.eia.doe.gov/emeu/perfpro/data_tables_finance.htm provides information on how FRS data are collected and evaluated.

[9] 2006 for reserve additions, 2004–2006 for costs.

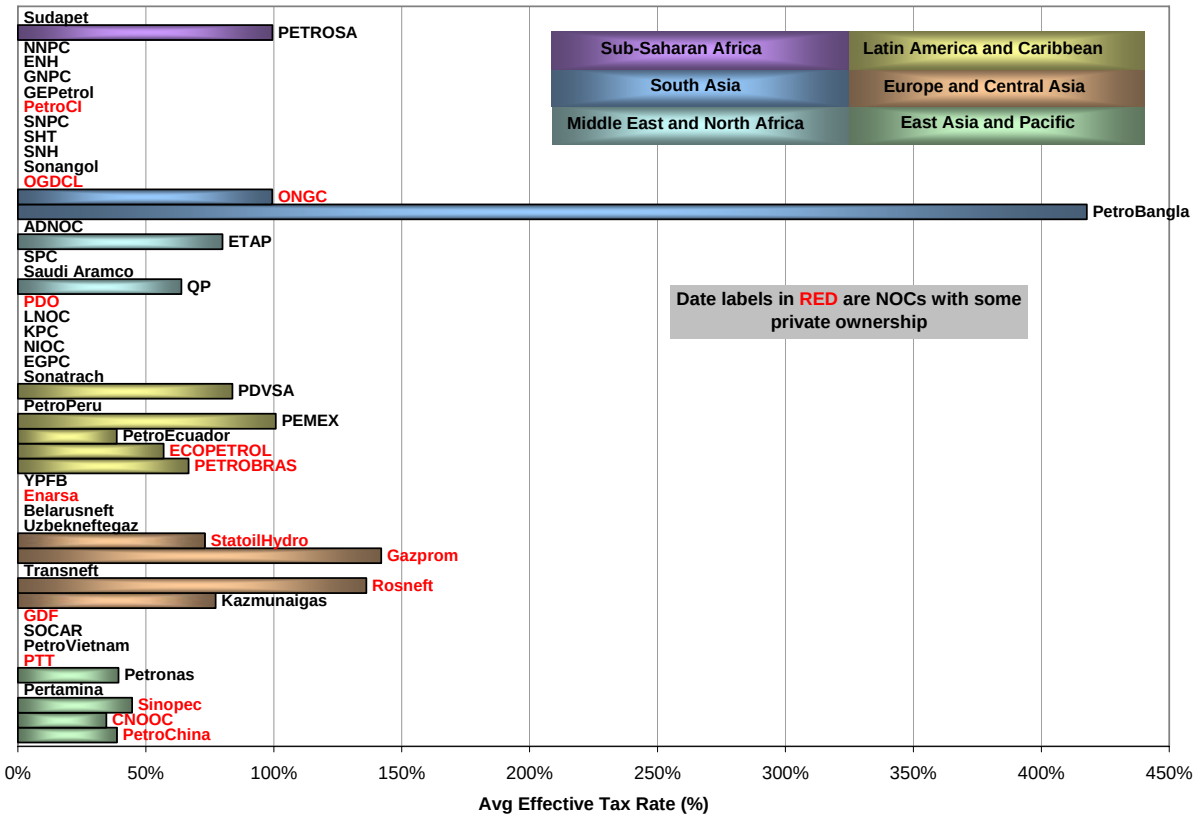
[10] Petronas states that results are audited in accordance with Malaysian Accounting Board standards but has not disclosed the auditor.

Figure 15. Gross Debt as Share of Total Capital Employed



Both debt and tax payments are indicators of NOC operating environments. NOC debt profiles are shown in **Figure 15**. SOCAR's operations appear to be funded primarily through loans from the state treasury. In contrast, PEMEX must borrow on the market to fund its operations. QP (Qatar) has new project financing debt associated with its world-class natural gas monetization and export (liquefied natural gas, or LNG) operations. Information in the public domain is insufficient to determine which factors explain the high debt ratio for LNOC (Libya): its financing arrangement with the state, the effects of past trade and economic sanctions, or some other reasons.

Figure 16. Effective Tax Rates for NOCs



Effective tax rates are shown in **Figure 16**. In several cases, tax rates are close to or exceed 100 percent of a company's pretax earnings. The tax treatment of some NOCs appears to be guided by short-term macro-fiscal considerations rather than the sustainable and durable development of the country's hydrocarbons resources.

In the extreme case of Bangladesh, Petrobangla essentially provides more than four times its pretax earnings to its sovereign government; PEMEX has had to borrow to meet its tax obligations in past years; while a number of NOCs—especially in resource-dependent developing countries—appear to enjoy a preferential tax treatment compared to IOCs (in some cases, governments have looked to their NOCs to ease their fiscal deficits).

NOCs and Value Creation (Figures 17–21)

A major objective of this Guide is to provide a framework for further in-depth analysis on how NOCs address value creation, i.e. their varied approaches to capturing and enhancing value associated with intrinsic assets including resource endowments and relevant infrastructure, such as oil and gas pipelines, refining and facilities for producing petrochemicals, and processing gas and liquefied natural gas (LNG).

The final charts show key financial performance indicators and reflect many of the attributes already discussed: operating margins, profit margins, ROA, and return on total capital employed. These are all accounting measures, and the reader should therefore be cautious in comparing data from different NOCs as they are likely to reflect, among other things, different accounting practices. The reader is reminded that all operating and financial performance data for the NOCs is averaged for 2004–2007 (many NOCs do not report all years).

Figure 17. Operating Margins for NOCs

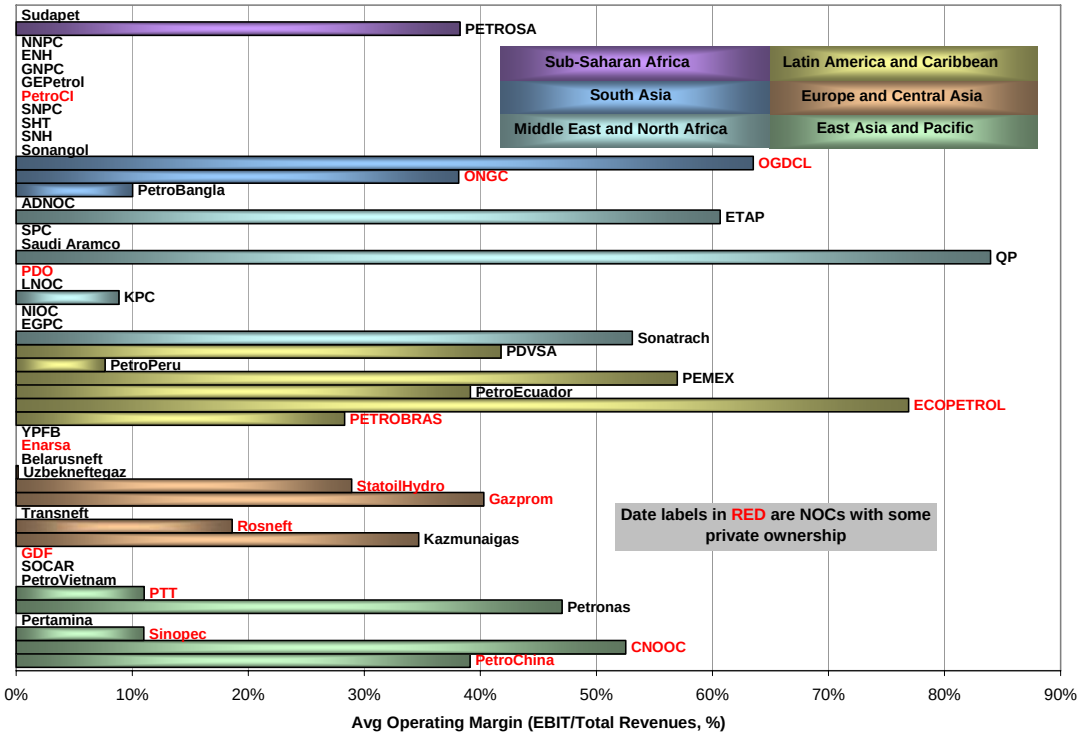


Figure 17 illustrates the wide rage of operating margins for NOCs. The percentage operating margin is calculated as the ratio between: (a) earnings before interest payments on borrowings and taxes (EBIT) and (b) total revenue as reported by the NOCs.

For a given level of sales, a company with higher costs will have lower operating margins, that is, it will have fewer resources available for distribution to shareholders or reinvestment after honoring its debt and tax obligations. It is important to note that EBIT is affected by the company's assets depreciation, amortization, and depletion policies. Hence different operating margins do not necessarily reflect differences in operational efficiency among companies.

Figure 18. Profit Margins for NOCs

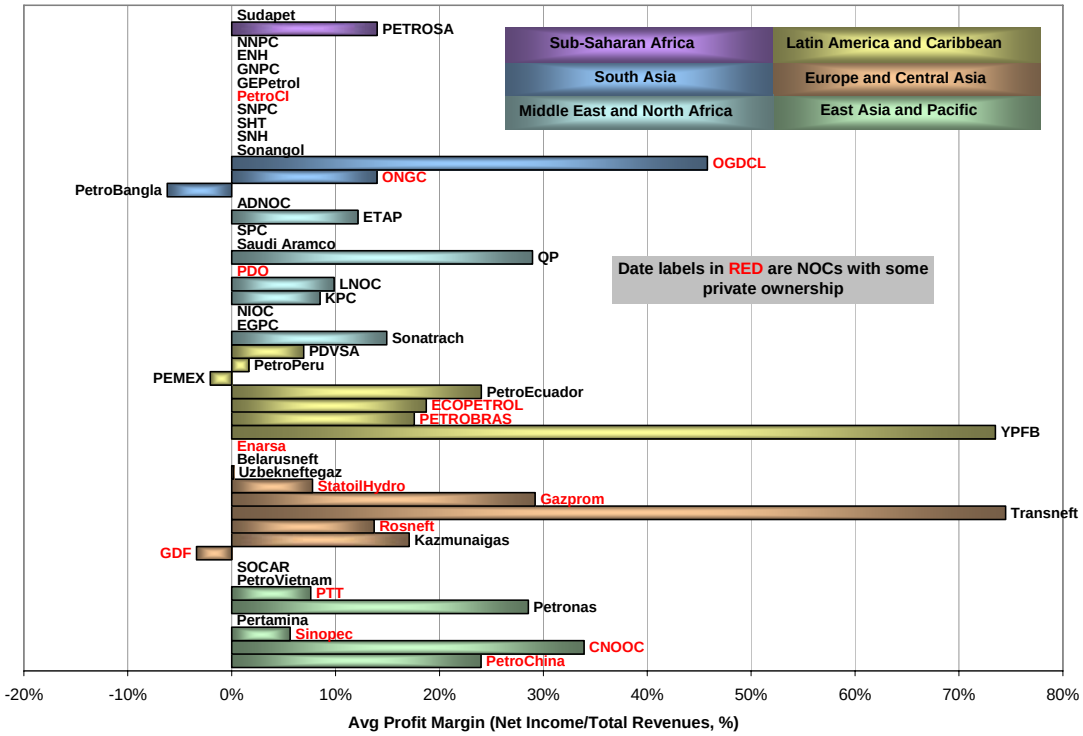


Figure 18 shows the percentage profit margins, calculated as the ratio between net profit (or loss) and total revenue as reported by the NOCs. The difference between operating margins and profit margins is explained by the financial leverage (the debt structure of the company—see Figure 15) and the tax burden (the tax treatment of its earnings—see Figure 16).

Clearly the heavy tax burdens on Petrobangla and Pemex hinder these companies' abilities to generate profits for distribution to their respective shareholders and reinvestment, while Qatar Petroleum's (QP) high operating margin is eroded by the company's financial leverage. LNOC (Libya), Pemex, SOCAR (Azerbaijan), and PetroPeru all show substantial costs associated with debt.

Figure 19. Return on Assets for NOCs

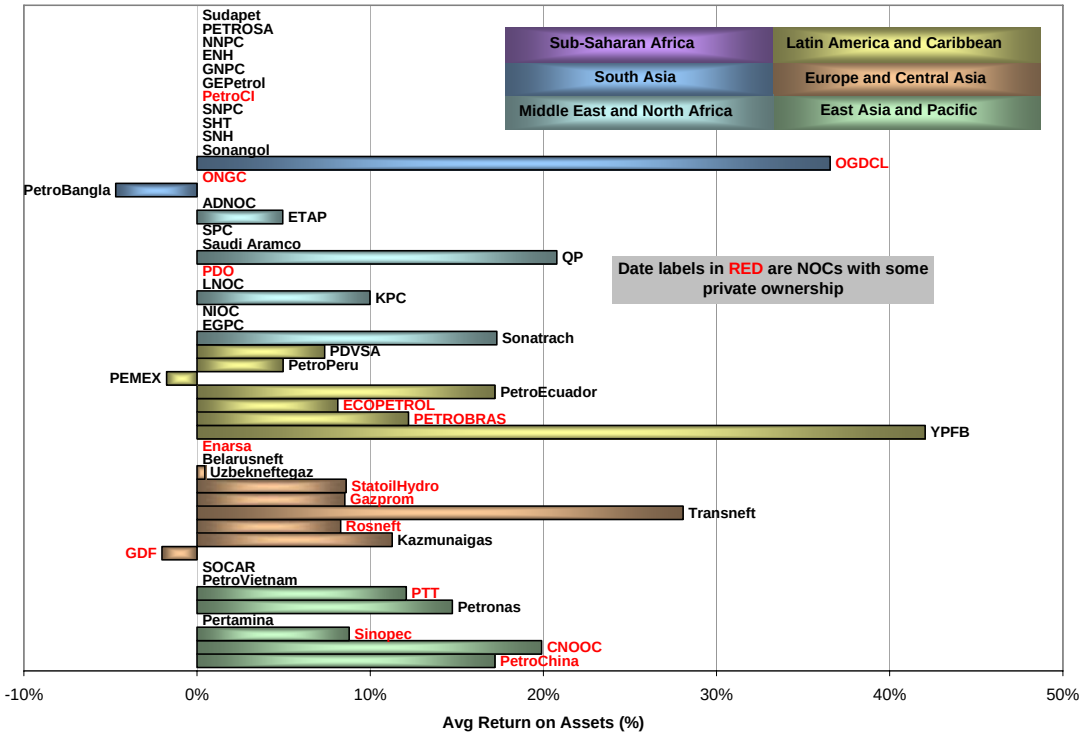


Figure 19 shows the ROA calculated as the ratio between net profit (or loss) and total assets (liquidity, current assets, and long-term assets net of depreciation) as reported by the NOCs. The ROA measures a company's earnings in relation to all of the resources at its disposal (the shareholders' capital plus short- and long-term borrowed funds). Thus, it is the most stringent and excessive test of return to shareholders. For instance, if a company has no debt, the ROA and return on equity will be the same. The ROA also allows gauging the asset intensity of a business.

Oil companies are generally asset-intensive, meaning that they require large and long-term capital investments and specialized equipment to generate a profit. Among our examples, OGDCL (Pakistan) appears to be affected mainly by recent discoveries (and consequent high reserves replacement rate, as shown in Figure 13, along with associated revenues). In spite of poor results on reserves replacement, YPFB (Bolivia) reports large net profits yielding a strong ROA. An interesting comparison can be made between Petrobras and StatoilHydro. As previously noted (**Table 3** and related discussion), Petrobras appears to be more efficient in its core domestic businesses than StatoilHydro. The two companies pursue different financing strategies as shown by the higher financial leverage of StatolHydro.

Figure 20. Return on Capital Employed for NOCs

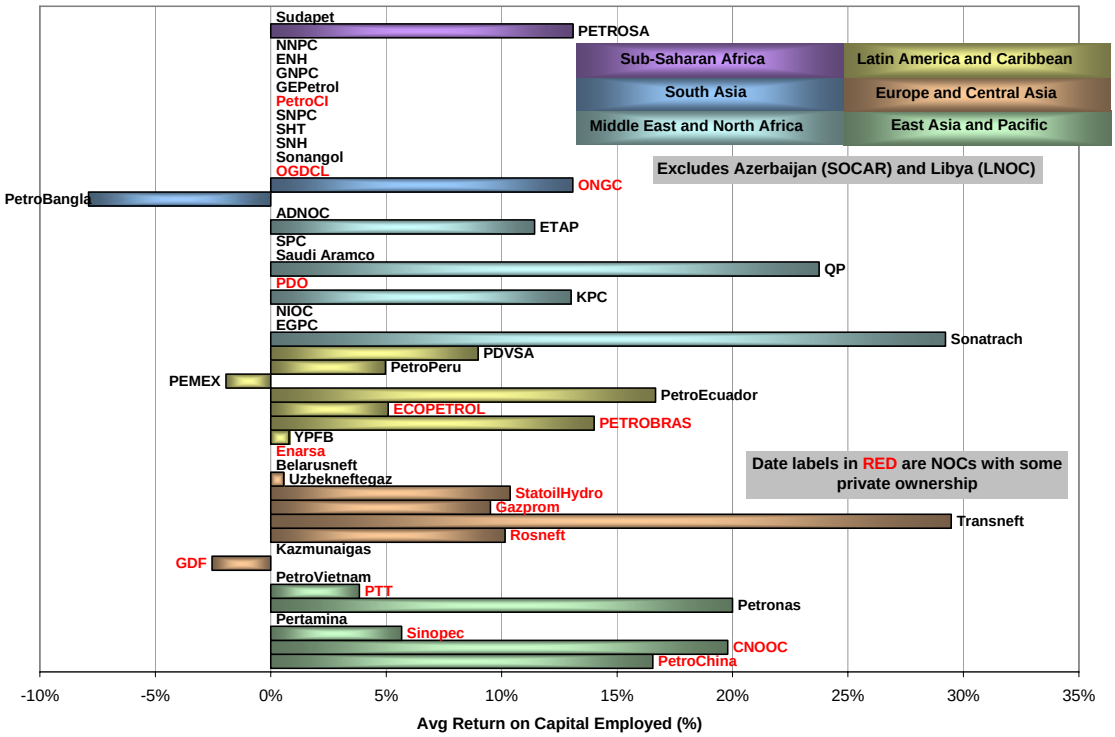
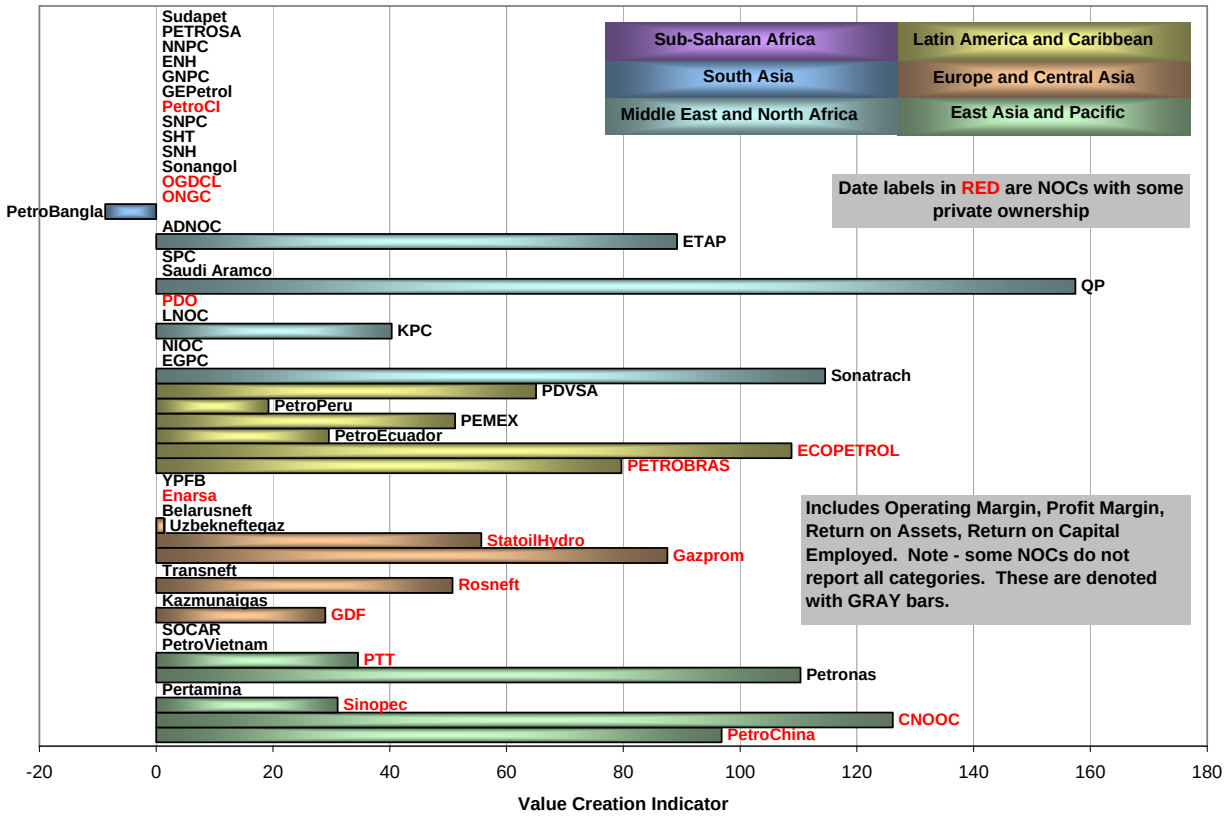


Figure 20 shows the return on capital employed (ROCE) for the NOCs in this Guide. The ROCE is commonly used as a measure for comparing the performance between businesses and for assessing whether a business generates enough returns to pay for its cost of capital.[11] It is similar to ROA, but takes into account sources of financing (capital employed is equal to total assets minus current liabilities).

The extraordinary situation for SOCAR with respect to debt profile yields a negative return on capital employed of almost 700 percent; consequently, SOCAR is excluded from Figure 12. Likewise, Libya (LNOC) is excluded for the opposite reason: the ROCE calculated for LNOC is well over 100 percent.

[11] The main drawback of the ROCE is that it measures returns against the book value of assets in the business. As these are depreciated the ROCE will increase even though the cash flow generated for the business had remained the same. Thus NOCs with mature portfolios (depreciated assets) will tend to have higher ROCE than NOCs that have newer investments.

Figure 21. A Suggested Combined "Value Creation" Indicator



In view of future analytical work associated with the Guide, a "value creation" indicator was compiled that incorporates the most commonly available financial performance measures—operating margin, profit margin, ROA, and ROCE. The results of this simple additive indicator are shown in **Figure 21**. As Part III will demonstrate, a composite indicator could facilitate analysis of NOCs by providing a concise independent variable. But, even the best-reporting NOCs do not provide all of the raw data required to derive the four ratios. Of the total 49 NOCs included in the Guide, 21 provided reporting for all four ratios to be calculated.

Preliminary Conclusions: NOCs and Value Creation

The following preliminary conclusions can be derived from the observation of the data presented in the Guide:

- **Overall lack of transparency/lack of information.** Clear differences exist across NOCs in the sample with regard to the amount and quality of governance, operations, and financial data. For those NOCs that are partially listed on stock exchanges, the impact of public equity listings is substantial and substantive information is made available regarding the NOC and its business segments; this is true even for those NOCs listed only on domestic exchanges. Public listings of debt and/or equity encourage NOCs to adopt best practices with regard to reporting, credible auditing, and public access to information. Some examples include Brazil's Petrobras, Norway's Statoil, China's NOCs

(PetroChina, CNOOC, and Sinopec), Malaysia's Petronas, and Thailand's PTT. While it isn't a guarantee of good performance, with detailed reporting and transparency the issues impacting an NOC's performance can be understood and corrective action can be taken to improve operations and management. When the situation is not transparent, problems are rarely or never revealed.

Prominent examples of problems are Mexico's Pemex, which is chronically underfunded for reinvestment, and China's Sinopec, which is reporting substantial losses as a result of petroleum product pricing policies in China (a red flag for shareholders with regard to the company's ability to internally fund investment). Regional differences exist regarding the tendencies to report (and provide public offerings of NOC equities). Asia-Pacific NOCs appear to be much more transparent with respect to data coverage and quality. African NOCs are generally furthest behind. These differences probably reflect relative levels of national development, as well as access to and development of financial markets and resource endowments (Asia-Pacific NOCs being generally weaker in that regard).

- **Prevalence/level of price subsidies.** Petroleum product and natural gas end-user pricing policies in NOCs' home countries have considerable impact on the NOCs' financial performance and their ability to reinvest. Energy subsidies sustain high demand, which in turn sustains higher prices during bull market cycles, as we have been experiencing in recent years. The cost of these subsidies can be substantial. Thus, a possible dilemma lies ahead:
    - Will some NOCs face financial failure?
    - Who would ultimately bear the cost of failure and what would the consequences be for countries' economic development and poverty reduction?
    - Would a prolonged period of high subsidies for energy affect the role of some NOCs and their way of doing business?
- **Information on noncommercial activities and obligations.** Price subsidies are linked to the level and extent of an NOC's noncommercial obligations. Every modern business enterprise today, whether privately or state owned, is expected to pursue, at least to some extent, objectives that fall outside of the traditional definition of core businesses. Hence, the distraction between "commercial" and "noncommercial" activities becomes blurred. This is particularly true when it comes to health, safety, and environment; a company's "corporate citizenship"; or, increasingly, socioeconomic investments that support the company's ability to carry out its core operations.[12]

  Increasingly, strategic socioeconomic investments are migrating to the commercial side of a company's management structure. Modern corporate governance is expanding to include those functions that directly affect the socioeconomic context for companies operations. As a result, a portion of "resource rents" is used to finance socioeconomic improvements (either by the investor or the government).

[12] The latter is a special concern in sensitive locations, countries, and regions where security of operations and integrity of assets may be at risk.

NOCs are often the providers of last resort of certain services and infrastructure in their home countries; NOCs that go international are learning to deal with these issues in countries where they seek to operate. Information on noncommercial activities and obligations is particularly poor. Hard data regarding direct provision by NOCs of services and infrastructure in their home countries is sparse. But, qualitative information suggests that many, perhaps most, NOCs no longer are the direct providers of socioeconomic goods but rather are indirect providers via funds transferred to their home governments. A measure of these funding streams, "fiscal contribution to the state,"[13] was developed and used in the Guide to capture both the transfer of economic rents and as an indicator for information transparency.

- **The trend toward investing abroad.** In many instances, sometimes for reasons that are not readily apparent, NOCs are engaging in international investment programs. This is evident among NOCs based in countries that are net hydrocarbon consumers or, perhaps more interestingly, with maturing or weak resource bases. While China, India, Malaysia, and Norway all reflect these tendencies, energy security considerations appear to be a more important driver for China and India, while Malaysia, Norway, and possibly Indonesia appear to be mostly guided by commercial considerations. Geopolitical considerations may be the key drivers for internationalization by Gazprom and Belarusneft. NOC strategies in these instances are already matters of discussion in the international news media; the rationale is not clearly evident from data incorporated into the directory and almost certainly encompasses an array of considerations other than the NOCs' core business imperatives.

These preliminary conclusions serve as a backdrop for devising logical groupings of NOCs and teasing out "cluster patterns" that suggest strong relationships across different indicators and metrics, as described in Part III.

[13] See footnote 4 and refer to CEE working paper for background and development of the fiscal contribution to the state measurement.

PART III. PRELIMINARY CLUSTERING

Notwithstanding the low level of reporting by NOCs, the Guide contains a rich data set that provides a picture of NOCs' operations and distinctive features of their host countries (such as the importance of oil export revenues relative to GDP and whether the country is a net exporter or importer).

The data directory consists of 9,212 data entries. The primary data attributes (DAs) outlined in Part I are described by 189 indicators observed for the 49 NOCs in the Guide. Among these are operating and financial measurements, raw data collected from company reports, and country macro-variables for key aspects of hydrocarbon sector performance. All indicators mapped to the primary DAs received the same weight.

For comparison and context, specific value creation metrics were created, and the World Bank governance indicators were included in two-page NOC summary reports.

Eight summary groupings of primary DAs were created and indicators were mapped to the summary groupings as described in Appendix III. All NOCs in the Guide were analyzed against a selected combination of summary groupings and an average scoring[14] was calculated for all companies.

Subjective and objective scoring criteria were applied to the indicators, depending on their nature and on data availability, to group NOCs listed in the Guide in order to draw broad comparisons. The scores for each summary grouping were then averaged to obtain an overall summary grouping score. [15]

Finally, companies were categorized in three tiers for further analysis:

1. NOCs scoring above average that provide substantial, audited reporting
2. NOCs scoring above average, some with audited reporting
3. NOCs of great importance with common issues and challenges (the Sub-Saharan NOCs)

Determination of Summary Groupings

The eight groupings and general descriptions of associated criteria proposed in the Guide are as outlined below.

- **Corporate governance (CG)—**relevant objectives, autonomy; independent board of directors; clear human resource policies based on merit; independent budget, auditing of results; financial oversight and corporate planning; ability to fund out of cash flow.
- **Public sector governance (PSG)—**relevant policy and clear roles; relevant objectives; independent functions (NOC, ministry, regulator); requirements for noncommercial

[14] A description of the scoring methodology is provided further in this Part III.

[15] Some of these groupings benefited from the result of previous analytical work carried out by CEE, including an extensive review of literature on NOCs. See footnote 4.

activity reporting and measurement; clear information on fiscal regime; independent hydrocarbon regulator.

- **Commercialization (C)—**domestic and/or international partnerships; profit centers with financial reporting.
- **Fiscal regimes (FRs)—**availability of external financing; investment by non-NOCs.
- **Resource endowment (RE)—**based on reserves (oil and/or natural gas).
- **Oil dependency (OD)—**oil and/or natural gas export revenues relative to GDP (includes the absolute value of oil payments by net importing countries).
- **Local contribution (LC)—**reporting on noncommercial activities as indicated by the measure, *fiscal contribution to the state budget.*
- **Sector and trade openness (STO)—**WTO membership (positive), OPEC membership (negative); level of privatization (shares held by investors other than the state).

The large data set contained in the Guide allows numerous possibilities for cross-sections and interactions, and additional clusters could be developed. A logical set of pairings across the eight groupings was used for the initial exploration of relationships, as shown in **Table 4** below.

Table 4. Cluster Pairings Using NOC Guide and Groupings

	CG	PSG	C	FR	RE	OD	LC	STO
CG								
PSG								
C								
FR								
RE								
OD								
LC								
STO								

The Appendices provide the details that the cluster graphs are based on:

- **Appendix 1** provides data directory dimensions of analysis indicators.
- **Appendix 2** describes each of the groupings, rationale for the grouping, and criteria for scoring.
- **Appendix 3** shows how the DA indicators were mapped to the eight groupings for scoring.
- **Appendix 4** contains a table ranking the countries and NOCs according to the scores for each grouping.

The clustering proposed in this Guide is an initial attempt to explore some of the most relevant and clear patterns arising from the observation of relationships among variables that might help explain NOC performance. Overall:

- CG yielded the strongest results across the data set. That result should not be surprising, as it would be logical to assume that an NOC's management capacities and skills should affect its ability to produce value.
- PSG also exhibited a strong relationship with NOC performance. Scores for both of these groupings, when applied to scores for other groupings and therefore other attributes, tended to yield positive linear correlations across the data set, that is, higher scores for CG or PSG resulted in positive correlations when compared to other groupings or variables.
- Variables that appeared to have the weakest effect on NOC performance were OD and RE; considerable variation appears to exist among NOCs with respect to CG, PSG, and LC, regardless of a country's oil dependence or resource endowments. These results should be further analyzed.
- The interactions between STO and the other groupings selected for this analysis exhibited ample variations across NOCs.
- The strongest relationships appeared to arise when matching STO with the CG, PSG, and C.

Many of the results confirmed observations from previous analytical work and literature on NOC performance.

Examples of Clustering

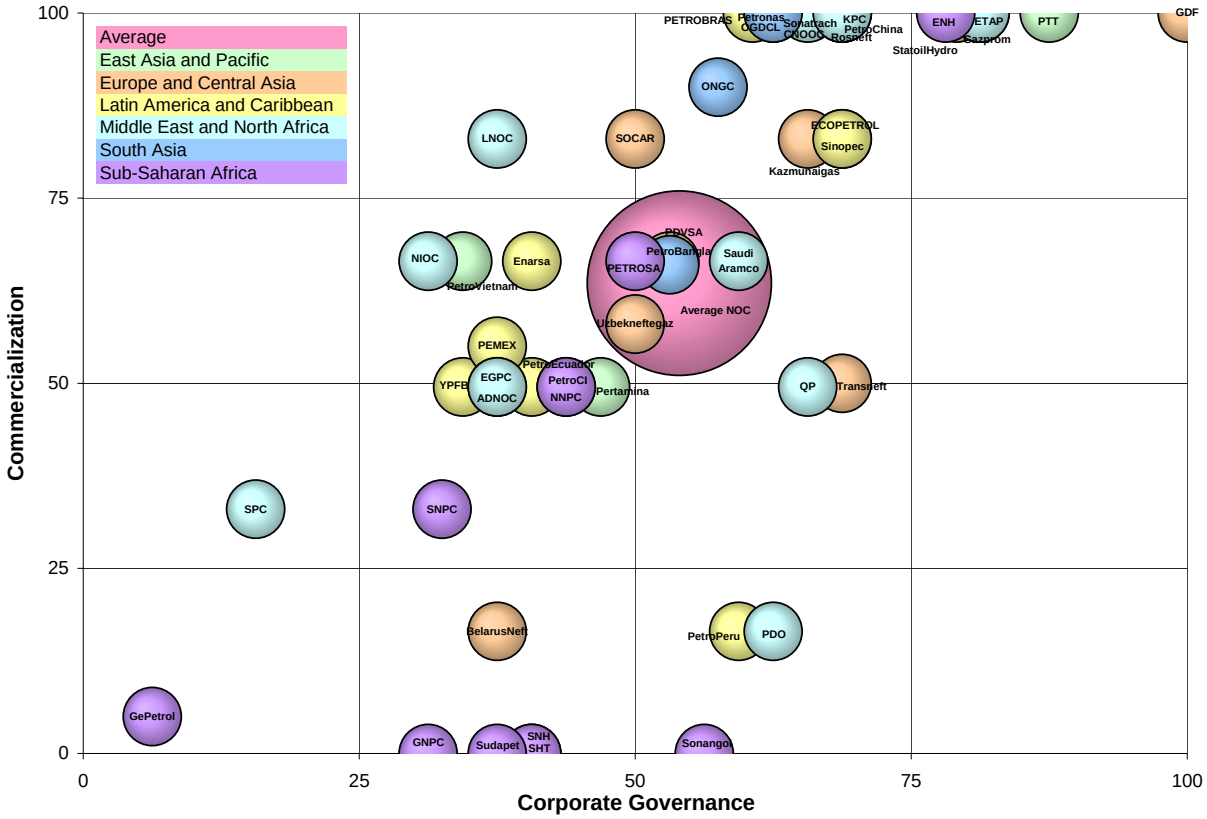
This section presents the proposed clusterings along with brief analysis to highlight possible avenues for future research.

The highest score utilized in cluster diagrams is 100. It is important to note that in the clustering diagrams that follow, low scores are attributed to cases where data are not available or are insufficient, as well as to situations in which low scores are merited on the basis of information collected. Therefore, low scores do not necessarily imply an insufficient level or quality in the attribute being rated. Consequently, how NOCs are described, grouped, and scored in the Guide may change if more information becomes available. This might serve as an incentive for NOCs and their governments to improve the coverage and quality of reporting in the future.

Is Corporate Governance Positively Associated with Commercialization?

Figure 22 suggests that this may indeed be the case. Based on the scores derived from the Guide data, as corporate governance strengthens so does the level of commercial activity. The cross-section of corporate governance and commercialization relates the structure of an NOC—including ownership structure, management processes and workforce skill base—to its operations and commercial strategy (including the demands of operating in multiple segments of the oil and gas value chains, engaging in partnerships and alliances, and "going international").

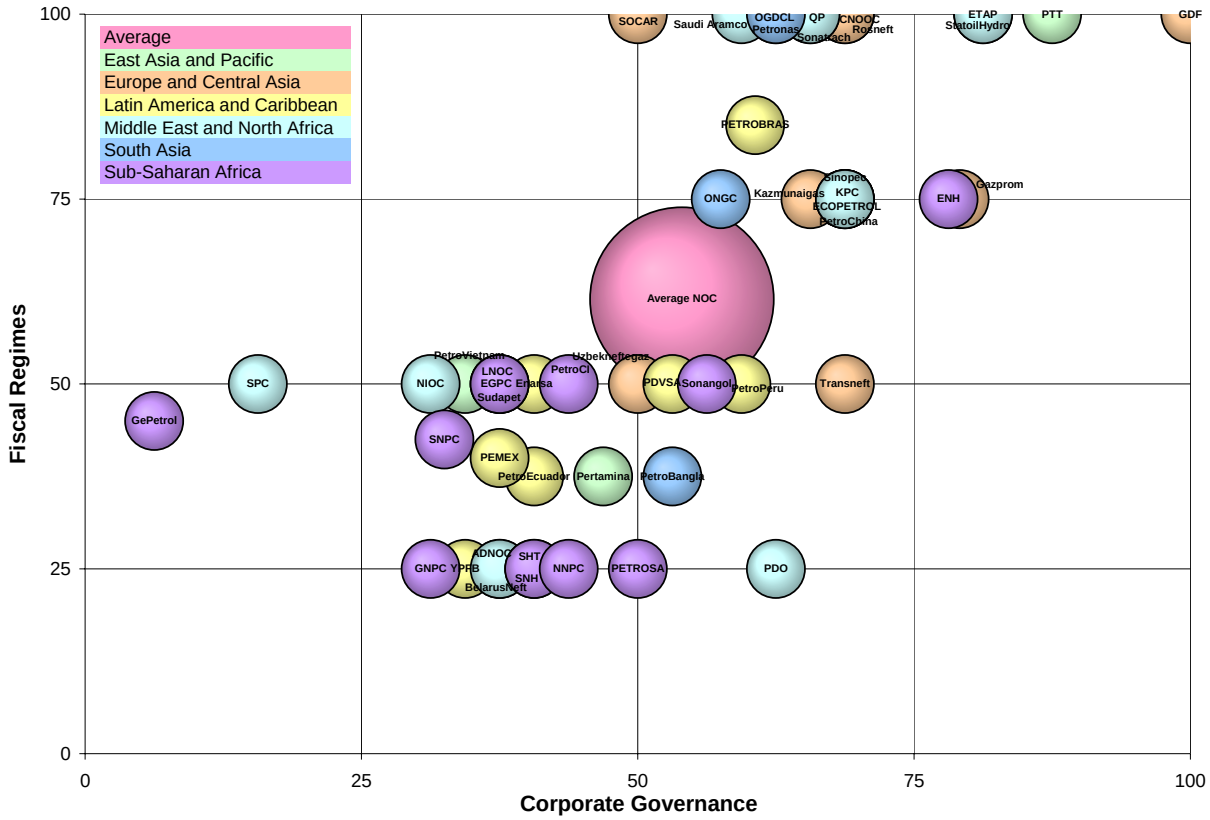
Figure 22. Corporate Governance vs. Commercialization



Can Corporate Governance Overcome Inadequate Fiscal Regimes?

Poorly devised fiscal terms impact both foreign investors and NOCs. Our analysis suggests that there is a limit to what can be attained through improved corporate governance if fiscal regimes do not adequately support hydrocarbon exploration and production activities. More balanced fiscal regimes (which neither impose onerous conditions on NOCs nor on competitors, including foreign direct investors) appear to be correlated with higher scores for corporate governance. In addition, better managed NOCs (with stronger governance, independent boards, budget processes, and so on) will also do more with better fiscal regimes—they will put capital to work more efficiently and compete more vigorously at home and abroad.

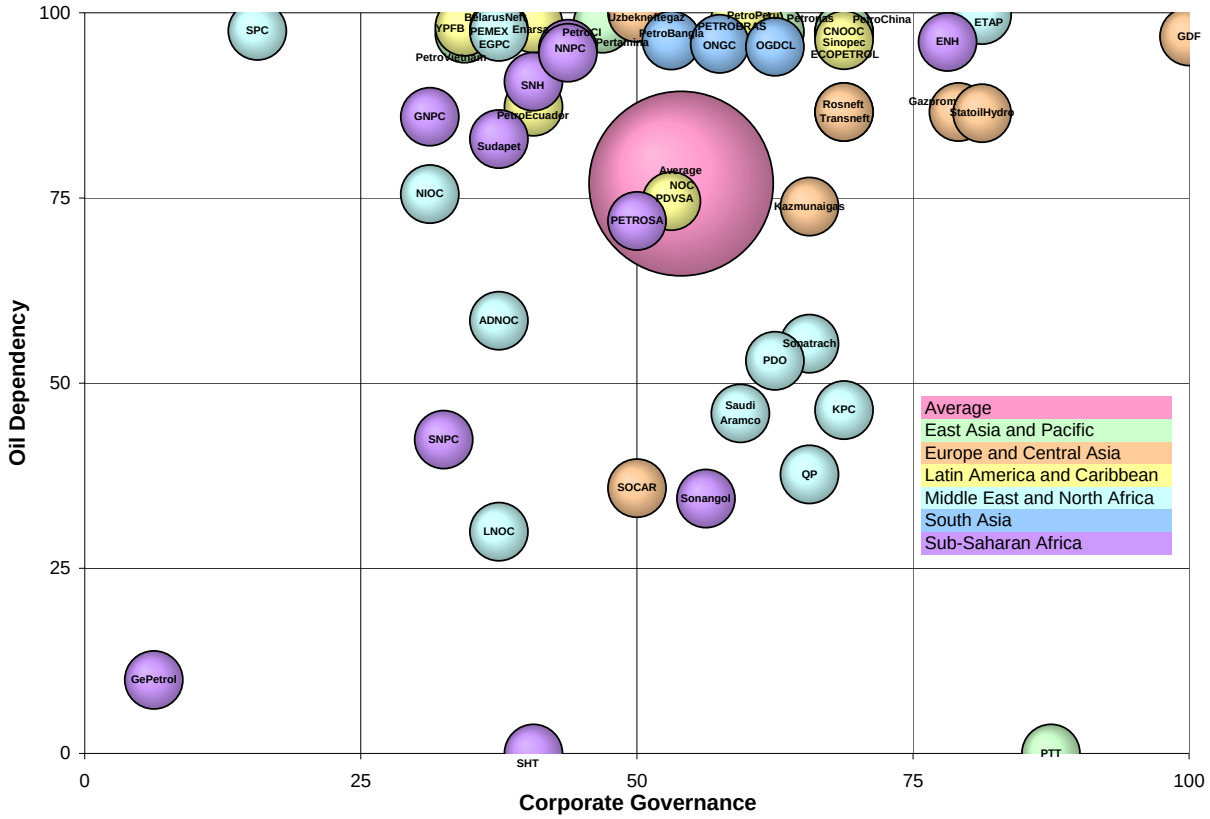
Figure 23. Corporate Governance vs. Fiscal Regimes



What About the Relationship Between Oil Dependency and Corporate Governance?

This should be a classic "resource curse" dilemma—NOCs located in countries with higher levels of oil dependency might be expected to exhibit lower corporate governance scores (or so some would think). Our analysis suggests that oil dependency does not inhibit higher scores for corporate governance. Strong-performing NOCs can be found in a range of circumstances. It should be noted that the oil dependency scoring method includes countries that are net importers. Therefore, this indicator provides a performance measure for NOCs that also focuses on situations where these companies are used for energy security strategies or where they exist mainly as "national champions."

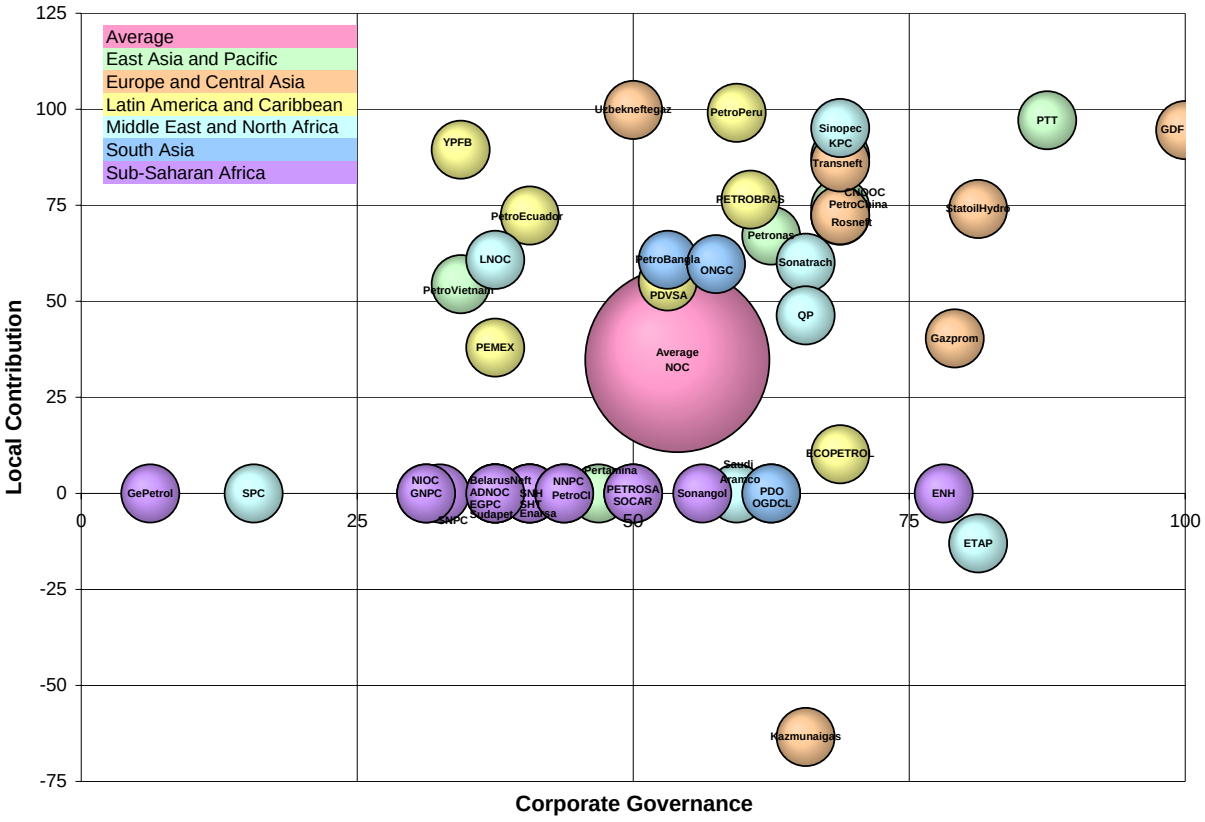
Figure 24. Corporate Governance vs. Oil Dependency



Is There a Relationship Between Corporate Governance and Local Contributions?

Likewise, one might expect a positive relationship between local contributions—reporting on noncommercial activities that NOCs support through their revenue streams, including fuel subsidies—and corporate governance. NOCs with stronger corporate governance traditions tend to report more openly, engage with their public audiences (stakeholders) and support a number of social, cultural, educational, and other activities. NOCs, especially if partially privatized, appear to be adopting more of the kind of "corporate citizenship" that has come to be expected of private sector companies. Few of the NOCs in the sample appear to host the kind of overt social welfare (directly operating schools and hospitals, for example) that older models encompassed. Hence, it would be fair to assume that governments are shouldering these obligations. But, the process of transitioning these activities and the associated costs to the government budget is often not obvious in either public accounts or the NOC's revenue stream.

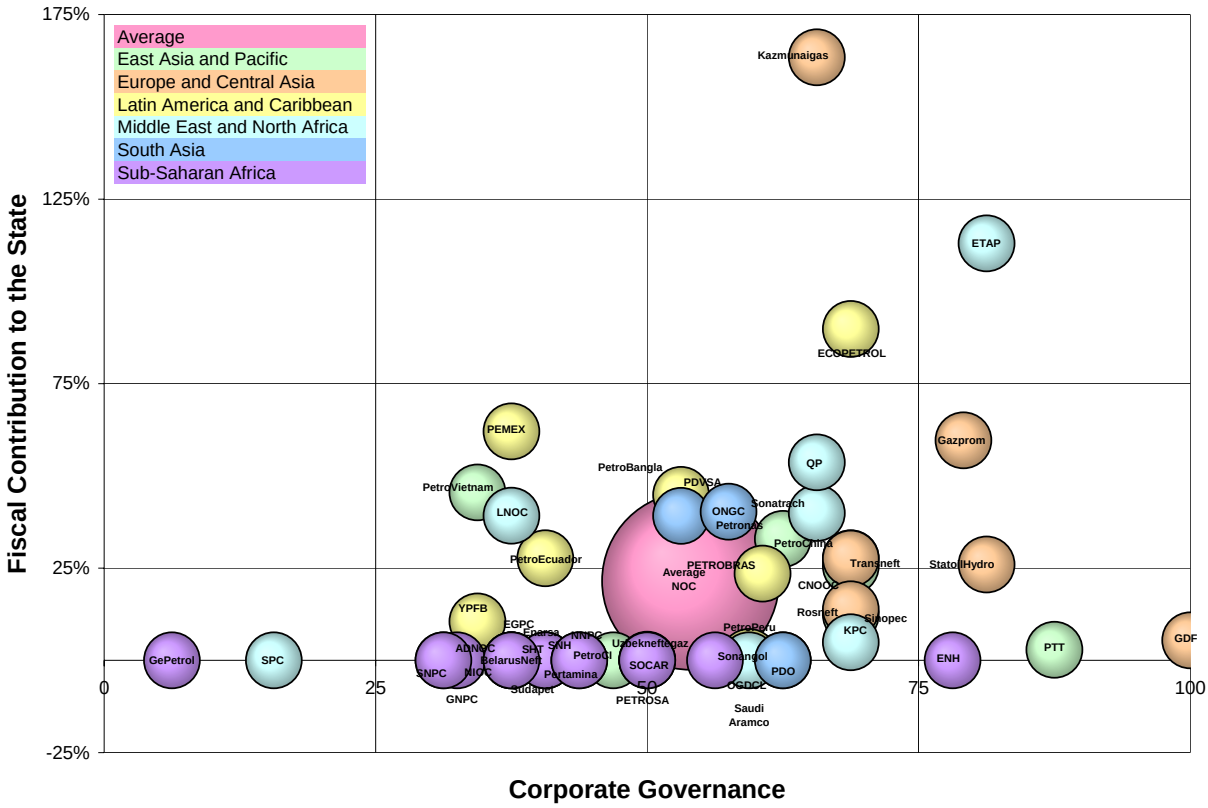
Figure 25. Corporate Governance vs. Local Contribution



Is There a Relationship Between Corporate Governance and Fiscal Contributions to the State?

Charting the measure of fiscal contribution to the state against corporate governance further emphasizes both the extent to which NOC revenues are relied upon and the lack of information regarding payments. To construct the measure of fiscal contribution to the state, data are required on all income tax and nonincome tax payments, royalties, dividends and special dividends, and other payments provided to the home government.

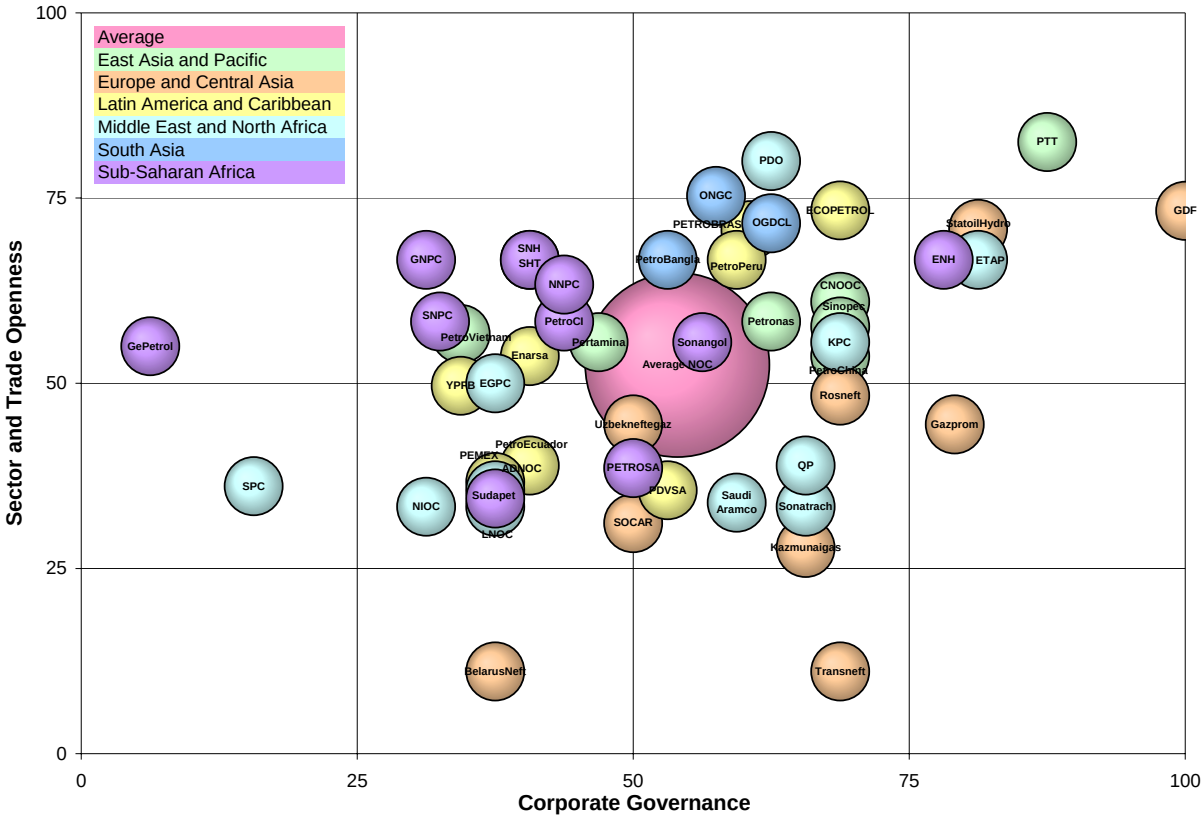
Figure 26. Corporate Governance vs. Fiscal Contribution to the State



Is There a Relationship Between Corporate Governance and Sector/Trade Openness?

As might be expected, sector and trade openness is positively correlated with corporate governance. Openness means more competition—and more demands on an NOC's performance. This should foster the development of stronger management skills and business processes.

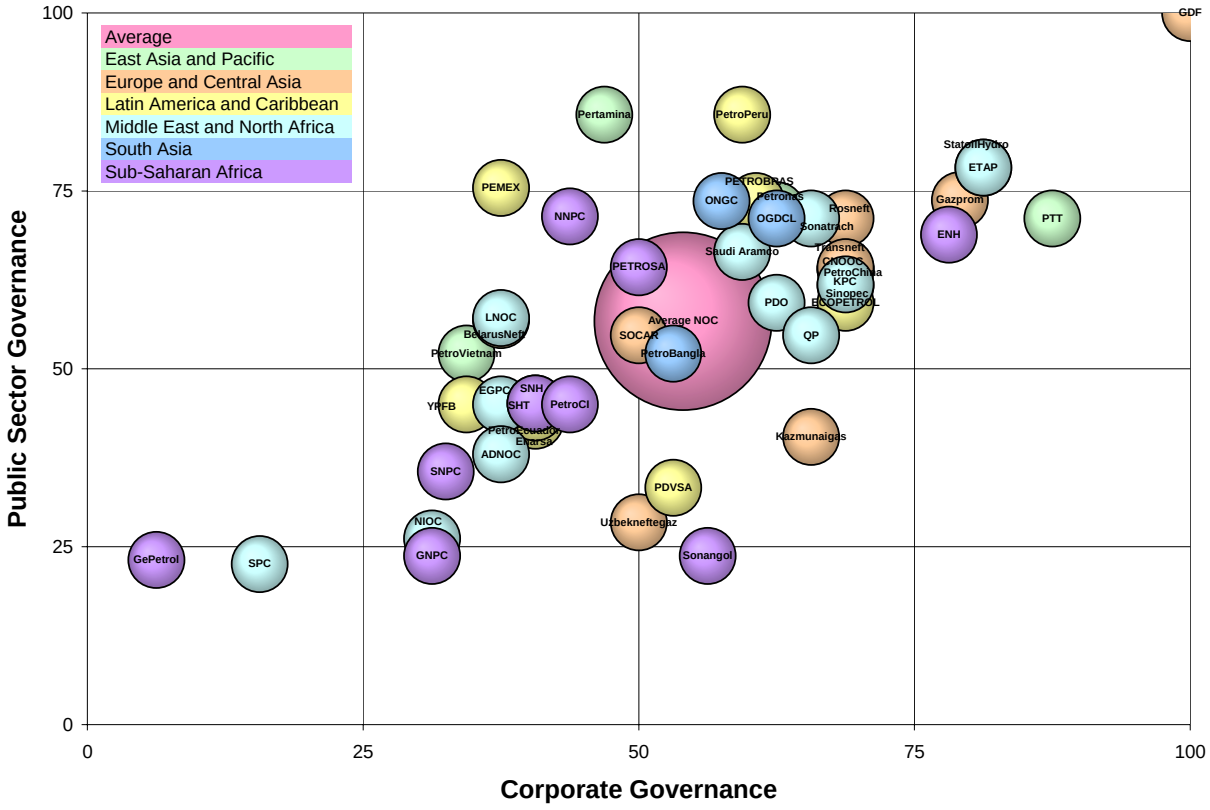
Figure 27. Corporate Governance vs. Sector and Trade Openness



What Is the Interaction between NOC Corporate Governance and Public Sector Governance?

The interaction between corporate governance and public sector governance is positive, but not as strong as expected. In several instances where credit ratings are available, the NOC's rating is above its home country's or it is the only entity rated. This suggests that, in some cases, the NOC is the dominant or strongest institution in an otherwise weaker state. Generally speaking, deploying commercial objectives is an incentive to better corporate governance, perhaps because NOCs interact with partners and competitors and, as a result, pick up best practices. The relationship between corporate and public sector governance may also be a matter of checks and balances. Countries with stronger civil societies and civil rights have better public sector governance and more scrutiny on both public and private sectors and practices.

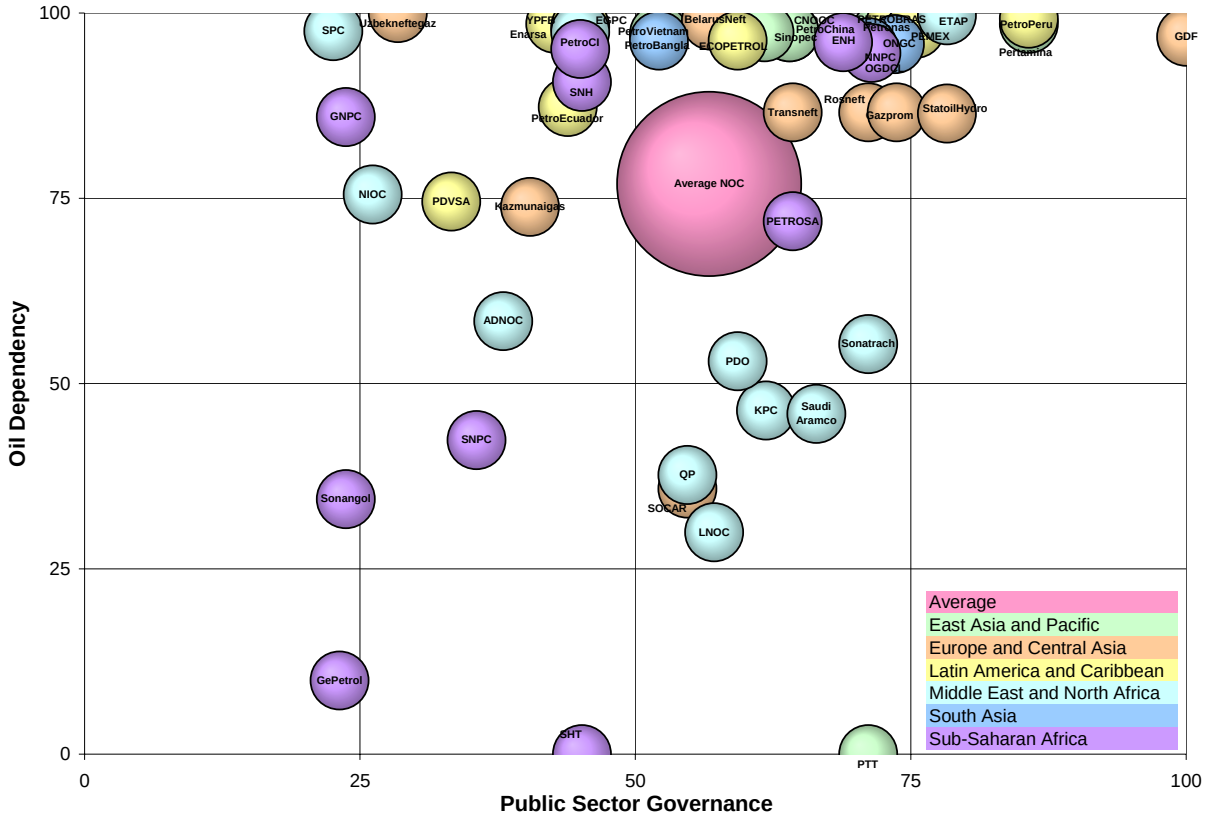
Figure 28. Corporate Governance vs. Public Sector Governance



Does Oil Dependency Inhibit Public Sector Governance?

Low public sector governance attributes do not appear to be strongly associated with oil dependency. Indeed, the opposite appears to emerge from the data for some cases. There are several possible reasons for a result that might seem counterintuitive. The measure of public sector governance mainly addresses hydrocarbon sector management, as opposed to more general public sector governance qualities. More research is needed on how to best define public sector governance. The result of this cross-section may also capture some of the previous discussion—the ability for some NOCs to outperform their countries. Finally, the result obtained here may reflect the general diversity across nation states with respect to governance and point to the importance of investigating fundamental issues associated with the strength and effectiveness of public governance institutions.

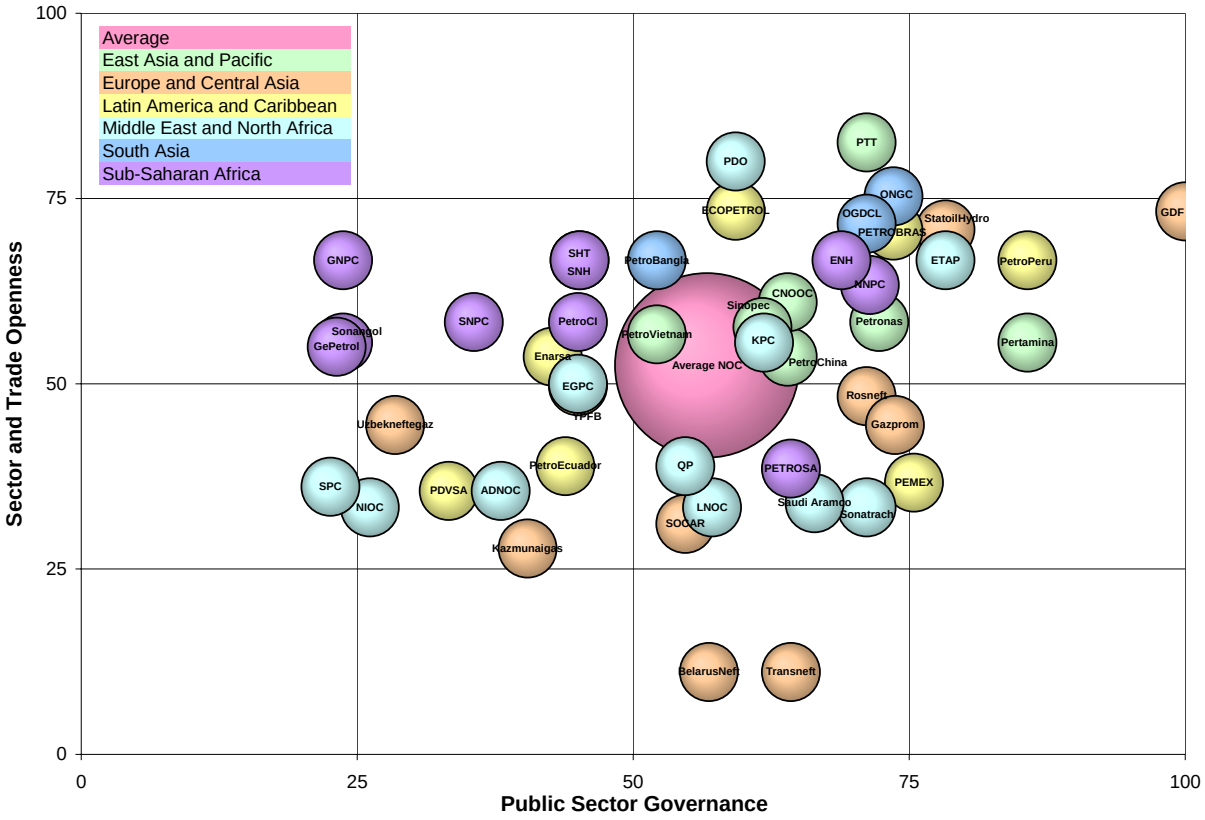
Figure 29. Public Sector Governance vs. Oil Dependency



What Is the Impact of Sector and Trade Openness?

Does sector and trade openness trigger improvements in public sector governance, or can countries only engage in more open and competitive environments if their public sector management is strong? The relationship between these two groupings is not as strong as might be expected. Generally there is a positive pull and evidence of clustering where scores for both groupings are higher. The interactions between the two variables deserve further and more sophisticated analysis.

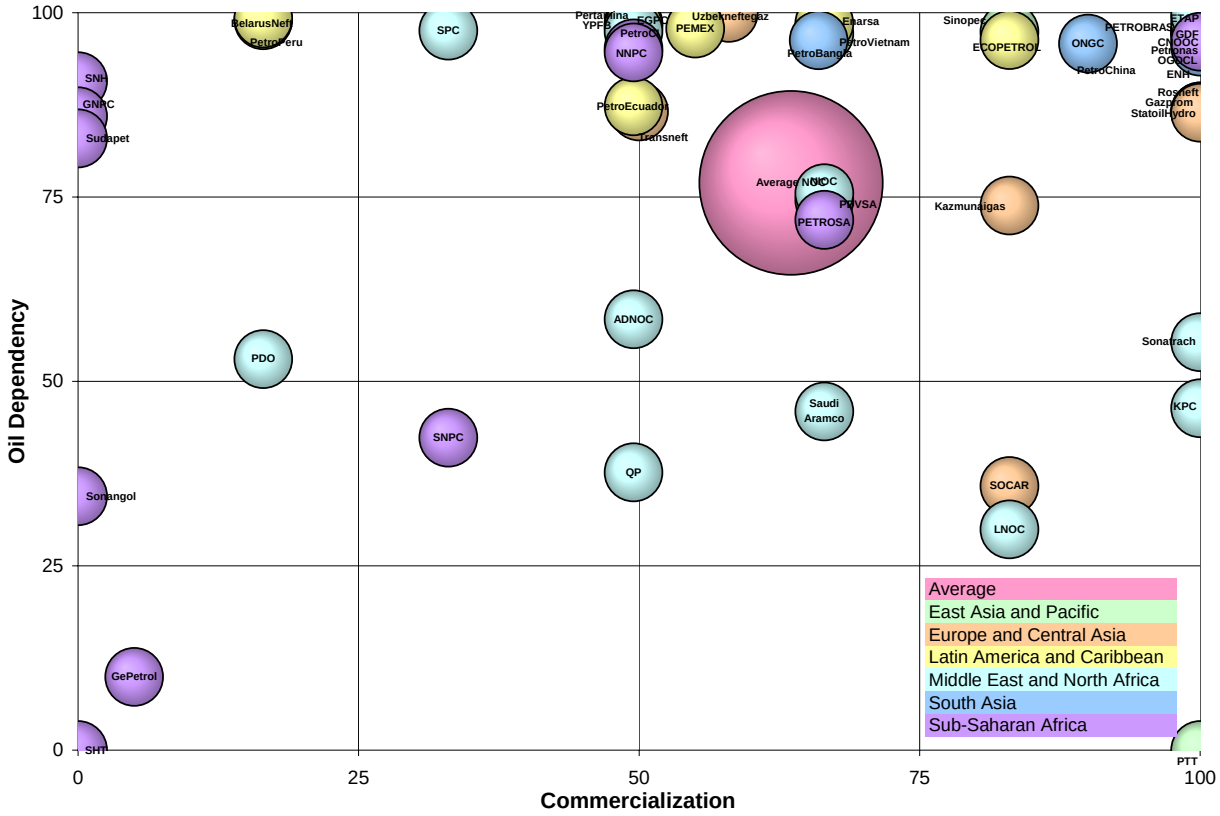
Figure 30. Public Sector Governance vs. Sector and Trade Openness



Does Oil Dependency Hold Back Commercialization?

Oil dependency does appear to exert a strong constraint on commercialization. The tendency for governments to prevent NOCs from venturing more deeply into their value chains may hinge on the reliance on upstream revenues (resource rents) and concerns that commercialization will inhibit yields. But, the result may also be affected by the fact that more oil-dependent economies are also those that are dominated by partnerships and alliances that target the resource endowment and economic rents from extraction rather than the lower returns so often associated with mid- and downstream businesses. In any case, this very strong, very inelastic cross-section may explain much of the recently observed strategic push by NOCs to break out of historic business models and pursue participation arrangements downstream of the wellhead.

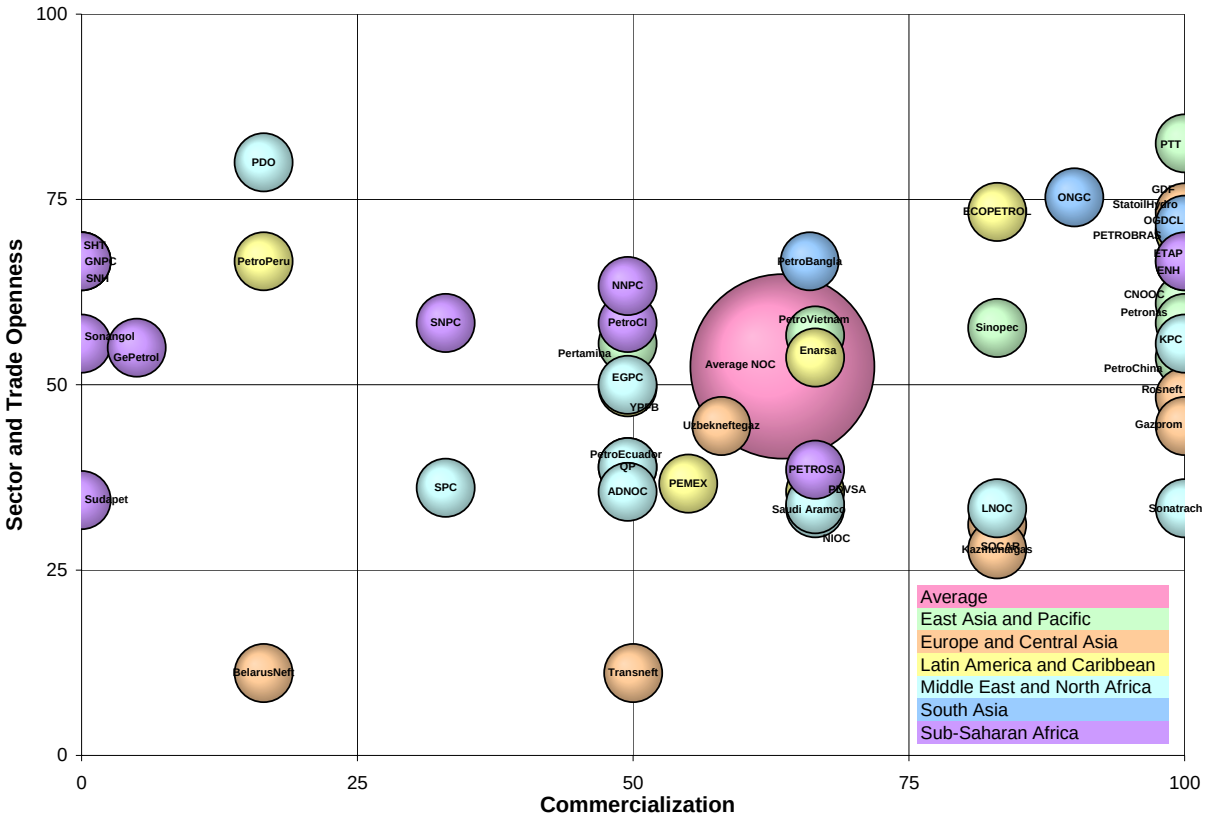
Figure 31. Commercialization vs. Oil Dependency



Does Commercialization Affect Sector/Trade Openness?

Sector and trade openness appear to be positively related to commercialization. In fact, access to more and more varied partnerships and alliances as well as to the advanced technologies, external financing, and other advantages associated with those arrangements, would be expected to increase the level of commercialization.

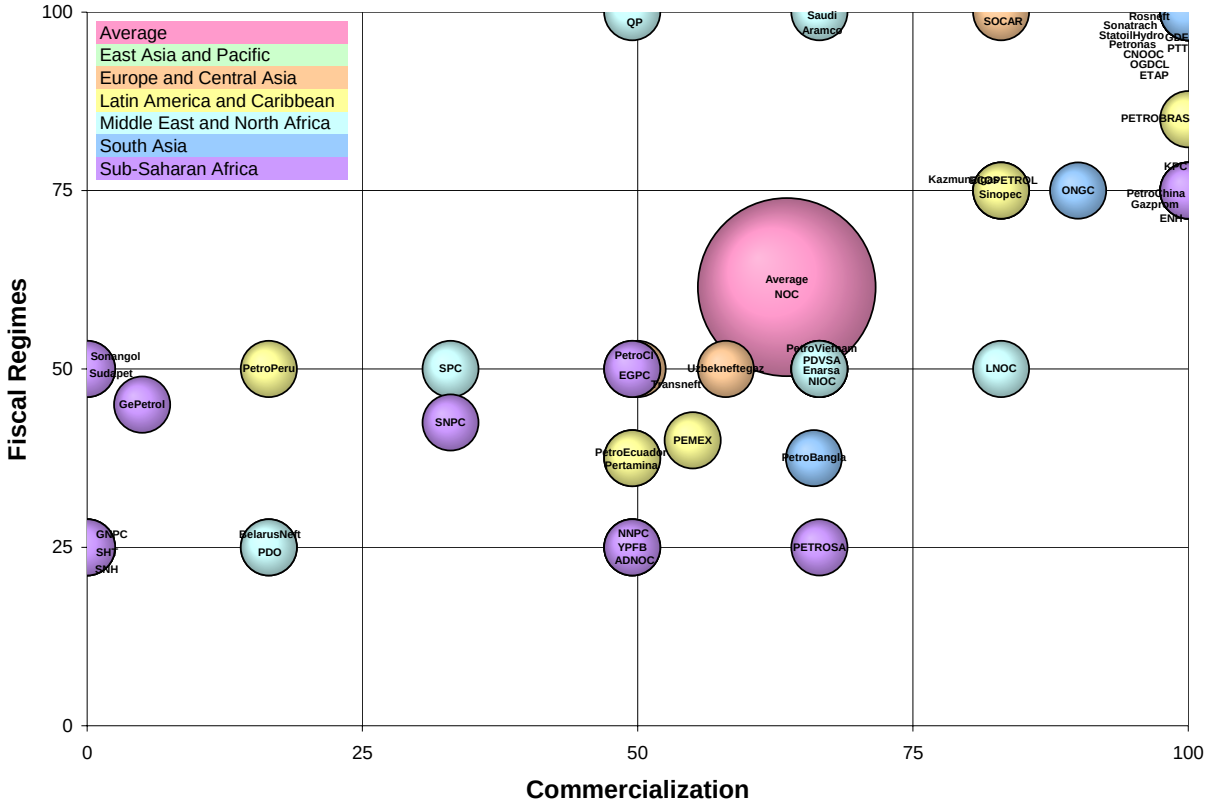
Figure 32. Commercialization vs. Sector and Trade Openness



Are Fiscal Regimes Important For Commercialization?

This seems to be the case, with strong positive divergence as high commercialization scores cluster around higher scoring fiscal regimes. How fiscal regimes are designed vary widely (even though governments pay close attention to their closest competitors) and may accommodate numerous drivers, goals, and objectives. Less favorable regimes may require efficient companies to commercialize marginal fields. Very favorable regimes may contribute to inefficiencies (for instance, requiring NOC participation to be higher). Fiscal regimes may challenge NOC financial sustainability by imposing high taxes on a country's primary revenue producer or by targeting competition without providing the NOC flexibility to adapt, trim costs, and implement best practices.

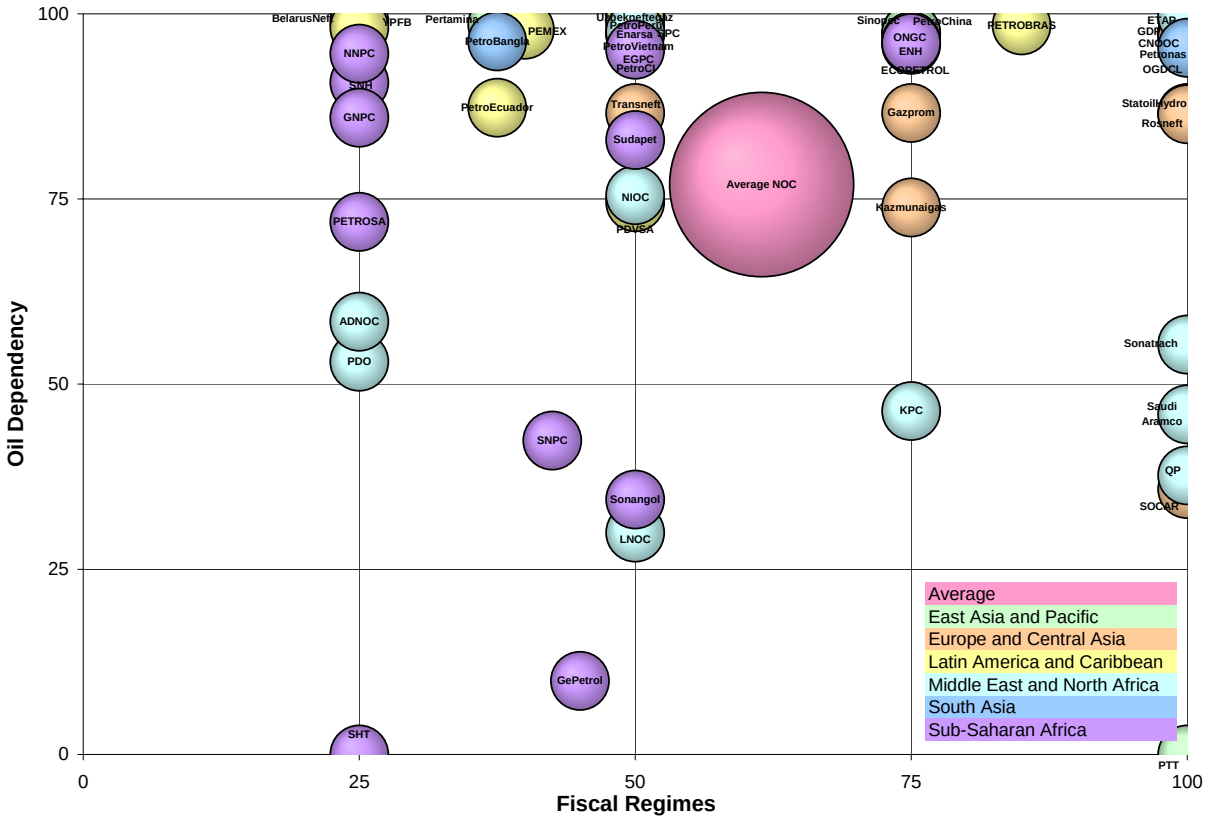
Figure 33. Commercialization vs. Fiscal Regimes



How Do Oil Dependency and Fiscal Regimes Interact?

In similar fashion to the interaction between fiscal regimes and commercialization, divergent clusters form as fiscal regimes improve. The interaction is less compelling and, overall, the distribution of NOCs appears to verify the general conclusions that inverse (negative) relationships exist between fiscal regimes, oil dependency, and resource endowments.

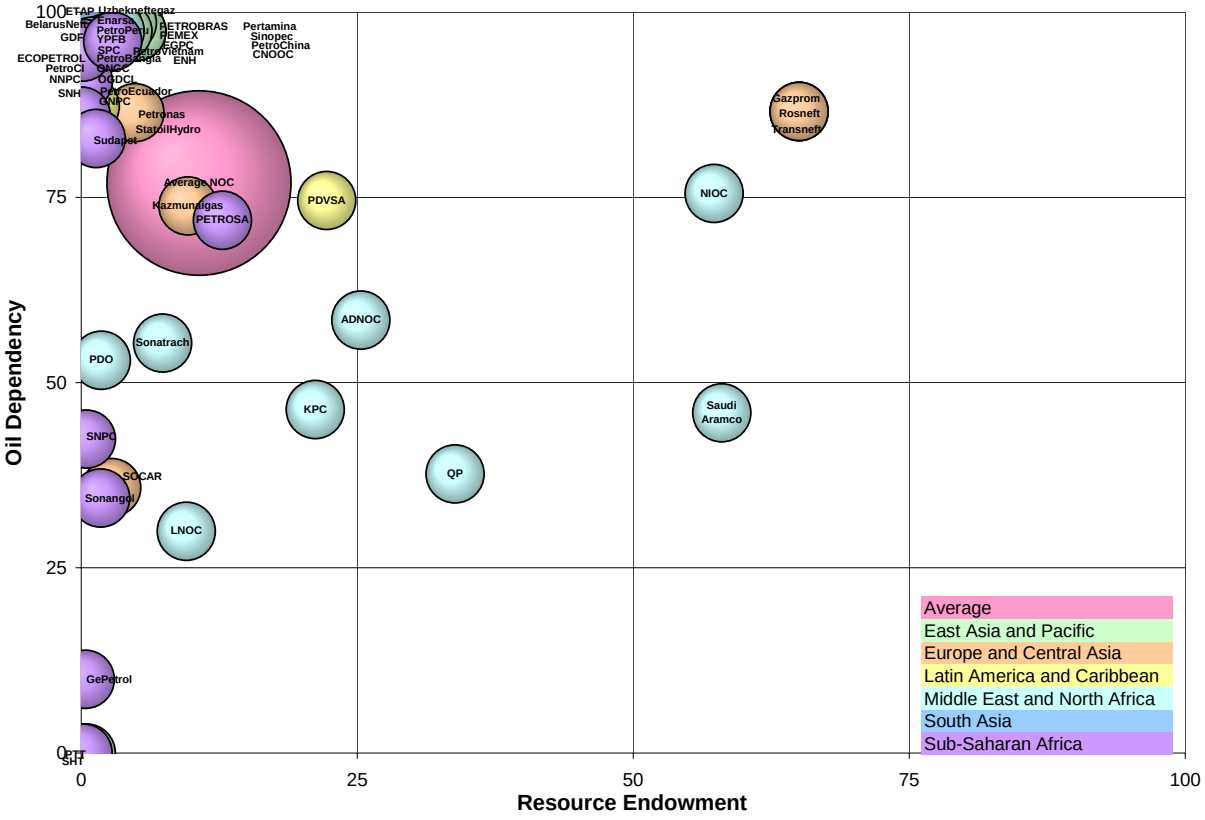
Figure 34. Fiscal Regimes vs. Oil Dependency



Are Oil Dependency and Resource Endowments Necessarily Related?

Interestingly, this does not appear to be the case. Countries with smaller endowments may be even more reliant on their revenue streams while some richly endowed countries may be better at managing their resources.

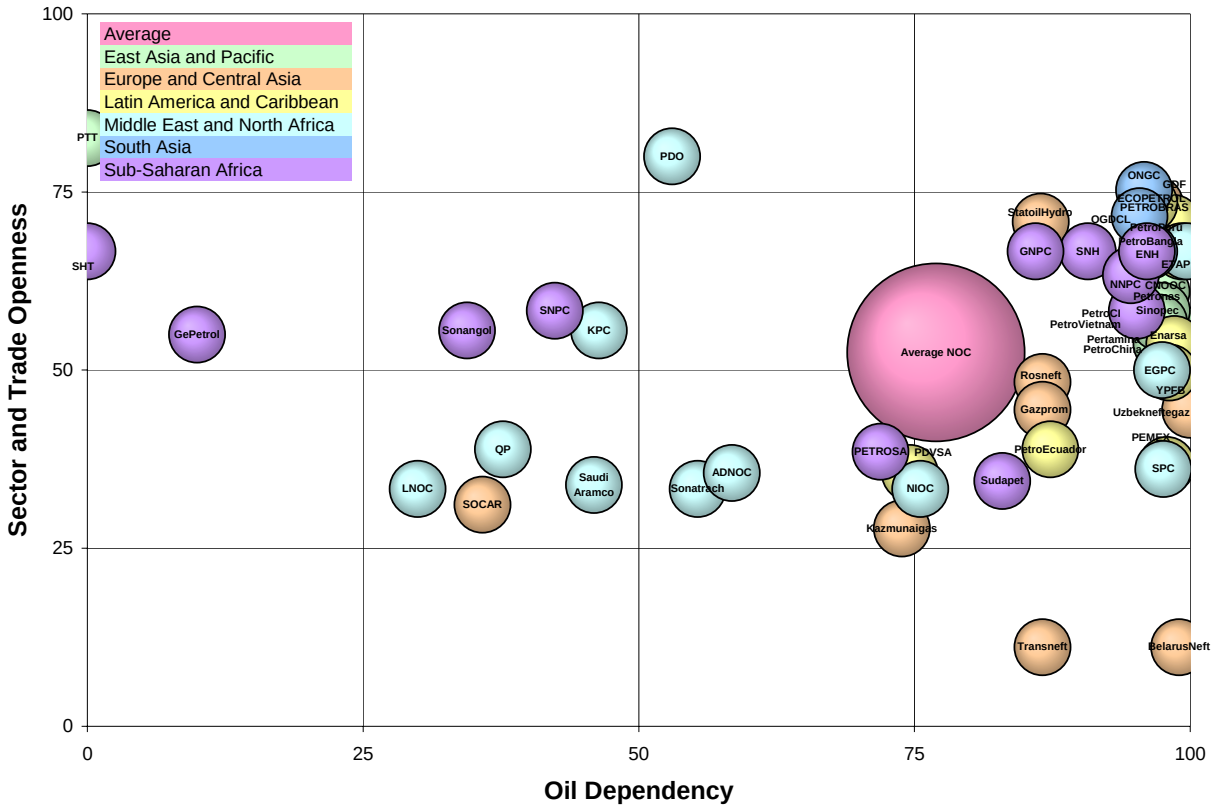
Figure 35. Resource Endowment vs. Oil Dependency



Does Oil Dependency Inhibit Sector and Trade Openness, or Vice Versa?

There does seem to be a limit to what can be achieved with openness when oil dependency is high. This seems to fall in line with the suggestion that dependency and resource endowment constrain fiscal regimes—governments and their NOCs may be more fearful of the effect of competition or other pressures when revenue streams are at stake.

Figure 36. Oil Dependency vs. Sector and Trade Openness



Review of Financial Metrics

Based on the highlights from clustering as presented above and the previous observations in Part II regarding operating and financial performance, a final series of cluster diagrams, **Figures 37** through **46,** were prepared. These diagrams use only the NOCs for which information deemed of reasonable quality (usually externally audited) is publicly available. The diagrams match a selection of the financial metrics discussed in Part II against the average of all eight groupings scores for each NOC (referred to hereon as average NOC scores). The diagrams also reflect the size of each NOC according to BOE production. The charts include trend lines to emphasize relationships and aid in development of potential hypotheses for further testing.

The results in the following charts demonstrate that if NOC reporting is sufficiently robust to support analysis, key findings can be obtained that reflect a logical pattern of relationships. This observation constitutes a major outcome of the Guide and supports the importance of reporting in order to assess and discern improvements in performance and policy.

Figure 37. Fiscal Contribution to the State

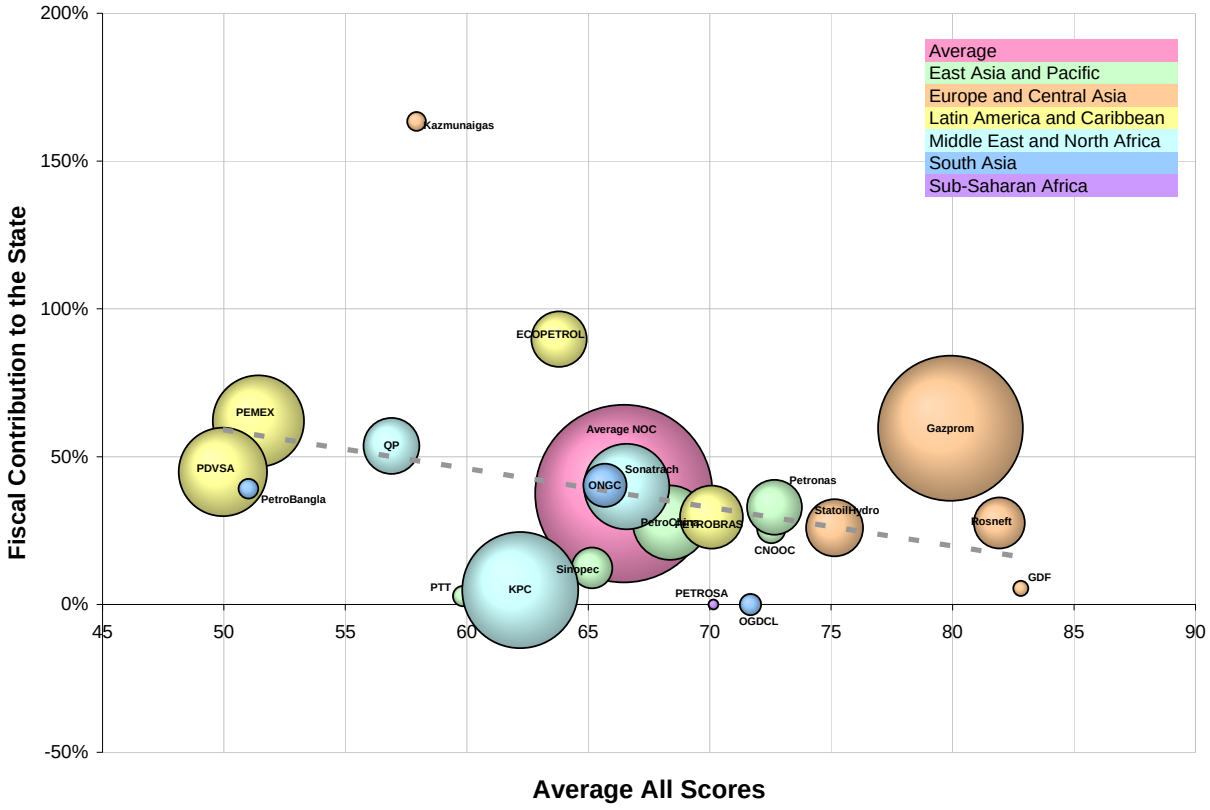
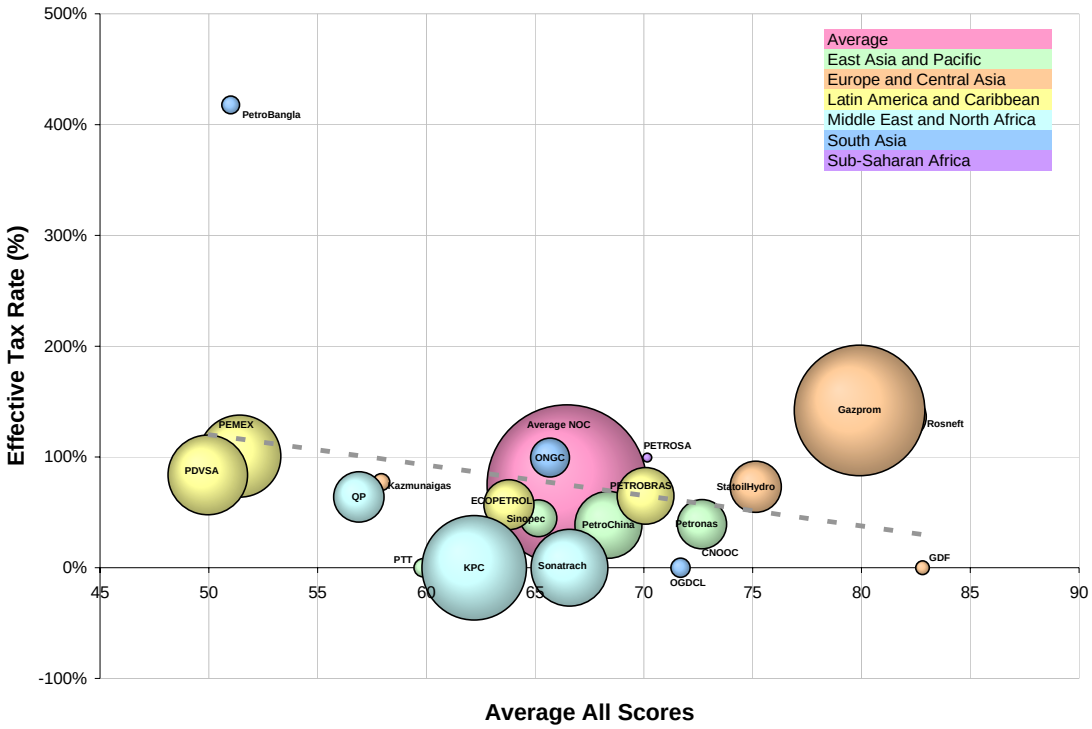


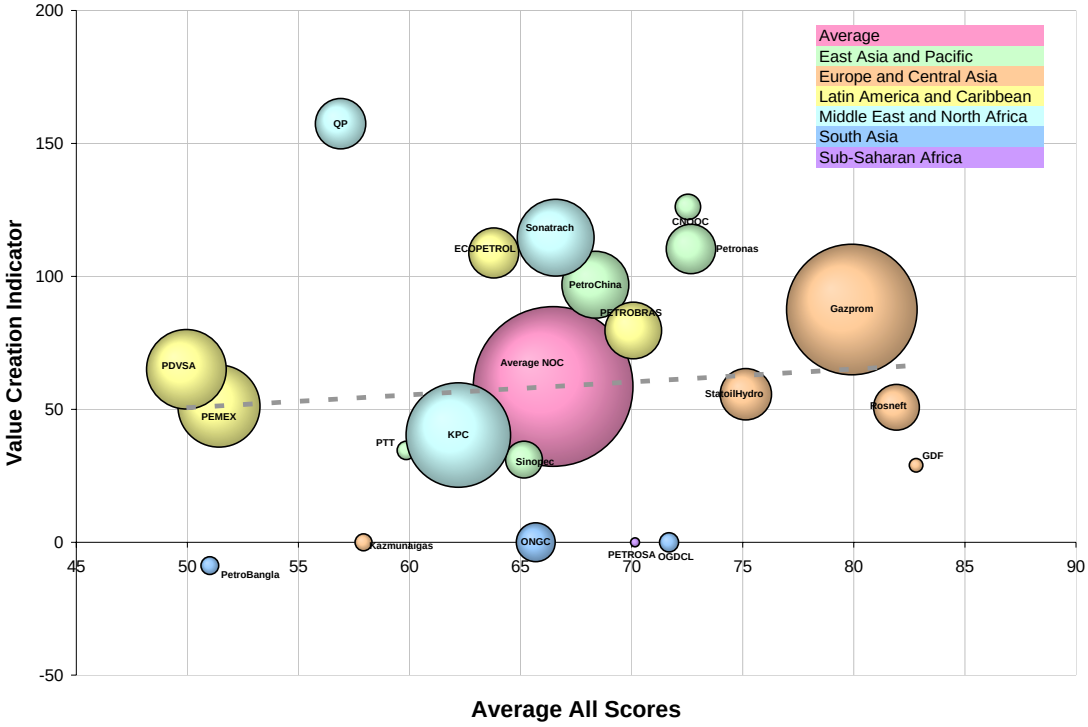
Figure 37 indicates that fiscal contribution trends down as average NOC scores increase on revenue flows to the state—an inverse relationship that logically reflects the impact of more competitive, commercial environments and less stringent fiscal regimes imposed on NOCs. This result supports previous observations regarding the tendency for governments to avoid actions that might diminish a critical component of government treasuries in those countries where NOCs and oil and gas export revenues are larger components of the overall economy. **Figure 37** also points to the risk to NOC sustainability if fiscal contributions are very high.

Figure 38. Effective Tax Rate



Taxes are a large component of an NOC's fiscal contribution to the state. **Figure 38** compares effective tax rate with the overall average NOC scores for the reduced sample of NOCs. The inverse relationship between tax rates and average scores emphasizes the compelling link between the key dimensions reflected in the groupings and the fiscal regimes that governments impose on NOCs.

Figure 39. Value Creation Indicator



In **Figure 39** the experimental value creation indicator trends up with average NOC scores (the indicator, as explained in Figure 21, is the combination of operating margin, profit margin, ROA, and ROCE). The positive correlation suggests that combined improvements (corporate and public sector governance, fiscal regimes, sector and trade openness, and so on) can affect NOC performance. The positive trend is repeated for three of the value-creation indicator components illustrated in the next pages:

- Profit margin (**Figure 40**)
- Return on assets (**Figure 41**)
- Return on capital employed (**Figure 42**)

Figure 40. Profit Margin

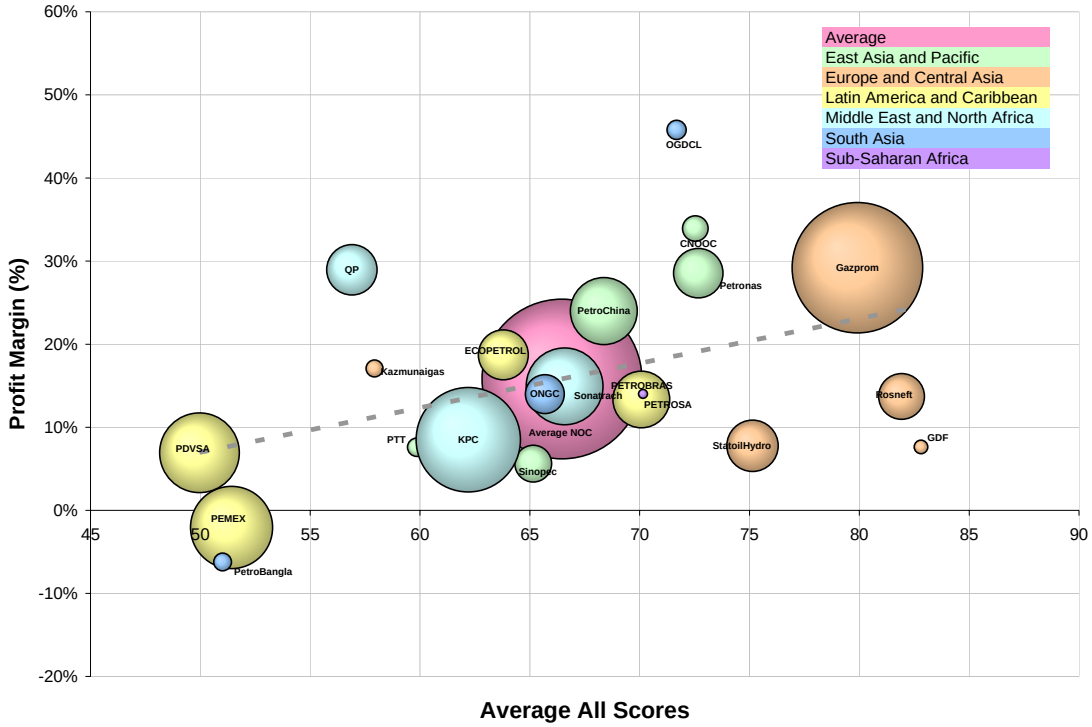


Figure 41. Return on Assets

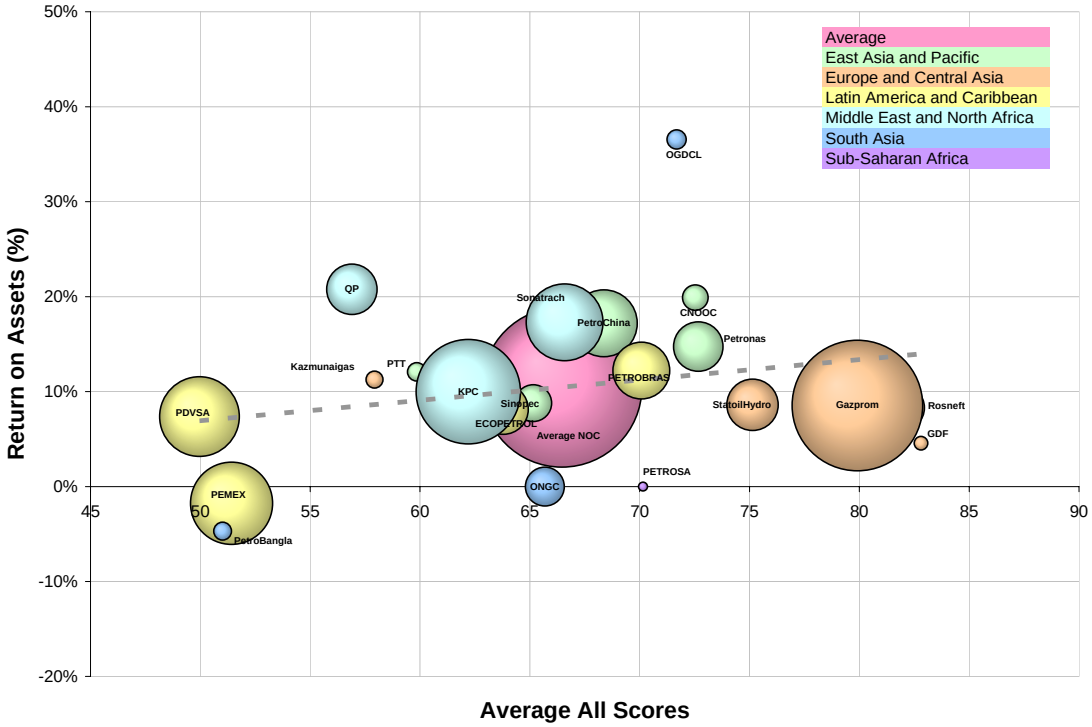


Figure 42. Return on Capital Employed

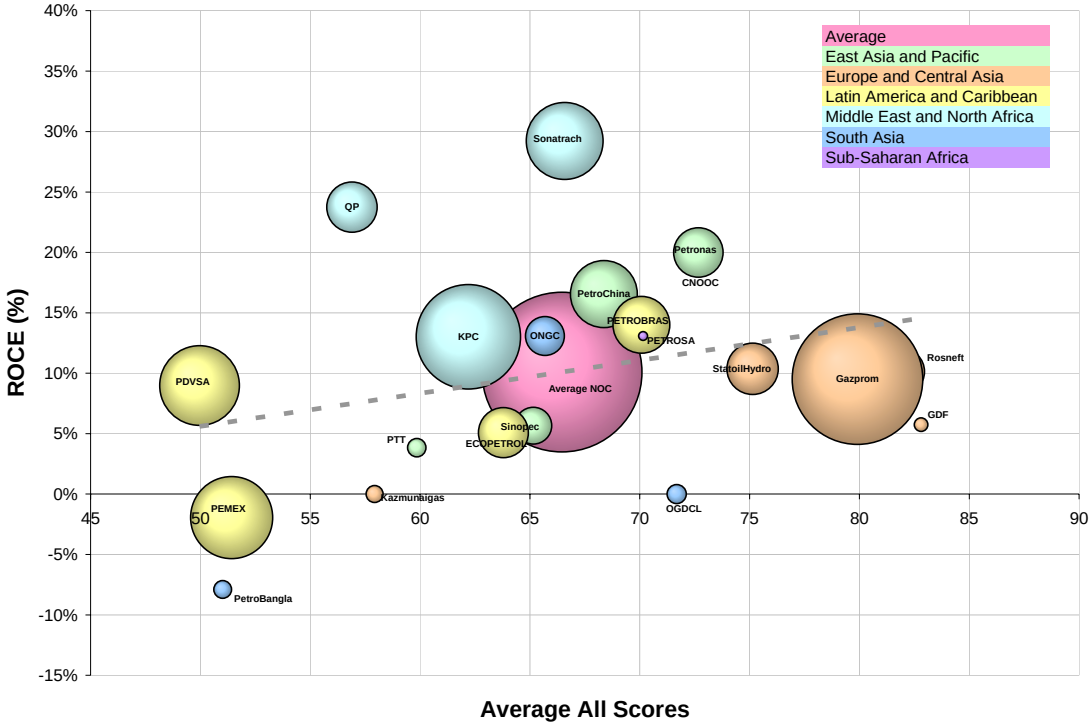
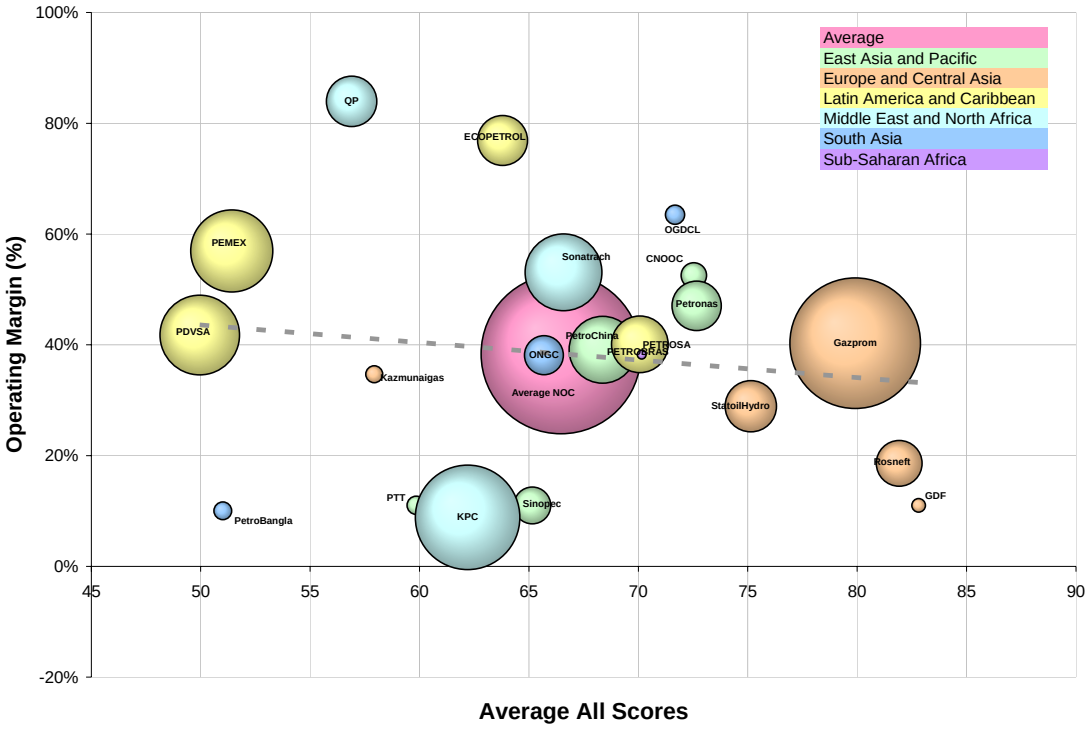
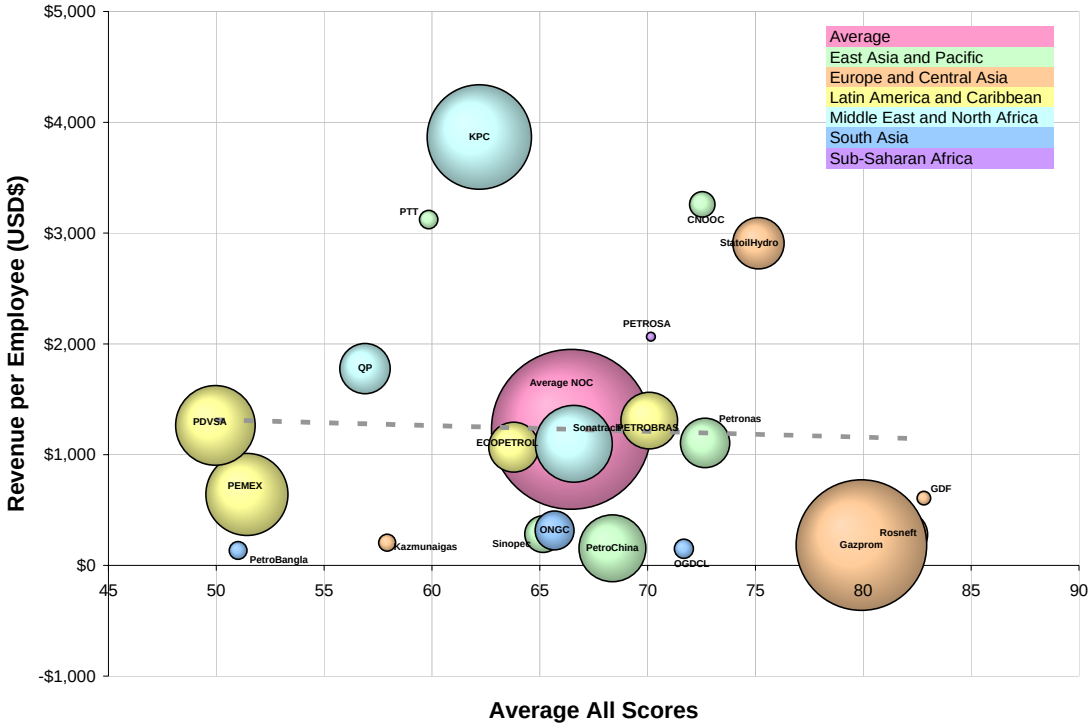


Figure 43. Operating Margin



An anomalous relationship appears to exist when the fourth component of the value creation indicator—operating margin—is plotted against the average NOC scores (**Figure 43**). This is most likely a reflection of more competitive conditions and changing operating costs for the reduced sample of NOCs. For instance, in the reduced sample, higher costs incurred by those NOCs engaged in international exploration and production activities (outside of their domestic markets) are amplified. Higher profit margins (see Figure 40) reflecting more favorable fiscal policies and lower costs of capital (a consequence of performance and country rating) allow higher scoring NOCs to retain more of their earnings.

Figure 44. Revenue per Employee



Revenue per employee (**Figure 44**) and BOE production per employee (**Figure 45)** are skewed by the effect of the larger workforces maintained by PetroChina and Sinopec on the reduced sample of NOCs. These results also can be explained by the more robust competitive conditions both within these countries, as reflected in higher scores for sector and trade openness (increased participation by non-NOCs and international trade engagement), and the impact of competition in the international exploration and production investment arena.

Figure 45. BOE Production per Employee

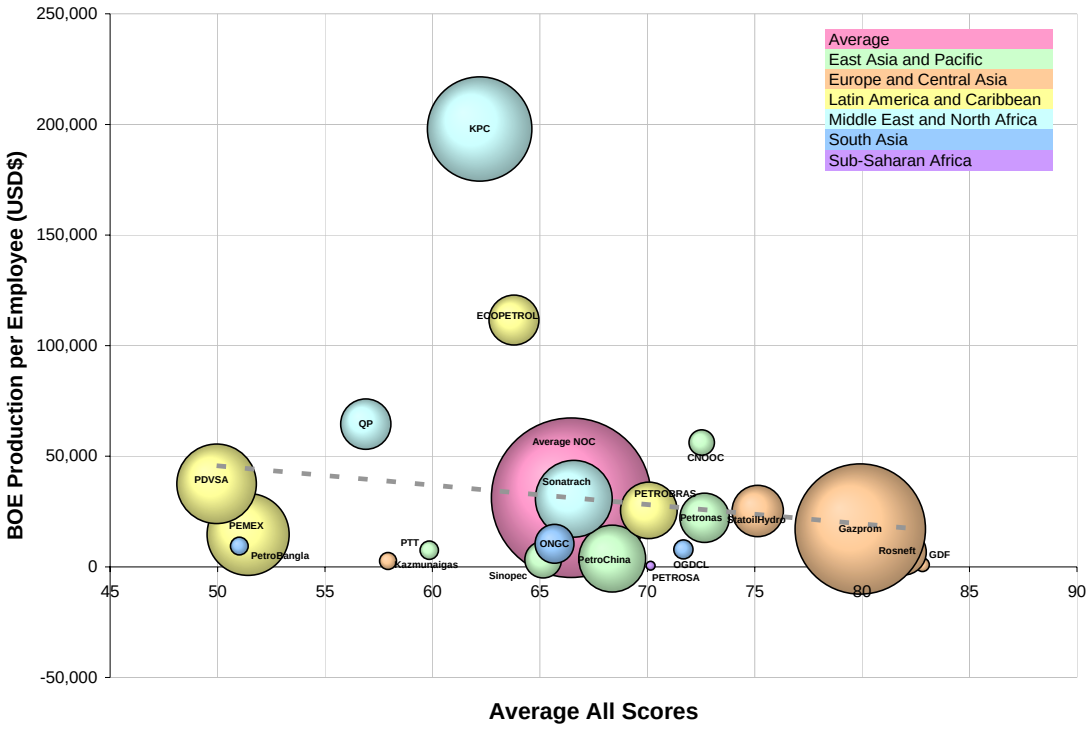
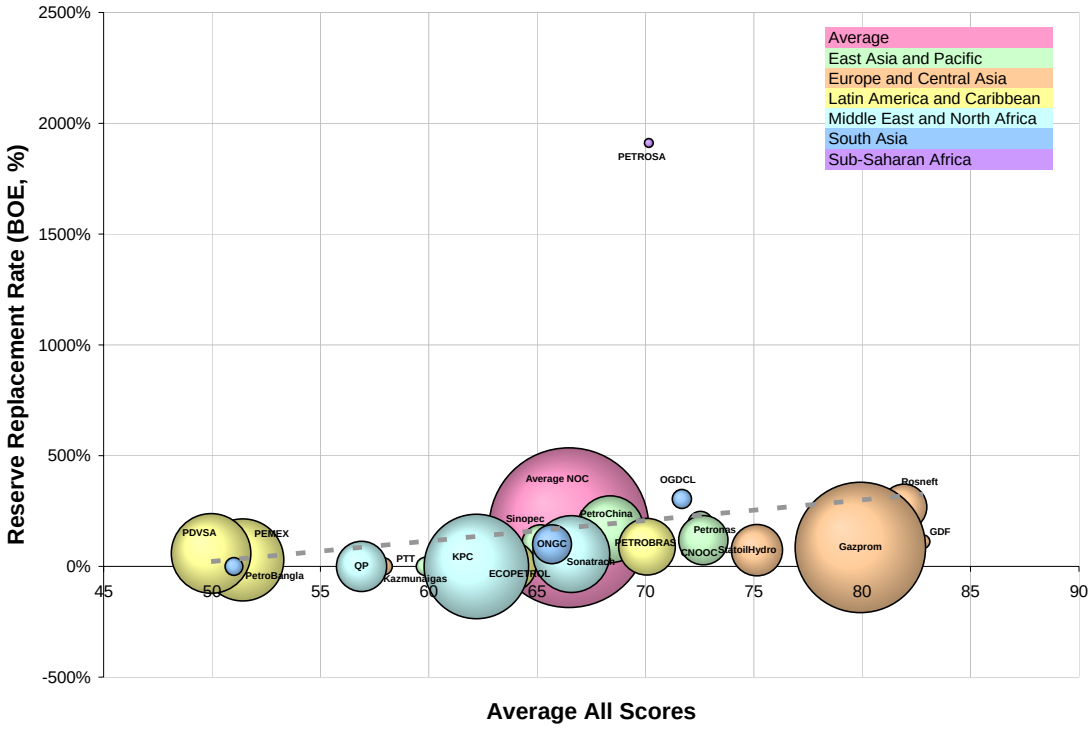


Figure 46. Reserve Replacement Rate



Lastly, a plot of reserve replacement rate against the average NOC scores for the reduced sample results in a generally positive trend for reserve replacement rate (**Figure 46**). This encouraging trend suggests that global oil and gas reserve replenishment can be enhanced with key actions to improve governance, trade and sector openness, fiscal regimes, and other factors as captured in the groupings.

Conclusions Based on Clustering

A number of observations can be drawn from the examples of clusters shown previously.

- Other things being equal, it appears that the quality of institutions—both the NOC's organizational and management structure and charters and the strength of public governance—matter greatly in how NOCs are distributed. This relationship is clear when corporate governance and public sector governance are paired and when they are each paired against other groupings. It is useful to compare the clustering results obtained in the Guide with the World Bank governance indicators[16] for the respective countries. Generally speaking, public sector governance for the hydrocarbon sector will not be better than overall public sector governance for a country, and it can certainly be worse. This tendency has broad impact both on NOC corporate governance structures and processes and how NOCs perform given the attributes at hand.
- Any number of motivations might drive the existence and persistence of the NOC business model, but the clustering approach illustrated here bolsters long-established thinking. NOCs generally appear to prefer and reflect various forms of nationalism or nationalist approaches. As oil-export-revenue dependence increases, sovereign governments have ever-greater incentives to control NOC revenues. As oil-import dependence grows, governments rely on NOCs to procure and secure new sources of supply. Where these conditions seem to be weak, NOCs seem mostly to be relics of national economic policies that give prominence to "champions" as vehicles for comparative advantage or dominance. Situations where NOCs exist but do not appear to meet domestic energy needs potentially are most volatile with respect to restructuring the NOC business model and associated policies.
- Gauging the influence of fiscal regimes on NOC performance or structure requires a better, more discrete measure. A recommendation is that rankings or other output from fiscal regime models, including cash flow-based approaches, could provide a more robust set of indicators and metrics for analysis. A caution is that some fiscal regime models may be biased either toward a host government's priorities or those of investors. This means that an independent fiscal regime model should be developed for purposes of the Bank's research program.
- The results illustrated in the Guide appear to indicate that oil dependency and resource endowment do not have a major role in explaining NOC structure and performance or interactions with other variables. NOC corporate governance and public sector governance appear to be important values regardless of how oil dependent the country is or how large the resource endowment appears to be. Moreover, it appears that many NOCs that are most proficient with respect to commercialization also are those from more oil-dependent and richly endowed countries. This stands to reason. It is precisely these countries that:

[16] World Bank's Worldwide Governance Indicators were used for comparisons and interpretation and, as noted previously, are incorporated in the two-page NOC reports. http://www.govindicators.org/.

- Attract the most investment from IOCs and the best oil service vendors
- Produce the largest sovereign wealth funds, and so on.

Their learning curves should be shorter than for other less well-positioned countries. In contrast to the observations on quality of institutions, it seems very apparent that proficient NOCs can surpass their governments in both sophistication and performance. In some cases, this may create information asymmetry problems and trigger reliance on NOCs as providers of last resort.

PART IV. RECOMMENDATIONS ON SELECTION OF NOCS FOR FURTHER CASE STUDIES

Based on the results from the Part III cluster analysis, the first group of NOCs recommended for further study and analysis are those that already provide sufficient, audited reporting. These NOCs also:

- Achieve high scores in the various groupings categories
- Reflect considerable regional and resource endowment diversity; operate within markedly different fiscal regimes
- Reside in countries that vary widely with regard to economic performance as well as governance indicators
- Reflect various stages of commercial and organizational development

This group is categorized as **"Top Performers"** based on the data illustrated in the Guide. Optional for further study within this group are GDF (France) and StatoilHydro (Norway); both are advanced, international companies and StatoilHydro already has been the subject of extensive research.

The second category of NOCs, **"Mid-Tier,"** consists of "up and comers"—NOCs that either are:

- In the process of interesting transitions
- Are challenged in particular ways with regard to their operating contexts
- Should be performing better than they appear to do (or are able to);
- Reflect complex mixed goals and objectives among their sovereign governments
- Could achieve higher scores by virtue of better reporting

Because of the very clear, compelling, and difficult issues with transparency, the **"Sub-Saharan"** NOCs are a third and separate category. Within this group are countries with large resource endowments; countries with relatively high governance scores; and countries that are of great concern with respect to stability, future outlook, private market advancement, and international trade and engagement.

The proposed categorization is summarized in **Table 5** below. A complete table of NOCs and their scores is shown in Appendix 4.

Table 5. NOC Categorizations and Recommendations for Case Studies and Further Analysis

Company	Corporate Governance	Public Sector Governance	Commer-cialization	Fiscal Regimes	Resource Endowment	Oil Dependency	Local Contribution	Sector and Trade Openness	Average
Average NOC	**54**	**57**	**64**	**61**	**11**	**81**	**33**	**52**	**55**
Top Performers—*NOCs scoring above average and that provide substantial, audited reporting*									
GDF	100	100	100	100	0	97	95	73	83
Rosneft	69	71	100	100	65	87	72	48	82
Gazprom	79	74	100	75	65	87	40	44	80
StatoilHydro	81	78	100	100	5	86	74	71	75
CNOOC	69	64	100	100	5	97	74	61	73
PETROBRAS	61	74	100	85	3	98	76	71	70
PetroChina	69	64	100	75	5	97	72	54	68
Sinopec	69	62	83	75	5	97	88	58	65
ECOPETROL	69	59	83	75	0	96	0	73	64
KPC	69	62	100	75	21	46	0	56	62
Mid-Tier—*NOCs scoring above average, some with audited reporting*									
PTT	88	71	100	100	0	83	97	83	74
Petronas	63	72	100	100	4	97	67	58	73
OGDCL	63	71	100	100	1	95	0	72	72
Sonatrach	66	71	100	100	7	55	60	33	67
ONGC	58	74	90	75	2	96	60	75	66
Saudi Aramco	59	66	67	100	58	46	0	34	66
Kazmunaigas	66	40	100	75	10	74	-63	28	61
QP	66	55	50	100	34	38	46	39	57
SOCAR	50	55	83	100	3	36	0	31	54
Pertamina	47	86	50	38	4	99	0	56	54
PEMEX	38	75	55	40	3	98	38	37	51
PetroBangla	53	52	66	38	1	96	61	67	51
PDVSA	53	33	67	50	22	75	55	36	50
PetroVietnam	34	52	67	50	1	97	54	57	50

Company	Corporate Governance	Public Sector Governance	Commer-cialization	Fiscal Regimes	Resource Endowment	Oil Dependency	Local Contribution	Sector and Trade Openness	Average
ADNOC	38	38	50	25	25	58	0	36	39
Sub-Saharan—*NOCs of great importance with common issues and challenges*									
ENH	78	69	100	75	3	96	0	67	70
PETROSA	50	64	67	25	13	72	0	39	48
NNPC	44	71	50	25	0	95	0	63	47
Sudapet	38	24	0	50	1	83	0	34	33
SNPC	33	36	33	43	0	42	0	58	31
Sonangol	56	24	0	50	2	34	0	56	28
GNPC	31	24	0	25	0	86	0	67	28
GEPetrol	6	23	5	45	0	10	0	55	15

PART V. SOURCES AND OTHER INFORMATION

A rule of thumb for the Guide was that all information sources must be public domain so that any reader or user of the directory could obtain the original information, if needed. In addition, the authors have broad experience across a number of countries, regions, and languages, and with several of the NOCs included in the Guide. Thus, the data obtained from publicly available sources were interpreted on the basis of informed observation of the global oil and gas marketplace and industry structure.

This illustrates the complicated transparency challenge: not only is information scarce and difficult to obtain from public domain sources, but a user must be able to navigate that information in its complexity, sometimes with a good language dictionary at hand.

A number of standard, information sources were relied upon for general background across all countries and situations. These are presented below in no particular order of priority. In the data directory, these sources are repeated whenever specific information was drawn. Web links and specific links for particular materials and reports are provided in the data directory.

- NOC websites
- NOC annual reports when available
- International Energy Agency (IEA)
- U.S. Energy Information Administration (EIA), Country Analysis Briefs
- U.S. Geological Survey, Annual Minerals Yearbook
- U.S. Central Intelligence Agency (CIA), World Factbook
- BP Statistical Reviews of World Energy
- World Bank Group, including all country data and statistics, World Governance Indicators, Energy Sector Management Assistance Program (ESMAP), and International Monetary Fund (IMF) data
- U.S. Securities and Exchange Commission (SEC)
- Credit ratings organizations—Standard & Poor and Moody's, for both company and sovereign ratings
- The major transparency programs of interest: Extractive Industries Transparency Initiative, Transparency International, National Democratic Institute (U.S.)
- World Trade Organization (WTO)
- Organization of Petroleum Exporting Countries (OPEC)

In addition to the above, the following literature sources provided background and were used for targeted elements of data collection and clustering analysis:

Aegis Energy Advisors Corp. 2002. "State Oil Company Privatizations," Presentation, November.

Alleyne, D. H. N. 1980. "The State Petroleum Enterprise and the Transfer of Technology." In *State Petroleum Enterprises in Developing Countries*, United Nations Centre for Natural Resources, Energy and Transport (UNCNRET). New York: Pergamon Press.

Al-Mazeedi, W. 1992. "Privatizing the National Oil Companies in the Gulf." *Energy Policy*, October, 1992.

Al-Naimi, Ali. 2004. "The Role of the National Oil Companies in a Changing World's Economic and Energy Relations." Speech at the OPEC International Seminar, Vienna, Austria, September 16.

Auty, R. M. 1990. *Resource-Based Industrialization: Sowing the Oil in Eight Developing Countries*. Oxford: Clarendon Press.

Bacon, Robert. April 1999. "A Scorecard for Energy Reform in Developing Countries." *Public Policy for the Private Sector*, Note No. 175, World Bank Group.

Baum, Vladimir. "Introduction." In UNCNRET, op. cit.

Boué, Juan Carlos. 2003. "Efficiency or Fiscal Revenue? The True Challenge Facing the Large State Oil Companies." Presentation, Coloquio Internacional, "Energia, Reformas Institucionales y Desarrollo en America Latina," Universidad Nacional Autonoma de Mexico, Mexico, D.F., November.

El Mallakh R., O. Noreng, and B.W. Poulson. 1984. *Petroleum and Economic Development: The Case of Mexico and Norway*. Lexington, Massachusetts: Lexington Books.

Foss, Michelle Michot. 2005. "The Struggle to Achieve Energy Sector Reform in Mexico." Prepared in 2004 for the U.S. Agency for International Development, *The Nexus Between Energy and Democracy*.

____. 2005. "Global Natural Gas Issues and Challenges: A Commentary." *The Energy Journal*, January.

Foss, Michelle Michot, Joseph A. Pratt, Gary Conine, Alan Stone, and Robert Keller. May 1998. *North American Energy Integration: The Prospects for Regulatory Coordination and Seamless Cross-Border Transactions of Natural Gas and Electricity*. CEE-UT.

Foss, Michelle Michot, Jack Casey, Paul Gregory, Everette Gardner, and Gürcan Gülen. March 2000. "Best Practices in Energy Sector Reform." Final Technical Report, UH Shell Interdisciplinary Scholars Program III.

Grayson, Leslie E. 1981. *National Oil Companies*. Great Britain: John Wiley & Sons Ltd.

Hartshorne, J. E. 1993. *Oil Trade: Politics and Prospects*. Cambridge, MA: Cambridge University Press.

Heller, C. A. "The Birth and Growth of the Public Sector and State Enterprises in the Petroleum Industry." In UNCNRET, op. cit.

Khan, S. 1994. *The Political Economy of Oil in Nigeria*. Oxford: Oxford University Press.

Khelil, Chakib. 2002. Remarks at National Oil Companies Forum, Algiers, April.

Madelin, H. 1974. *Oil and Politics*. London: Saxon House/Lexington Books.

McPherson, Charles. 2003. "National Oil Companies: Evolution, Issues and Outlook." In *Fiscal Policy Formulation and Implementation in Oil-Producing Countries*, eds. J. M. Davis, R. Ossowski, and A. Fedelino. International Monetary Fund, Washington DC,

Megateli, Abderrahmane. 1980. *Investment Policies of National Oil Companies: A Comparative Study of Sonatrach, NIOC and Pemex*. New York: Praeger Publishers.

Mommer, Bernard. 2002. *Global Oil and the Nation State*. New York: Oxford University Press.

Noreng, O. 1997. *Oil and Islam: Social and Economic Issues*. Chichester: John Wiley & Sons.

Office of Water Regulation, Commonwealth of Australia. 1999. "Best Practice Utility Regulation." Discussion Paper, Utility Regulators Forum, July.

Olorunfemi, M. A. 1991. "The Dynamics of National Oil Companies." *OPEC Review* XV (4) Winter.

Petroleum Intelligence Weekly. April 2005. "Ranking the World's Oil Companies 2005." http://www.energyintel.com.

Philip, G. 1982. *Oil and Politics in Latin America: Nationalist Movements and State Companies.* Cambridge: Cambridge University Press.

Sastri, V. V. "Research and Training in State Petroleum Enterprises." In UNCNRET, op. cit.

Stevens, Paul. 2003. "National Oil Companies: Good or Bad? A Literature Survey." National Oil Companies Workshop Presentation, World Bank, Washington DC, May 27.

Sultan, Nader H. 2003. "The Challenges of Opening Up the Upstream to International Investors—A Kuwaiti Perspective." Presentation, Oil and Money 2003 Conference, London, November 4.

Taher, A. H. "The Role of State Petroleum Enterprises in Developing Countries: The Case of Saudi Arabia." In UNCNRET, op. cit.

Tordo, Silvana. August 2007. "Fiscal Regimes for Hydrocarbons: Design Issues." Working Paper 123, World Bank.

Van der Linde, C. 2000. *The State and the International Oil Market: Competition and the Changing Ownership of Crude Oil Assets*. Boston: Kluwer Academic Publishers.

Wong, Simon C. Y. 2004. "Improving Corporate Governance in SOEs: An Integrated Approach." *Corporate Governance International* 7 (2), June.

World Bank Group. "Country Data at a Glance." Country Unit Staff. http://www.worldbank.org.

Zakariya, Hasan S. "State Petroleum Enterprises: Some Aspects of Their Rationale, Legal Structure, Management and Jurisdiction." In UNCNRET, op. cit.

Zanoyan, Vahan. 2002. Remarks at the National Oil Companies Forum, Algiers, April.

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS—INDICATORS

Based on CEE proposal submission to World Bank.

Title 1	Title 2	Query	Formula References
Corporate Governance	Ownership Structure and Its Organization	Sole NOC or one of cluster of NOCs and other sovereign enterprises in country.	
Corporate Governance	Ownership Structure and Its Organization	Number of NOCs in country.	
Corporate Governance	Ownership Structure and Its Organization	Description of incorporation and ownership.	
Corporate Governance	Ownership Structure and Its Organization	Shares controlled by government.	
Corporate Governance	Ownership Structure and Its Organization	Domestic, international exchanges where shares are listed.	
Corporate Governance	Ownership Structure and Its Organization	Domestic, international exchanges where bonds are traded.	
Corporate Governance	Ownership Structure and Its Organization	Company files form 20-F with SEC?	
Corporate Governance	Board of Directors (BOD)	Does a BOD exist?	
Corporate Governance	Board of Directors (BOD)	Description of BOD and structure.	
Corporate Governance	Board of Directors (BOD)	Is chairman also minister of energy or otherwise appointed by head of state?	
Corporate Governance	Board of Directors (BOD)	Are any BOD members considered independent (external) and, if so, how are they appointed?	

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Corporate Governance	Board of Directors (BOD)	Term of service (years, with reappointment). Comment if they can be readily removed.	
Corporate Governance	Role of BOD	Description of role and policy statements.	
Corporate Governance	Role of BOD	Based on available information, does BOD have power, impact, decision-making authority?	
Corporate Governance	Recruitment/Replacement Key Executives	General process for recruitment, replacement of key executives and senior managers.	
Corporate Governance	Decision-making Processes	Level of NOC budget authority. Comment on the general decision flow within NOC and between NOC and government for major projects.	
Corporate Governance	Decision-making Processes, Budget Autonomy	Based on available information, is NOC budget process predictable and separate from government?	
Corporate Governance	Decision-making Processes, Budget Autonomy	Does the NOC have authority to partner with other entities?	
Corporate Governance	Mission and Objectives	Does NOC have a mission statement and, if so, what are the key elements?	
Corporate Governance	Sources of Capital	Based on available information, budgeting process and policy including % of cash flow/revenue available for reinvestment.	
Corporate Governance	Disclosure/Transparency Policy	Disclosure of audited data and other indications of disclosure and transparency.	
Corporate Governance	Skill Base	Based on available information, NOC demographics (% management, % technical, other descriptors).	
Corporate Governance	Incentives/Career Management	Based on available information, HR promotion and professional development policies.	
Corporate Governance	Noncommercial objectives	Based on available information, brief description of reporting on noncommercial objectives	

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Corporate Governance	Noncommercial objectives	Based on available information, extent of noncommercial obligations.	
Value Creation Metrics	Operating Performance	Upstream oil E&P. Where does it operate (solely in the country or abroad—name countries)? Does it have sole access to country's resources?	
Value Creation Metrics	Operating Performance	Does the NOC operate abroad?	
Value Creation Metrics	Operating Performance	Midstream oil pipelines, storage, shipping.	
Value Creation Metrics	Operating Performance	Downstream oil refining and marketing, petrochemicals.	
Value Creation Metrics	Operating Performance	Upstream natural gas E&P.	
Value Creation Metrics	Operating Performance	Midstream natural gas pipelines, storage, LNG.	
Value Creation Metrics	Operating Performance	Downstream natural gas distribution, NGL sales, petrochemicals.	
Value Creation Metrics	Operating Performance	Other (power generation, and so on).	
Value Creation Metrics	Operating Performance	Avg reserve replacement rate (BOE, %).	Net BOE additions/BOE production.
Value Creation Metrics	Operating Performance	Avg reserve replacement cost ($/BOE).	Avg total cost incurred in upstream oil and gas activities/avg net BOE reserve additions.
Value Creation Metrics	Operating Performance	Change in BOE reserves (%).	Across all periods.

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Value Creation Metrics	Operating Performance	Change in BOE production (%).	Across all periods.
Value Creation Metrics	Operating Performance	Avg upstream operating cash flow/upstream capital expenditures, CAPEX (%).	(DDA + results of operations from producing activities)/total upstream CAPEX. DDA is depreciation, depletion, and amortization.
Value Creation Metrics	Operating Performance	Avg upstream exploration and production expenses ($/BOE).	Total costs incurred in oil and gas activities/total BOE production.
Value Creation Metrics	Operating Performance	Avg production costs excluding production taxes ($/BOE).	Production costs excluding production taxes/total BOE production.
Value Creation Metrics	Operating Performance	Avg upstream after-tax income/revenues (%).	(Upstream income or loss before income and nonincome taxes—income taxes—nonincome taxes)/total E&P revenues.
Value Creation Metrics	Operating Performance	Avg earnings before interest and taxes ($/BOE).	Upstream income or loss before income and nonincome taxes/total BOE production.
Value Creation Metrics	Operating Performance	Avg income after all taxes ($/BOE).	(Upstream income or loss before income and nonincome taxes—income taxes—nonincome taxes)/total BOE production.
Value Creation Metrics	Operating Performance	Avg effective tax rate (%).	(Income taxes + nonincome taxes)/Upstream income or loss before income and nonincome taxes.
Value Creation Metrics	Operating Performance	Avg operating cash flow vs. costs incurred (%).	(DDA + results of operations from producing activities)/total costs incurred in oil and gas activities.
Value Creation Metrics	Operating Performance	After-tax return on assets.	Results of operations from producing activities/total value upstream assets.
Value Creation Metrics	Operating Performance	Avg refinery utilization rate (%).	Total refining throughput/primary distillation capacity.

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Value Creation Metrics	Operating Performance	Change in total refining production (%).	Across all periods.
Value Creation Metrics	Operating Performance	Change in refinery capacity (%).	Across all periods.
Value Creation Metrics	Operating Performance	Avg income from operations per unit volume ($million/barrel).	Refining and marketing income or loss/total refinery production.
Value Creation Metrics	Operating Performance	Avg refining and marketing operating cash flow/CAPEX (%).	(DDA + refining and marketing income or loss)/total CAPEX.
Value Creation Metrics	Operating Performance	Avg pretax return on assets (%).	Refining and marketing income before taxes and other costs/total value refining and marketing assets.
Value Creation Metrics	Financial Performance	Avg total operating cash flow/total CAPEX (%).	Cash provided by operating activities/total CAPEX.
Value Creation Metrics	Financial Performance	Avg gross debt/after-tax capital employed (%).	Gross debt/total capital employed.
Value Creation Metrics	Financial Performance	Avg operating margin (%).	EBIT/total revenues.
Value Creation Metrics	Financial Performance	Avg profit margin (%).	Net income/total revenues.
Value Creation Metrics	Financial Performance	Avg effective tax rate (%).	(Income taxes + nonincome taxes)/EBIT.
Value Creation Metrics	Financial Performance	Avg reinvestment risk (%).	Cash provided by operating activities/total CAPEX.
Value Creation	Financial Performance	Avg return on assets (%).	Net income/total assets.

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Metrics			
Value Creation Metrics	Financial Performance	Avg return on total capital employed (%).	Net income/total capital employed. Total capital employed is gross debt plus total equity.
Value Creation Metrics	Financial Performance	Avg fiscal contribution to State (%).	Total fiscal contribution to State/total revenues.
Other Factors	Public Sector Governance	Based on available information, presence of a publicly articulated role of the hydrocarbon sector with respect to national development objectives.	
Other Factors	Public Sector Governance	Based on available information, clear definition of the roles of policy, commercial operation and regulation, and assignment to specific entities avoiding conflicts of interest.	
Other Factors	Public Sector Governance	Based on available information, presence of publicly stated objectives ranked by priority for NOC(s).	
Other Factors	Public Sector Governance	Based on available information, presence of a strategy to transfer NOC noncommercial objectives to government or other agencies as capacity becomes available.	
Other Factors	Public Sector Governance	Based on available information, transparent hydrocarbon sector revenue management including revenue distribution within the country.	
Other Factors	Public Sector Governance	NOC and/or country participate in EITI and/or other transparency initiatives.	
Other Factors	Oil Dependency	BOE R/P (years).	Country BOE reserves/(country BOE production*365).
Other Factors	Oil Dependency	Net oil and gas export revenues as share of overall export revenues (oil trade balance as % of exports of goods and services).	Country BOE export revenues/country total export revenues.
Other Factors	Oil Dependency	Total oil and gas revenues as a share of GDP (%).	Country BOE export revenues/real GDP PPP.

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Other Factors	Oil Dependency	Total oil and gas revenue as a share of total government revenue (%).	Country BOE export revenues/total treasury inflows.
Other Factors	Fiscal Sustainability	Based on available information, do hydrocarbon sector fiscal regimes allow for sufficient capital investment?	
Other Factors	Fiscal Sustainability	Based on available information, do hydrocarbon sector fiscal regimes allow for investment grade NOC credit ratings?	
Other Factors	Fiscal Sustainability	Based on available information, are hydrocarbon sector fiscal regimes appropriate for the development stage of the domestic resource base?	
Other Factors	Resource Endowment	Avg end of year (EOY) oil reserves (million barrels).	
Other Factors	Resource Endowment	Audited or unaudited?	
Other Factors	Resource Endowment	Avg EOY natural gas reserves (BCF).	
Other Factors	Resource Endowment	Audited or unaudited?	
Other Factors	Resource Endowment	Total all source BOE reserves (million barrels).	
Other Factors	Operating Conditions	Country oil/natural gas split, reserves (%).	Country oil reserves/total BOE reserves.
Other Factors	Operating Conditions	Country oil/natural gas split, production (%).	Country oil production/total BOE production.
Other Factors	Operating Conditions	Company domestic reserves as % of country BOE reserves.	(Company total BOE reserves—company international BOE reserves)/country total BOE reserves.
Other Factors	Operating Conditions	Company domestic reserves as % of total company reserves	(Company total BOE reserves—company international BOE reserves)/company total BOE reserves.

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Other Factors	Operating Conditions	Company domestic BOE production as % of country BOE production.	(Company total BOE production—company international BOE production)/(country BOE production*365).
Other Factors	Operating Conditions	Country BOE production as % of total country BOE consumption.	Country BOE production/country BOE consumption.
Other Factors	Operating Conditions	Company primary distillation capacity as % of total country primary distillation capacity.	Company primary distillation capacity/country primary distillation capacity.
Other Factors	Operating Conditions	Company refinery throughput as % of total country refinery throughput.	Company refinery throughput/country refinery throughput.
Other Factors	Access to Reserves	Hydrocarbon law to facilitate competitive upstream investment.	
Other Factors	Access to Reserves	Based on available information, existence of negotiated contracts/agreements for upstream investment.	
Other Factors	Operating Strategy	Based on available information, types of joint ventures, role of NOC(s).	
Other Factors	Operating Strategy	Based on available information, extent of turnkey contracts used directly by NOC(s).	
Other Factors	Business Integration	Vertical, horizontal integration.	
Other Factors	International Presence	Does NOC make investments abroad?	
Other Factors	International Presence	Avg company international BOE production as % avg total company BOE production.	Company international BOE production/company total BOE production.
Other Factors	International Presence	Change in company BOE production from international operations (%).	Across all years.
Other Factors	International Presence	Does NOC make investments abroad?	

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Other Factors	International Presence	Avg company international refinery throughput as % total refinery throughput.	Company international refinery throughput/company total refinery throughput.
Other Factors	International Presence	Change in company refinery throughput from international operations (%).	Across all years.
Other Factors	International Presence	Avg company international refinery capacity as % company total refinery capacity.	Company international primary distillation capacity/company total primary distillation capacity.
Other Factors	International Presence	Change in company refinery capacity from international operations (%).	Across all years.
Other Factors	Commercialization	Non-NOC participants in upstream.	
Other Factors	Commercialization	Competition level in upstream including non-NOC participants and requirement to include NOC as partner.	
Other Factors	Commercialization	Competition level in midstream, downstream including non-NOC participants and requirement to include NOC as partner.	
Other Factors	Commercialization	Based on available information, prevalence and success of NOC/non-NOC alliances, joint ventures.	
Other Factors	Commercialization	Partial privatization of the NOC (as measured by ownership structure).	
Other Factors	Commercialization	Based on available information, level and quality of NOC international operations.	
Other Factors	Commercialization	Based on available information, percent of noncore commercial activities in overall operations.	
Other Factors	Regulation	Presence of independent, well-funded, and trained regulatory agencies, HC agency name, budget, number of staff.	
Other Factors	Regulation	NOCs are compelled to adopt practices that would provide results similar to those in competitive markets with price, access to and quality of energy services. brief description: HC agency enforcement powers.	

APPENDIX 1. NOC DATA DIRECTORY DIMENSIONS OF ANALYSIS: INDICATORS

Title 1	Title 2	Query	Formula References
Other Factors	Regulation	Regulators assure market transparency and good quality, unbiased data and information. HC agency independence indicators.	
Other Factors	Regulation	Regulators effectively resolve disputes and conflicts and address public concerns about development of and access to hydrocarbon resources and infrastructure. HC agency dispute resolution policy.	
Other Factors	Noncommercial Objectives (National Strategy)	Provision and level of hydrocarbon price subsidies ($/BOE production) provided by NOC. Based on available information, brief description of subsidy program, approach, cost.	
Other Factors	Noncommercial Objectives (National Strategy)	Provision and level of direct NOC funding of country social and economic programs. Brief description of programs and support.	
Other Factors	Noncommercial Objectives (National Strategy)	Asset value relative to workforce (total assets per employee, $M).	Total assets/total employees with adjustments for $ scale.
Other Factors	Noncommercial Objectives (National Strategy)	Compensation obligations relative to workforce ($M).	Total employee compensation costs/total employees with adjustments for $ scale.
Other Factors	Noncommercial Objectives (National Strategy)	Financial performance relative to workforce (total revenue per employee, $M).	Total revenues/total employees with adjustments for $ scale.
Other Comments	Quality of Data	Availability, extent, reliability of data provided by NOC(s) and governments.	
Other Comments	Longevity of NOC	Based on available information, history, and persistence of NOC(s).	
Other Comments	Country Status	Trends and issues related to country hydrocarbon sector endowments and performance.	
Other Factors	Noncommercial Objectives (National Strategy)	Number of employees.	
Other Factors	Noncommercial Objectives (National Strategy)	BOE production per employee (oil and natural gas production and/or refinery throughput; BOE/employee).	

APPENDIX 2. SUMMARY GROUPINGS FOR CLUSTER ANALYSIS

Grouping	Derivation (Literature Citations)[17]	Scoring Criteria
Public Sector Governance	The presence of a well-defined national hydrocarbon policy addressing oil and natural gas issues as well as the roles for permitted participants in the sector (Bacon, 1999; Khelil, 2002).	Criteria: Relevant policy exists with clear defined roles (100). Policy exists with roles not clearly defined or overlapping roles (50). Policy not publicly articulated (25). Policy does not exist (0).
Public Sector Governance	Clearly defined and publicly stated objectives ranked by priority for NOCs (Wong, 2004).	Criteria: Relevant objectives exist and are ranked (100). Objectives exist but are not ranked (50). Objectives do not exist or are not publicly articulated (0).
Public Sector Governance	Clear objectives and management separation among oil and gas policy making (executive branch function), regulation (a separate and autonomous executive branch function), and commercial operations (NOC) (Khelil, 2002; McPherson, 2003; Zanoyan, 2002; Al-Naimi, 2004; Ecopetrol 2003).	Criteria: Independent NOC, ministry and regulatory function (100). Regulatory function is performed by the Energy Ministry (66). Regulatory function is performed by the NOC (33). All three functions combined (0).
Public Sector Governance	Noncommercial objectives (including price subsidies) that are publicly disclosed as well as associated costs and sources of funding. These activities are reported and measured separately from the NOC's commercial activities (Wong, 2004).	Criteria: Noncommercial activities are reported and measured separately (100). General reporting exists but noncommercial activities are not measured separately (50). Not disclosed or reported (0).

[17] Based on CEE working paper as noted, see footnote 4.

APPENDIX 2. SUMMARY GROUPINGS FOR CLUSTER ANALYSIS

Grouping	Derivation (Literature Citations)[17]	Scoring Criteria
Public Sector Governance	The fiscal regime (royalties, taxes, dividends, cost sharing, profit sharing, and so on) is clearly defined for all sector participants (Al-Naimi, 2004; Ecopetrol, 2003).	Criteria: Readily available information exists about the fiscal regime and allows for evaluation of investments. No recent unexpected fiscal regime creep (100). Clearly defined snapshot of fiscal regime but has shown signs of fiscal regime creep (50). Fiscal regime is not clearly defined (0).
Corporate Governance	Clearly defined and publicly stated objectives ranked by priority for NOCs (Wong, 2004).	Criteria: Relevant objectives exist and are ranked (100). Objectives exist but are not ranked (50). Evidence of objectives does not exist or are not publicly articulated (0).
Corporate Governance	Only one government entity is the NOC "owner" and entitled to exercise shareholder rights; other government agencies interact with the NOC on an arm's length basis (Wong, 2004).	Criteria: NOC completely autonomous (100). NOC state-owned shareholder rights exercised by one state agency (50). Multiple government entities exercise control over NOC (0).
Corporate Governance	The NOC has an independent Board of Directors selected by merit and professional expertise which approves and oversees the NOC's business plan, capital budget, and strategies (Al-Naimi, 2004; Wong, 2004).	Criteria: BOD is completely independent and formed by career professionals (100). BOD incorporates political appointees (50). BOD does not incorporate any career professionals (0).
Corporate Governance	Merit and performance guides NOC manpower recruitment, placement, and development (Al-Naimi, 2004).	Criteria: Clear, established merit-based HR policies exist, are readily available and are followed (100). Clear established merit-based HR policies are not publicly available or there is evidence of political appointments (50). Merit does not guide HR policies (0).
Corporate Governance	The NOC has an independent financial structure (Al-Naimi, 2004; McPherson, 2003; Wong, 2004).	Criteria: NOC budget is not part of national budget, budget is completely independent (100). NOC budget is proposed to and approved by central government (50). NOC budget is determined via the national budget (0).

APPENDIX 2. SUMMARY GROUPINGS FOR CLUSTER ANALYSIS

Grouping	Derivation (Literature Citations)[17]	Scoring Criteria
Corporate Governance	The NOC has audited financial results (Al-Naimi, 2004; McPherson, 2003; Wong, 2004).	Criteria: Auditing performed by international entity and files reports to an international exchange (100). Auditing performed by international auditor (75). Auditing performed by domestic entity and reported (50). Auditing performed internally and reported publicly (25). Audit results are not publicly available or do not exist (0).
Corporate Governance	The NOC possesses strong internal financial oversight and controls as well as a strong corporate planning function (Al-Naimi, 2004; Wong, 2004).	Criteria: Financial oversight and corporate planning functions exist within the company (100). Financial oversight or corporate planning function is performed outside NOC (50). Both functions do not exist within NOC (0).
Corporate Governance	The fiscal regime for the NOC allows for net cash flow retention adequate to meet its objectives and plan over a reasonable time horizon (Al-Naimi, 2004; McPherson, 2003).	Criteria: Net cash flow is available to meet objectives over planning horizon (100). Cash flow is likely but not certain (50). Cash flow is deficient (0).
Fiscal Regimes	The fiscal regime permits the NOC to obtain a credit rating sufficient to attract the appropriate amount of external financing (Wong, 2004).	Criteria: External financing is available (100). External financing is available but at a premium (50). External financing is not available (0).
Fiscal Regimes	The fiscal regime for non-NOC participants in the upstream sector, if permitted, attracts the level of investment and operating results established by the government (Sultan, 2003).	Criteria: Investment by non-NOCs is happening at apparent government targets (100). Investment by non-NOCs is not meeting government expectations (50). Investment by non-NOCs is not taking place (0).

APPENDIX 2. SUMMARY GROUPINGS FOR CLUSTER ANALYSIS

Grouping	Derivation (Literature Citations)[17]	Scoring Criteria
Commercialization	Joint ventures and/or other alliances exist between the NOC and third parties domestically and/or internationally in order to promote efficiency and new technology assimilation (Al-Naimi, 2004; Zanoyan, 2002; McPherson, 2003).	Criteria: NOC partnerships exist domestically and internationally (100). NOC partnerships exist domestically but not internationally (66). NOC partnerships exist internationally but not domestically (33). NOC partnerships do not exist (0).
Commercialization	The NOC contains profit-oriented business units that are adequately capitalized and accountable for results (McPherson, 2003).	Criteria: NOC has profit-oriented business units with financial results that can be tracked, have clear budgets, and performance targets (100). NOC has profit-oriented business units whose results can be tracked but are not accountable for results (66). Profit-oriented business units exist but their financial results cannot be clearly tracked (33). None (0).
Public Sector Governance	Assure market transparency, especially the availability of good quality, unbiased data and information (Foss, 2005).	Criteria: Independent NOC, ministry and regulatory function (100). Regulatory function is performed by ministry (66). Regulatory function is performed by NOC (33). All three functions combined (0).
Public Sector Governance	Resolve disputes and conflicts and address public concerns about development of and access to oil and gas resources and infrastructure (Foss, 2005).	Criteria: Regulatory function is independent, clearly defined, and functioning (100). Regulatory function is not independent but clearly defined and functioning (66). Regulatory function is mixed with policy and operating functions (33). Regulatory function is not apparent (0).
Resource Endowment	Size and certainty of resource endowment as measured by reported gas reserves.	Criteria: 100*Reserves of Gas/Maximum across all countries.
Resource Endowment	Size and certainty of resource endowment as measured by reported oil reserves.	Criteria: 100*Reserves of Oil/Maximum across all countries.

APPENDIX 2. SUMMARY GROUPINGS FOR CLUSTER ANALYSIS

Grouping	Derivation (Literature Citations)[17]	Scoring Criteria
Sector and Trade Openness	Participation in WTO and OPEC.	Criteria: Membership in WTO and not in OPEC (100). Membership in WTO and OPEC (67). Not a member of WTO or OPEC (33). Member of OPEC and not of WTO (0).
Sector and Trade Openness	Degree of privatization of the NOC.	Level of privatization measured by % of shares held privately.
Local Contribution	Non-NOC participants are permitted in the upstream sector in order to provide the performance incentives associated with competition (Bacon, 1999; McPherson, 2003; Wong, 2004).	Criteria: 100—% of required NOC participation (if applicable); otherwise, 0.
Local Contribution	Transparency for noncommercial activities and obligations.	Criteria: Quantitative reporting of noncommercial activities (100). Qualitative reporting of noncommercial activities (50). No clear reporting (0).
Oil Dependency	Importance of oil sector with respect to the size of the economy.	Criteria: 100—share of oil revenues in GDP.

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	DA Subtitle 1	DA Subtitle 2	Indicator	Corporate Governance	Public Sector Gover-nance	Commer-cialization	Fiscal Regimes	Resource Endow-ment	Oil Depen-dency	Local Contri-bution	Sector and Trade Open-ness
Corporate Governance	Ownership Structure and Its Organization	NOCs control	Oversight authority (actual shareholder, to be provided by World Bank).	X							
Corporate Governance	Ownership Structure and Its Organization	NOC status	Sole NOC or one of cluster of NOCs and other sovereign enterprises in country.	X							
Corporate Governance	Ownership Structure and Its Organization	NOC status	Number of NOCs of country.	X							
Corporate Governance	Ownership Structure and Its Organization	Incorporation and ownership	Description of incorporation and ownership.	X							
Corporate Governance	Ownership Structure and Its Organization	Government ownership	% shares controlled by government.	X							
Corporate Governance	Ownership Structure and Its Organization	Share listings	Domestic, international exchanges where shares are listed.	X							
Corporate Governance	Ownership Structure and Its Organization	Bond listings	Domestic, international exchanges where bonds are traded.	X							

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Corporate Governance	Ownership Structure and Its Organization	Public share listings	Company files form 20-F with SEC?	X							
Corporate Governance	Board of Directors (BOD)	Status of BOD	Does a BOD exist?	X							
Corporate Governance	Board of Directors (BOD)	BOD structure	Description of BOD and structure.	X							
Corporate Governance	Board of Directors (BOD)	Chairman	Is chairman also minister of energy or otherwise appointed by head of state?	X							
Corporate Governance	Board of Directors (BOD)	Independent members	Are any BOD members considered independent (external) and, if so, how are they appointed?	X							
Corporate Governance	Board of Directors (BOD)	Terms	Term of service (years, with reappointment). Comment if they can be readily removed.	X							
Corporate Governance	Role of BOD	Brief description	Description of role and policy statements.	X							
Corporate Governance	Role of BOD	Impact	Based on available information, does BOD have power, impact, decision-	X							

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
			making authority?								
Corporate Governance	Recruitment/Replacement Key Executives	Senior appointments	General process for recruitment, replacement of key executives and senior managers.	X							
Corporate Governance	Decision-making Processes	Authority	Level of NOC budget authority. Comment on the general decision flow within NOC and between NOC and government for major projects.	X							
Corporate Governance	Decision-making Processes, Budget Autonomy	Independence	Based on available information, is NOC budget process predictable and separate from government?	X							
Corporate Governance	Decision-making Processes, Budget Autonomy	Independence	Does the NOC have authority to partner with other entities?	X							

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Corporate Governance	Mission and Objectives	Mission statement	Does NOC have a mission statement and, if so, what are key elements?	X							
Corporate Governance	Sources of Capital	Process	Based on available information, budgeting process and policy including % of cash flow/revenue available for reinvestment.	X							
Corporate Governance	Disclosure/Transparency Policy	Reporting	Disclosure of audited data and other indications of disclosure and transparency.	X							
Corporate Governance	Skill Base	Workforce demographics	Based on available information, NOC demographics (% management, % technical, other descriptors).	X							
Corporate Governance	Incentives/Career Management	Human resources management	Based on available information, HR promotion and professional development policies.	X							

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Corporate Governance	Full Disclosure and Measurement of Noncommercial Objectives	Noncommercial objectives	Based on available information, brief description of reporting on noncommercial objectives.	X							
Corporate Governance	Full Disclosure and Measurement of Noncommercial Objectives	Noncommercial objectives	Based on available information, extent of noncommercial obligations.	X							
Other Factors	Public Sector Governance	Hydrocarbon sector and national development	Based on available information, presence of a publicly articulated role of the hydrocarbon sector with respect to national development objectives.		X						
Other Factors	Public Sector Governance	Separation of functions and conflict of interest	Based on available information, clear definition of the roles of policy, commercial operation and regulation, and assignment to specific entities avoiding conflicts of interest.		X						

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Public Sector Governance	Publicly stated objectives for NOC(s)	Based on available information, presence of publicly stated objectives ranked by priority for NOC(s).		X						
Other Factors	Public Sector Governance	Government takeover of noncommerci al objectives	Based on available information, presence of a strategy to transfer NOC noncommercial objectives to government or other agencies as capacity becomes available.		X						
Other Factors	Public Sector Governance	Hydrocarbon revenue management and transparency	Based on available information, transparent hydrocarbon sector revenue management including revenue distribution within the country.		X						
Other Factors	Public Sector Governance	Hydrocarbon revenue management and transparency	NOC and/or country participation in EITI and/or other transparency initiatives.		X						

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Oil Dependency	Country reserve life (below ground savings)	R/P (years).						X		
Other Factors	Oil Dependency	Country export revenues	Hydrocarbon export revenues as share of overall export revenues.						X		
Other Factors	Oil Dependency	Country GDP dependence	WB: Oil and Gas revenues as a share of GDP (%).						X		
Other Factors	Oil Dependency	Country treasury dependence	WB: BOE export revenues as a share of total treasury (%) (if available).						X		
Other Factors	Oil Dependency	Economic diversification	WB: Oil and gas revenue as a share of total government revenue (%).						X		
Other Factors	Oil Dependency	Contribution of HC sector to public expenditure	WB: Expenditure/oil and gas revenue (%).						X		
Other Factors	Fiscal Sustainability	Financing gap	WB: Non-oil deficit as a share of non-oil GDP (%).						X		
	Fiscal Sustainability	Expenditure policy	WB: Expenditure growth rate (%).						X		

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
	Fiscal Sustainability	Debt sustainability	WB: Public debt as a share of GDP (%).						X		
Other Factors	Fiscal Sustainability	Country fiscal regime and reinvestment	Based on available information, do hydrocarbon sector fiscal regimes allow for sufficient capital investment?				X				
Other Factors	Fiscal Sustainability	Country fiscal regime and credit ratings	Based on available information, do hydrocarbon sector fiscal regimes allow for investment grade NOC credit ratings?				X				
Other Factors	Fiscal Sustainability	Country fiscal regime and hydrocarbon sector development	Based on available information, are hydrocarbon sector fiscal regimes appropriate for the development stage of the domestic resource base?				X				
Other Factors	Resource Endowment	Country oil reserves	Avg EOY oil reserves (million barrels).					X			
Other Factors	Resource Endowment	Country oil reserves	Audited or unaudited?					X			

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Resource Endowment	Country natural gas reserves	Avg EOY natural gas reserves (BCF).					X			
Other Factors	Resource Endowment	Country natural gas reserves	Audited or unaudited?					X			
Other Factors	Resource Endowment	Country BOE reserves	Total all source BOE reserves (million barrels).					X			
Other Factors	Operating Conditions	Upstream	Oil/natural gas split, reserves (%).					X			
Other Factors	Operating Conditions	Upstream	Oil/natural gas split, production (%).					X			
Other Factors	Operating Conditions	Upstream	Company domestic reserves as % of country BOE reserves.			X					
	Operating Conditions	Upstream	Company domestic reserves as % of total company reserves.			X					
Other Factors	Operating Conditions	Upstream	Company domestic BOE production as % of country BOE production.			X					
Other Factors	Operating Conditions	Upstream	Country BOE production as % of total country BOE consumption.			X					

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Operating Conditions	Downstream	Company primary distillation capacity as % of total country primary distillation capacity.			X					
Other Factors	Operating Conditions	Downstream	Company refinery throughput as % of total country refinery throughput.			X					
Other Factors	Access to Reserves	Entry laws	Hydrocarbon law to facilitate competitive upstream investment.								X
Other Factors	Access to Reserves	Negotiated access	Based on available information, existence of negotiated contracts/agreements for upstream investment.								X
Other Factors	Operating Strategy	NOC partnerships	Based on available information, types of joint ventures, role of NOC(s).			X					
Other Factors	Operating Strategy	Turnkey contracts	Based on available information, extent of turnkey contracts used			X					

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	DA Subtitle 1	DA Subtitle 2	Indicator	Corporate Governance	Public Sector Gover-nance	Commer-cialization	Fiscal Regimes	Resource Endow-ment	Oil Depen-dency	Local Contri-bution	Sector and Trade Open-ness
			directly by NOC(s).								
Other Factors	Business Integration	NOC scale and scope	Vertical, horizontal integration.			X					
Other Factors	International Presence	Upstream	Does NOC make investments abroad?			X					
Other Factors	International Presence	Upstream	Avg company international BOE production as % avg total company BOE production.			X					
Other Factors	International Presence	Upstream	Change in company BOE production from international operations (%).			X					
Other Factors	International Presence	Downstream	Does NOC make investments abroad?			X					
Other Factors	International Presence	Downstream	Avg company international refinery throughput as % total refinery throughput.			X					
Other Factors	International Presence	Downstream	Change in company refinery throughput from international operations (%).			X					

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	DA Subtitle 1	DA Subtitle 2	Indicator	Corporate Governance	Public Sector Gover-nance	Commer-cialization	Fiscal Regimes	Resource Endow-ment	Oil Depen-dency	Local Contri-bution	Sector and Trade Open-ness
Other Factors	International Presence	Downstream	Avg company international refinery capacity as % company total refinery capacity.			X					
Other Factors	International Presence	Downstream	Change in company refinery capacity from international operations (%).			X					
Other Factors	Commercializ ation	Upstream competition	Non-NOC participants in upstream.								X
Other Factors	Commercializ ation	Upstream competition	Competition level in upstream including non-NOC participants and requirement to include NOC as partner.								X
Other Factors	Commercializ ation	Midstream, downstream competition	Competition level in midstream, downstream including non-NOC participants and requirement to include NOC as partner.								X
Other Factors	Commercializ ation	Midstream, downstream competition	Competition level in midstream and downstream sectors.								X

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Commercialization	Overall competition	Based on available information, prevalence, and success of NOC/non-NOC alliances, joint ventures.			X					
Other Factors	Trade Openness	Overall competition	WTO membership.								X
Other Factors	Competition	Overall competition	OPEC membership.								X
Other Factors	Commercialization	Private ownership of NOC shares	Partial privatization of the NOC (as measured by ownership structure).								X
Other Factors	Commercialization	International diversification	Based on available information, level and quality of NOC international operations.			X					
Other Factors	Commercialization	Social obligations	Based on available information, percent of noncore commercial activities in overall operations.							X	

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Regulation	Hydrocarbon regulator	Presence of independent, well-funded, and trained regulatory agencies; HC agency name, budget, number of staff.		X						
Other Factors	Regulation	Contestability	NOCs are compelled to adopt practices that would provide results similar to those in competitive markets with price, access to, and quality of energy services. Brief description: HC agency enforcement powers.								X
Other Factors	Regulation	Regulated transparency	Regulators assure market transparency and good quality, unbiased data and information. HC agency independence indicators.		X						

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
Other Factors	Regulation	Dispute resolution	Regulators effectively resolve disputes and conflicts and address public concerns about development of and access to hydrocarbon resources and infrastructure. HC agency dispute resolution policy.		X						
Other Factors	Noncommercial Objectives	Hydrocarbon subsidies	Provision and level of hydrocarbon price subsidies ($/BOE production) provided by NOC. Brief description of subsidy program, approach, cost.							X	
Other Factors	Noncommercial Objectives	Socioeconomic programs	Provision and level of direct NOC funding of country's social and economic programs. Brief description of programs and support.							X	
Other Factors	Noncommercial Objectives	Labor benefits	Measure of NOC employees relative to total			X					

APPENDIX 3. MAPPING INDICATORS TO GROUPINGS

Dimensions of Analysis Indicators				Summary Groupings							
DA Title	**DA Subtitle 1**	**DA Subtitle 2**	**Indicator**	**Corporate Governance**	**Public Sector Gover-nance**	**Commer-cialization**	**Fiscal Regimes**	**Resource Endow-ment**	**Oil Depen-dency**	**Local Contri-bution**	**Sector and Trade Open-ness**
			assets ($M).								
Other Factors	Noncommercial Objectives	Labor benefits	Compensation obligations relative to workforce ($M).							X	
Other Factors	Noncommercial Objectives	Labor benefits	Financial performance relative to workforce ($M).			X					
Other Comments	Quality of Data	Data transparency	Availability, extent, reliability of data provided by NOC(s) and governments.								
Other Comments	Longevity of NOC	NOC history	Based on available information, history and persistence of NOC(s).								
Other Comments	Country Status	Hydrocarbon dependence	Trends and issues related to country hydrocarbon sector endowments and performance.								

APPENDIX 4. COUNTRY/NOC RANKINGS (SORTED) ON GROUPINGS

Region	Country	Company	Corporate Governance	Public Sector Governance	Commer-cialization	Fiscal Regimes	Resource Endowment	Oil Dependency	Local Contribution	Sector and Trade Openness	Avg
Europe and Central Asia	France	GDF	100	100	100	100	0	97	95	73	83
Europe and Central Asia	Russia	Rosneft	69	71	100	100	65	87	72	48	82
Europe and Central Asia	Russia	Gazprom	79	74	100	75	65	87	40	44	80
Middle East and North Africa	Tunisia	ETAP	81	78	100	100	0	100	-13	67	77
Europe and Central Asia	Norway	StatoilHydro	81	78	100	100	5	86	74	71	75
East Asia and Pacific	Thailand	PTT	88	71	100	100	0	83	97	83	74
East Asia and Pacific	Malaysia	Petronas	63	72	100	100	4	97	67	58	73
East Asia and Pacific	China, P.R.: Mainland	CNOOC	69	64	100	100	5	97	74	61	73
South Asia	Pakistan	OGDCL	63	71	100	100	1	95	0	72	72
Sub-Saharan Africa	Mozambique	ENH	78	69	100	75	3	96	0	67	70
Latin America and Caribbean	Brazil	PETROBRAS	61	74	100	85	3	98	76	71	70
East Asia and Pacific	China, P.R.: Mainland	PetroChina	69	64	100	75	5	97	72	54	68
Middle East and North Africa	Algeria	Sonatrach	66	71	100	100	7	55	60	33	67
Middle East and North Africa	Saudi Arabia	Saudi Aramco	59	66	67	100	58	46	0	34	66
South Asia	India	ONGC	58	74	90	75	2	96	60	75	66

APPENDIX 4. COUNTRY / NOC RANKINGS (SORTED) BY GROUPING

Region	Country	Company	Corporate Governance	Public Sector Governance	Commer-cialization	Fiscal Regimes	Resource Endowment	Oil Dependency	Local Contribution	Sector and Trade Openness	Avg
East Asia and Pacific	China, P.R.: Mainland	Sinopec	69	62	83	75	5	97	88	58	65
Europe and Central Asia	Russia	Transneft	69	64	50	50	65	87	86	11	64
Latin America and Caribbean	Colombia	ECOPETROL	69	59	83	75	0	96	0	73	64
Middle East and North Africa	Kuwait	KPC	69	62	100	75	21	46	0	56	62
Europe and Central Asia	Kazakhstan	Kazmunaigas	66	40	100	75	10	74	-63	28	61
Middle East and North Africa	Qatar	QP	66	55	50	100	34	38	46	39	57
Average	**Average**	**Average NOC**	**54**	**57**	**64**	**61**	**11**	**81**	**33**	**52**	**55**
Europe and Central Asia	Azerbaijan	SOCAR	50	55	83	100	3	36	0	31	54
East Asia and Pacific	Indonesia	Pertamina	47	86	50	38	4	99	0	56	54
Latin America and Caribbean	Peru	PetroPeru	59	86	17	50	1	99	99	67	52
Latin America and Caribbean	Mexico	PEMEX	38	75	55	40	3	98	38	37	51
Middle East and North Africa	Iran, Islamic Rep. of	NIOC	31	26	67	50	57	76	0	33	51
South Asia	Bangladesh	PetroBangla	53	52	66	38	1	96	61	67	51
East Asia and Pacific	Vietnam	PetroVietnam	34	52	67	50	1	97	54	57	50
Latin America and Caribbean	Venezuela, Bolivia	PDVSA	53	33	67	50	22	75	55	36	50
Latin America and Caribbean	Argentina	Enarsa	41	43	67	50	1	99	0	54	50
Sub-Saharan Africa	South Africa	PETROSA	50	64	67	25	13	72	0	39	48
Europe and Central Asia	Uzbekistan	Uzbekneftegaz	50	28	58	50	2	100	100	44	48

APPENDIX 4. COUNTRY / NOC RANKINGS (SORTED) BY GROUPING

Region	Country	Company	Corporate Governance	Public Sector Governance	Commer-cialization	Fiscal Regimes	Resource Endowment	Oil Dependency	Local Contribution	Sector and Trade Openness	Avg
Sub-Saharan Africa	Nigeria	NNPC	44	71	50	25	0	95	0	63	47
Sub-Saharan Africa	Côte d'Ivoire	PetroCI	44	45	50	50	0	95	0	58	47
Middle East and North Africa	Egypt	EGPC	38	45	50	50	3	97	0	50	47
Middle East and North Africa	Libya	LNOC	38	57	83	50	10	30	61	33	45
Latin America and Caribbean	Ecuador	PetroEcuador	41	44	50	38	1	87	72	39	43
Latin America and Caribbean	Bolivia	YPFB	34	45	50	25	1	98	89	50	42
Europe and Central Asia	Belarus	Belarusneft	38	57	17	25	0	99	0	11	39
Middle East and North Africa	United Arab Emirates	ADNOC	38	38	50	25	25	58	0	36	39
Middle East and North Africa	Syrian Arab Republic	SPC	16	23	33	50	1	98	0	36	37
Middle East and North Africa	Oman	PDO	63	59	17	25	2	53	0	80	36
Sub-Saharan Africa	Chad	SHT	41	45	0	25	0	96	0	67	35
Sub-Saharan Africa	Cameroon	SNH	41	45	0	25	0	91	0	67	34
Sub-Saharan Africa	Sudan	Sudapet	38	24	0	50	1	83	0	34	33
Sub-Saharan Africa	Congo, Republic of	SNPC	33	36	33	43	0	42	0	58	31
Sub-Saharan Africa	Angola	Sonangol	56	24	0	50	2	34	0	56	28
Sub-Saharan Africa	Ghana	GNPC	31	24	0	25	0	86	0	67	28
Sub-Saharan Africa	Equatorial Guinea	GEPetrol	6	23	5	45	0	10	0	55	15