

Working paper

Oil in South Sudan

Implications from
International
Experience

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Preface

In late April 2013, Dr. Torfinn Harding met with officials from the Ministry of Finance and Economic Planning in Statistics Norway, Oslo. In attendance were the Deputy Minister of Finance (Ms. Mary Awaj Jervase Yak), the Director General for Macroeconomics (Philip Ajack Boldit), the Director for Macroeconomics (Richard Efil Simplicio), most of the economists in the group for Macroeconomics, and Acting Director of Downstream in the Ministry of Petroleum and Mining (Garweg Peter Garkouth), among others.

Dr. Harding presented insights from research with James Cust on oil exploration and institutions. The conjecture of Cust and Harding (2013) is that, *ceteris paribus*, countries with institutions providing more stable and secure incentives for oil exploration and production have a higher likelihood of oil exploration. The reason is simply that the economic climate will affect the expected profits of any actors in the oil extraction sector, such that a location decision at the margin will be determined by institutions as well as geology. Several policy-makers in attendance thought the finding that geology may not be sufficient to attract exploration activities was controversial, indicating a demand for further discussion of the issue. Dr. Harding proposed the idea of writing a case study on South Sudan, and Ms. Yak, Mr. Boldit and Mr. Garkouth welcomed the project, noting that it was a good idea and inviting Dr. Harding and his co-author to Juba to collect data.

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1 Introduction

Oil is the lifeline of the South Sudan economy now and over the medium term. It accounted for about half of the country's GDP, and most of the country's exports (about 97 %) and government's revenue (about 98 %) in the period 2008-2011. Oil production of 360 thousand barrels per day in 2011 resulted in high export earnings, high government revenues and an income per capita level of a lower middle-income country.

Given the current dominance of oil, and the relative underdevelopment of non-oil sectors; the functioning of the oil sector represents a key priority for government. Furthermore, since production and consequently revenues are forecast to cease by the 2030s, the future trajectory of the oil sector represents a critical challenge in the development of this new nation.¹

A key question for South Sudan going forward is whether the oil production can be increased and extended beyond the projections presented in the South Sudan Development Plan (2011). The most direct way to achieve this would be to increase the recovery rate from existing fields. The projected recovery rate - the amount of recovered oil as a percentage of reserves - for Sudan is 23% (EIA, 2013), which is low by international standards. However, discussions suggest significant increases in the recovery rates are possible if the necessary investments are put in place.

The second way to increase oil production in the longer run would be to discover new oil. Current exploration activity remains low and actions to encourage increased search activity pose an important challenge for the government (Shankleman, 2011). Both these steps are likely to require increased investment by international companies and therefore an important policy question is whether government actions can induce this increased investment.

Research on the pattern of oil exploration across developing countries suggests that oil exploration activities are not solely determined by geology. Cust and Harding (2013) show that, at the margin, factors related to institutional quality and the associated governance environment are of importance. Thus observed levels of exploration, drilling and investment in the sector are a function of both geology and institutional quality.

This finding is in line with the general economics literature explaining differences

¹For figures used in this note and more information on the South Sudan economy, see the National Accounts data published by the National Bureau of Statistics, <http://ssnbs.org/>, the South Sudan Development Plan 2011-2013 (Government of the Republic of South Sudan, 2011) on <http://www.jdt-juba.org/wp-content/uploads/2012/02/South-Sudan-Development-Plan-2011-13.pdf>, the IMF World Economic Outlook, <http://www.imf.org/external/country/ssd/>, and the U.S. Energy Information Administration (EIA, 2013), <http://www.eia.gov/countries/cab.cfm?fips=SU>.

in economic activity across countries. In the literature on economic growth, three categories of fundamental factors have been hypothesised to explain differences in economic performance across countries: geography, culture and institutions. These fundamental factors in turn affect proximate factors of economic growth, such as technological development, organisational know how and the accumulation of production factors, including human capital (education, health etc.) and physical capital (roads, buildings, electricity etc.). Over the last decade or so, institutional quality has been shown to be of dominating importance in explaining income differences across countries.

South Sudan is currently in the unique position of establishing central aspects of its institutional setting, while inheriting a relatively mature oil sector. It should therefore be aware of the essential role the design and functioning of the institutions have the potential to play. Institutions are held to be important because they shape firms and peoples incentives to invest and be productive (Acemoglu et al., 2005). This being said, another key insight from the literature on economic growth and institutions, e.g. Acemoglu et al. (2005), is that institutions are typically endogenous and often serve the objectives of the powerful elites (politicians and individuals with power to influence political decisions). The larger challenge is therefore to align the incentives of the elites with the country in question or to limit the power of the elites. For the oil sector, the phenomena that institutions are often shaped in the interest for the elites may be amplified given the potentially high rents in the sector. Indeed, the literature on the resource curse has pointed to important political economy aspects of the management of natural resources (e.g., van der Ploeg (2011) and Ross (2012)).

Based on new research on oil exploration in developing countries, this note makes the simple but significant point that favourable geology may not alone be enough for South Sudan to induce additional oil exploration, investments and production. The institutions and policies put in place by the government are likely to make a difference for the exploration activities and therefore also the likelihood of discovering new oil reserves. Furthermore, the institutions and policies put in place are also likely to matter for the recovery rates of proven reserves.

Rather than provide detailed policy design recommendation, the purpose of this note is to highlight the importance of the role of governance and institutions in shaping investment incentives in the oil sector. Further work would be require to determine the optimal configuration of policy actions and institutional design appropriate for South Sudan.

The note is structured as follows. Section 2 examines the macroeconomy of South Sudan and role of the oil sector. Section 3 and 4 introduce the role of institutions and how

Table 1: How productive was South Sudan compared to its neighbours in 2011?

Country	GDP per capita	
	US dollars	PPP dollars
Central African Republic	495	819
Democratic Republic of the Congo	217	345
Ethiopia	371	1164
Kenya	839	1723
South Sudan	1822	2203
Sudan	2048	2657
Uganda	528	1407

Source: IMF World Economic Outlook October 2013, <http://www.imf.org/external/pubs/ft/weo/2013/02/weodata/index.aspx>

they shape incentives and outcomes in the oil sector. Section 5 describes the institutional setting and the oil sector in South Sudan including key challenges across both exploration and recovery rates. Section 6 discusses what the government might do, drawing on international experience, best practice and analysis of oil sector governance in South Sudan. Section 7 concludes.

2 The macro economy of South Sudan

The economy of South Sudan consists predominantly of small scale agriculture and oil extraction. GDP per capita for 2011 is estimated to 1,822 USD, somewhat below Sudan, but more than double the level of neighbouring Kenya and almost five times the level of neighbouring Ethiopia, as shown in the first column of table 1. Aiming to take price-levels into account, the figures measured in PPP-prices in the second column of table 1 show that the average purchasing power of citizens in South Sudan is about 30% and 90 % higher than the one of Kenyans and Ethiopians, respectively. As it looks from these figures, South Sudanese are relatively well of compared to their neighbours.

Estimates suggests that value added in the oil extraction sector accounts for more than half of GDP. There are thought to be about one billion barrels of oil left in the ground.² This translates to a net present value of government revenues of 40 billion USD, or roughly 4000 USD per capita (Government of the Republic of South Sudan, 2011). 150

²See <http://www.southsudanembassydc.org/PDFs/Invesment/South%20Sudan%200i1%20Brochure.pdf>.

USD per year, or about 50 USD cents per day, in per capita terms are not trivial numbers in an economy with a GDP per capita of about five USD per day in 2011 and where 51% of the population lives below the poverty line.³

To get a rough idea of the structure of the South Sudan economy going forward, we can go to the South Sudan Development Plan 2011-2013 (SSDP, Government of the Republic of South Sudan 2011). A 40% decline in oil production was there expected over the period 2011-2016. A rough estimate of oil GDP, based on the value of oil exports, suggest that oil and non-oil GDP were of about equal size in 2011. With a downward path for the oil production and a growing population, the non-oil GDP would have to fill the gap left by the evaporating oil GDP to keep GDP per capita constant. With 40% lower oil production and value added from oil in 2016, the annual growth rate would have to be about 10 per cent in non-oil GDP to keep GDP per capita at the 2011-level in 2016, i.e. growth rates in excess of growth miracles like China.⁴ The challenge is accentuated of the fact that both the government sector and subsistence farming make up substantial fractions of non-oil GDP; sectors that may not be engines of economic growth judging by the experiences of other countries. This example, based on the information in the SSDP 2011 and ignoring the oil production shutdown in 2012 etc., illustrates the bigger picture for South Sudan: A decline in the dominant oil sector may be hard to compensate for with growth in the non-oil GDP in the medium run. The functioning of the oil sector will be essential for the GDP per capita growth in South Sudan over the coming decade or two.

Against this backdrop, it is projected that the GDP per capita in South Sudan will be lower in 2020 than in 2010. As a matter of prudence, the government should save a proportion of the oil revenues in international capital markets to finance future expenditures directly when oil revenues are reduced. Failure to do so may necessitate cutting its spending steeply as revenues decline. However, one promising avenue of increasing the growth in the non-oil economy is to invest some of the oil revenues in domestic public capital, like infrastructure (van der Ploeg and Venables 2011, van der Ploeg et al. 2011a, van der Ploeg et al. 2011b). Higher levels of public and human capital would increase the production capacity of the economy, in turn increase the tax base and allow more public expenditure to be financed by taxes.

One important consideration regarding domestic spending and investments in domestic capital, is potential capacity constraints in the economy (van der Ploeg and Venables,

³See the homepage of NBS: http://ssnbs.org/storage/key-indicators-for-southern-sudan/Key%20Indicators_A5_final.pdf

⁴This example is based on an assumed annual population growth rate of two percent over the period, which may be a low estimate.

2013). The experience from 2011, when fiscal spending increased dramatically and annual consumer price inflation stood above 50%, and the experience from 2012, when the fiscal spending was rolled back and the inflation fell towards zero, hint at existence of binding bottlenecks in the South Sudanese economy.

Another important consideration is the capacity of the government to undertake investments projects (Dabla-Norris et al. 2012, Woldeyes 2013). The public investment management systems put in place are shown to be important for the efficiency of public investment spending. The role of institutions and governance, to be discussed for the oil sector below, apply similarly for the non-oil economy. Regardless of where economic growth in South Sudan is to be generated, the institutional setting and implementation of laws and regulations are likely to play a key role.

3 Institutions and oil drilling

Economists have shown that differences in institutions, as deep determinants of economic growth, account for much of the differences in income and productivity per head observed between countries (Acemoglu et al., 2005). Institutions shape the policy and governance setting in a given country, which in turn characterise the rule of law, risk of expropriation, political stability and ease of doing business. Investor incentives are influenced by these factors, as well as commercial criteria such as capital costs and potential revenue streams. Thus, investment decisions at the margin take into account institutional factors as well as direct commercial factors.

Decisions about oil sector investments and choices about exploration drilling are no different. Such projects require large capital outlays and can span several decades. Investors will weigh risks alongside commercial opportunity. Geology is a key factor of both risk and likely profitability, however so are institutional factors that may otherwise determine the security and stability of an investment over time. Developing countries in particular face the challenge of weak institutions, informational asymmetries and investor uncertainty. Common characteristics of a weak institutional environment range across political instability, weakness in contract enforcement or rule of law, and lack of accountability of decision makers.

To be more specific, Mohn (2008) outlines four sets of factors held to be important for oil exploration:

1. Geology, i.e. the likelihood of discovering economically viable amounts of oil

2. Technology, i.e. the ability to collect and analyse geological data and for undertake the drilling
3. Economic factors, like the price of inputs, transportation costs and the price of oil
4. Political factors, i.e. stability and predictability, the allocation of licenses, the tax system and business regulation

With the exception of geology, all the other factors - the technological, economic and political factors - are directly or indirectly affected by the broad institutional setting.

The findings of Cust and Harding (2013) highlight the importance of the institutional setting for marginal investment decisions in determining the location and intensity of oil exploration. For a given pair of neighbouring countries with similar geology but divergent institutions, more exploration drilling is observed in the country with relatively better institutions. And the magnitude of the effect is relatively large; moving from Kenya, with a Polity4 score of 8 in 2011, to South Sudan, with a Polity4 score of -2 in 2011, it is about 4 times more likely to see a well being drilled in Kenya compared to South Sudan.⁵ Cust and Harding (2013) show that the higher likelihood of more exploration drilling on the "good side" of the border is a very robust pattern for developing countries and provides much more details on the identification strategy and the implications of the findings.

At first sight, it may seem that for some countries the quality of geology ensures exploration and subsequent production independently of their institutional setting, e.g. Nigeria and Iraq. One complication to this view, however, is that institutional quality can change over time. Political economy research within the resource curse literature has pointed to the negative effect of natural resource extraction on institutional quality and therefore the institutional environment at the exploration stage may be different to a country with a mature sector, i.e. before the exploration and extraction starts institutional quality may be higher, falling over time unless corrective actions are taken. Another complication is that the actual exploration efforts and the production levels should be judged in the light of the geological potential. It could for example be that the geology of Nigeria has been so promising that oil exploration and extraction would be likely to be a profitable undertaking regardless of the substantial political risk involved. Iraq may illustrate this point, as the level of proven reserves is significant and one would expect the oil sector to deliver favourable short run returns even in the context of political uncertainty.

⁵Based on an estimated coefficient of the polity variable of 1.4 and about 4 wells on average on the "bad side" of the border.

The popular press, however, reports that the huge reserves have not yet been enough to generate the anticipated take off since the US invasion.⁶

South Sudan neighbours several countries with nascent oil sectors. Uganda first discovered oil in commercial quantities in 2007, while exploration is underway in Ethiopia and Democratic Republic of Congo with possibility of commercial discoveries in the next few years. Nearby Kenya and Tanzania have recently discovered large quantities of on-shore oil and offshore gas respectively.

The pattern of oil exploration and production in the East Africa region is an important illustration of the power of institutional setting in shaping marginal decisions about the timing, location and intensity of exploration drilling. For example, oil exploration in the Albert Rift border region between Uganda and the Democratic Republic of Congo has so far been concentrated on the Uganda side of the border. Given that the geological basin of the Albert Rift spans both sides of the border, we would not expect *ex ante* for drilling to be more promising on the Ugandan side of the border. However, where institutions diverge, we would expect other non-geological factors to differ on each side of the border. A standard measure of institutions, the Freedom House, scores Uganda at 4.5, whereas for DRC it is 6, where 1 is 'most free' to 7, least free.⁷ This difference in institutional quality implies, using Cust and Harding's global estimates, that drilling is about three times more likely at the the Ugandan side of the border compared to the DRC side of the border.⁸ Indeed, drilling is now planned on the DRC side of the border, but concerns remain around enforceability of contracts and opacity of the licensing procedures in DRC.

4 Oil sector governance

Governance within the oil sector is likely to be an important signal to investors with consequences for investment and exploration activity. An assessment of quality of governance in the oil, gas and mining sector is provided by the Revenue Watch Institute's Resource Governance Index (RGI).⁹ Combining these data with the level of oil production in 2011

⁶See the article in the Economist, A hard tap to turn: An export boom needs more than just reserves, <http://www.economist.com/news/briefing/21572771-export-boom-needs-more-just-reserves-hard-tap-turn>. For a more formal analysis of the Iraqi economy in the face of oil, see van der Ploeg et al. (2011b).

⁷The Freedom House measure of Freedom in World is a standard measure of political institutions used in the literature. Freedom House measures the quality of democratic institutions, measured in terms of political rights and civil liberties.

⁸Going from about 4 to about 13 wells for the average border with such a jump in the institutional quality.

⁹For more details, see <http://www.revenuwatch.org/rgi/>

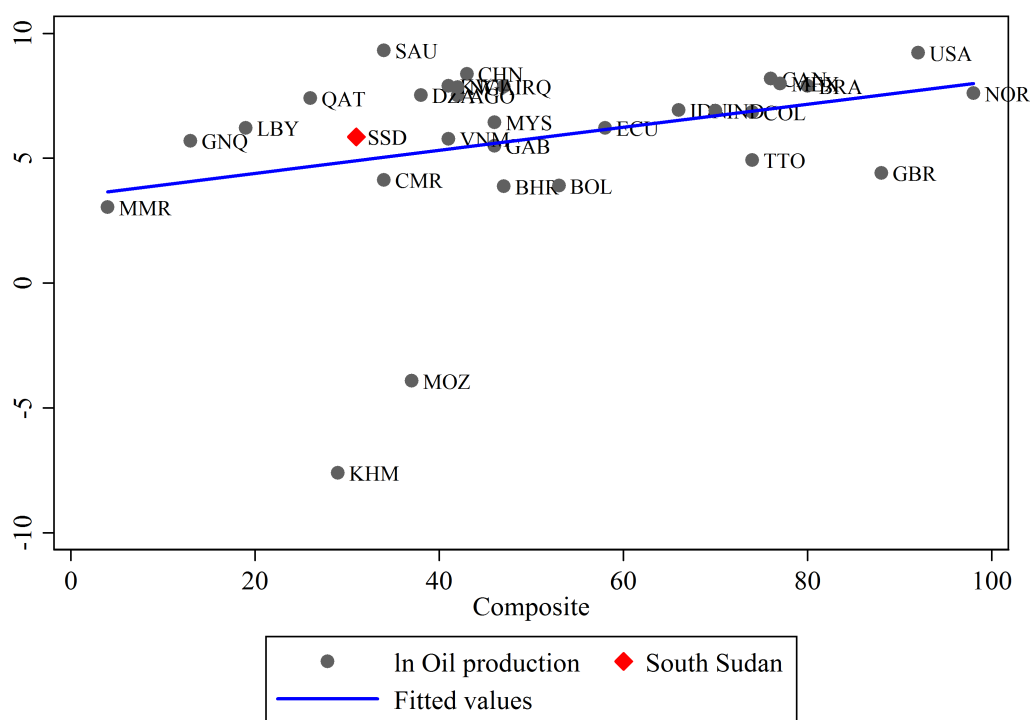


Figure 1: Oil production and RGI score

Notes: the graph shows oil production in 2011 (log of oil production measured in thousand barrels per day) in countries ranked by RGI in terms of their governance quality in the resource sector. Source: EIA for oil production data and Revenue Watch for the Resource Governance Index.

from EIA shows that there is, globally, a positive association between the amount of exploration activity and the quality of governance in the sector. Figure 1 presents the correlation between the level of oil production in 2011 and the RGI score. It can be noted that the Middle East, clustering in the northeast corner with low RGI scores and high production, seems to be outliers.

Figure 2 presents the same association for the four sub-measures of the RGI: Institutional and legal setting, Reporting practices, Safeguards and quality controls and Enabling environment. The same positive association is found for all measures.

Table A.2 illustrates the magnitudes of the correlations between oil production and the RGI scores, allowing for a role of also land area and landlocked status. In the table we focus on the average daily oil production over 1980-2012 as this should better correspond with deeper cross-sectional variation across these economies in terms of their institutions and oil activity, compared to the flash of the production level measured in 2011 and used

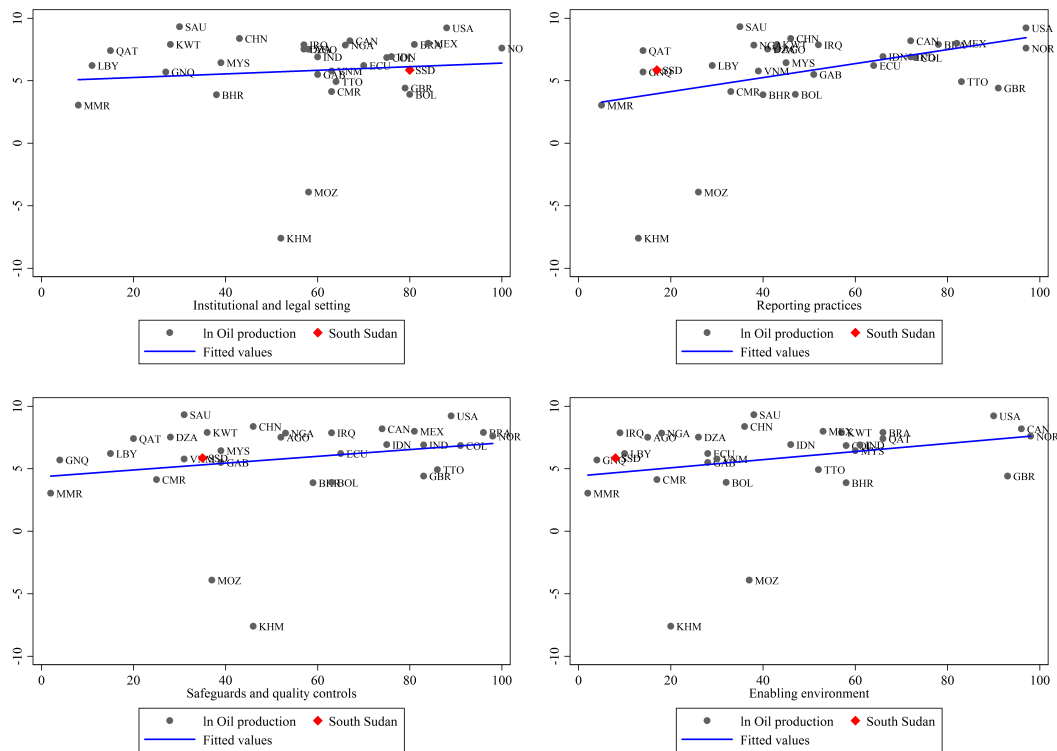


Figure 2: Oil production and RGI scores

Notes: the graph shows oil production in 2011 (log of oil production measured in thousand barrels per day) in countries ranked by RGI in terms of their governance quality in the resource sector. Source: EIA for oil production data and Revenue Watch for the Resource Governance Indexes.

in the graphs.¹⁰ To illustrate the magnitude of the estimated correlation, going from the level of Mexico to the level of US on the composite score, i.e. from 77 to 92 according to table A.1, is associated with a 85% higher average oil production in the years 1980-2012.¹¹ With only 30 observations these results should be taken as indicative rather than conclusive and, more importantly, it is unclear which way the causation goes; it could be that countries with more oil production over the last 30 years also have developed better governance quality in the sector. However, Cust and Harding (2013) employ a research strategy that deals with these issue and their findings indicate that better institutional quality causes more exploration drilling. We have here focused on oil production rather than exploration drilling, but expect the same pattern to hold true for exploration drilling.

¹⁰We chose to use the 2011 production level in the graphs to be able to depict South Sudan. We set the production level of South Sudan to 350 thousand barrels per day.

¹¹The calculation is based on column one in table A.2: $e^{0.041 \cdot (92-77)} - 1 = 0.85$.

5 Oil sector challenges in South Sudan

5.1 Oil production in South Sudan

Before 2005, South Sudan and Sudan was a unified country and oil sector policies were determined in Khartoum. Sudan is said to have imported much knowledge from the Egyptian oil sector, which had been active in oil exploration for decades. For South Sudan, a challenge is that in 2011 it inherited a relatively mature oil sector, while the government's capacity in facilitating and regulating the sector is still relatively constrained. Most countries embarking on oil production have time to develop the necessary government institutions as the activity in the oil sector gradually builds up.

Drilling for oil in Sudan dates back to the 1960s and 1970s, but production started first in the 1990s. U.S. sanctions against Sudan were introduced in November 1997, involving a trade embargo against the entire territory of Sudan and a total asset freeze against the Government of Sudan. The U.S. sanctions were expanded in April 2006, after the United Nations Security Council issued resolutions relating to actions in Darfur in March 2005 and April 2006. In October 2006, the regional Government of Southern Sudan was excluded from the definition of the Government of Sudan, in effect removing the sanctions introduced in 1997 and allowing most transactions with the Government of Southern Sudan. However, transactions relating to Sudan's petroleum or petrochemical industries, including in the Southern Sudan region, were still prohibited.¹² In December 2011, two general licenses were issued, authorizing "(1) activities and transactions relating to the petroleum and petrochemical industries in the Republic of South Sudan and related financial transactions" and "(2) the transshipment of goods, technology, and services through Sudan to and from the Republic of South Sudan and related financial transactions".¹³ In other words, U.S. sanctions applied for the petroleum sectors on both sides of the border over the period 1997-2011, while only Sudan's petroleum industry is now under sanctions.

Total production for South Sudan and Sudan is depicted in figure 3. The production started late 1990s and saw tremendous growth in the early 2000s. In 2010-11 it was around 500 thousand barrels per day, of which around 350 thousand barrels were produced in the South. The production dropped to about 100 thousand barrels per day in 2012 due to the shut down of production in South Sudan, but the production in South Sudan restarted

¹²For details on the U.S. sanctions against Sudan, see <http://www.treasury.gov/resource-center/sanctions/Programs/pages/sudan.aspx> and <http://www.treasury.gov/resource-center/sanctions/Programs/Documents/sudan.pdf>

¹³See http://www.treasury.gov/resource-center/sanctions/Programs/Documents/south_sudan_12082011.pdf

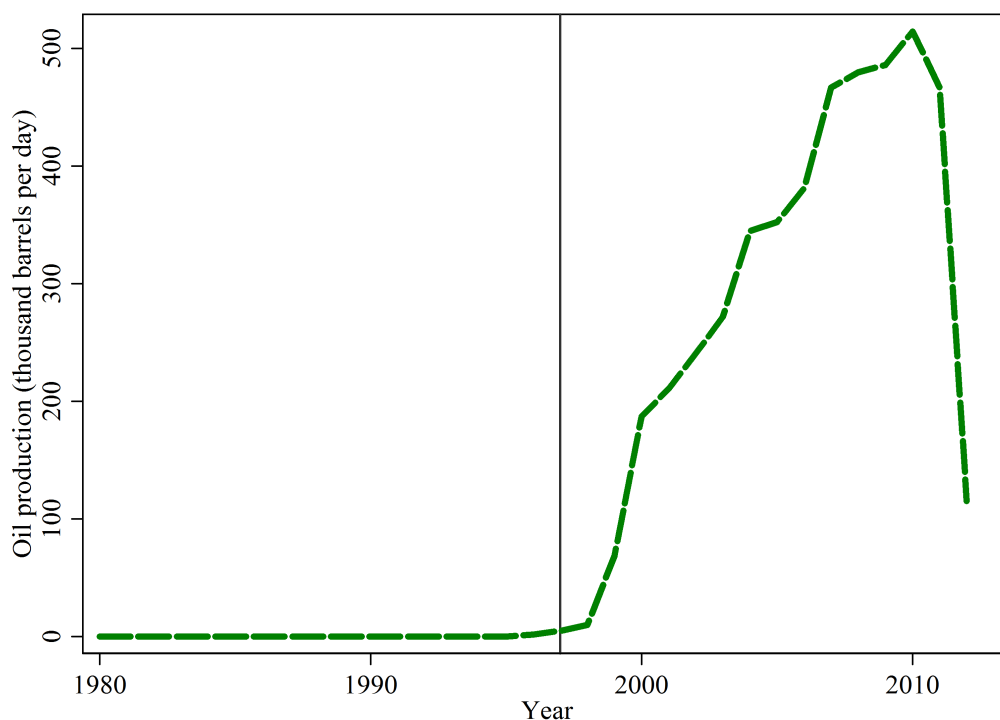


Figure 3: Oil production in South Sudan + Sudan

Notes: The vertical line in 1997 marks the introduction of US sanctions. Source: EIA for oil production.

in April 2013. Reserves figures reported by EIA/Oil & Gas journal/BP suggest current proved reserves of 5 billion barrels in South Sudan and Sudan together, of which 3.5 billion is estimated to be in South Sudan.¹⁴ The government's figure is, on the other hand, about 1.1 billion barrels.¹⁵ The source of discrepancy is unknown to these authors, but we understand that the 1.1 billion is based on information collected from the operating oil companies.

Looking forward, the oil production projections published in the South Sudan Development Plan 2011 showed a downward path, with a 40% reduction in the production over the period 2011-2016, and an expected cease of oil production by the mid-2030s. To counteract this downward trend, recovery rates will have to increase and/or new oil need to be found and come on stream.

In January 2012, South Sudan decided to shut down its oil production and exports via the pipeline were halted. The lack of a post-independence agreement between South

¹⁴See <http://www.eia.gov/countries/cab.cfm?fips=SU>

¹⁵See <http://www.southsudanembassydc.org/PDFs/Investment/South%20Sudan%20Oil%20Brochure.pdf>

Sudan and Sudan regarding the split of oil revenues from the production in South Sudan in combination with disagreement on other issues, seem to have led to the crisis. Sudan held back ships with oil in Port Sudan and South Sudan responded by stopping oil production. The outcome of the situation was a diplomatic agreement around export of oil via Sudan and the pipeline (see EIA (2013) for a description). There are currently discussions in Juba about the construction of a new pipeline from the South Sudanese oil fields, going either southwards and reaching the sea around Lamu in Kenya, or eastwards and reaching the Sea in Djibouti.¹⁶

In addition to capital and labour costs associated with a temporary stop in production 2012-13, the investment climate as perceived by international oil companies is likely to have worsened due to the crisis. This possibly strengthens the incentives for a "pump-and-run" approach of the operating companies, hence affecting the level of investments in workers and equipment employed in operating fields. In the longer run, the demonstrated volatility in the operating environment may affect the risk premium in the investment calculations regarding exploration and production activities, possibly limiting the possibility of lifting the production path described in SSDP 2011.

Partly due to the sanctions, the oil sector is currently dominated by Chinese, Indian and Malaysian oil companies, notably CNPC, ONGC Videsh and Petronas. Chevron was active in the 1970s and early 1980s, obtaining the first concession, Block 1, in south-central Sudan in 1975 and striking oil in 1979. Total has owned a license since 1979 in what is now part of South Sudan, however they suspended operations in 1985 after escalating violence. Total announced in February 2012 that it would be restarting exploration activities after a 27 year hiatus. However, activity is yet to resume and ensuring additional investments take place remains an important issue for the government.

South Sudan faces a significant challenge to induce increased exploration activity, in the hope of future reserve additions. An improved institutional environment is consistent with improved investment climate, which in turn is likely to increase the overall level of investments by oil companies. Since institutional quality is an important signal when making decisions about exploration drilling, steps the government take in this direction may extend the oil production horizon for the country and be of significant and lasting benefit to the citizens of South Sudan.

¹⁶See The Economist, Pipeline poker, <http://www.economist.com/news/middle-east-and-africa/21578402-east-africa-danger-throwing-away-part-its-new-found-oil>

5.2 Investments in existing fields

In addition to discovery of new oil fields, higher oil production may also arise from increased recovery rates from existing fields (Venables, 2011). The expected recovery rates in existing fields in South Sudan are likely to be relatively low by international standards; recovery rates were estimated to be 23% in Sudan prior to secession (SSDP 2011). In Sudan, plans have been announced to increase the recovery rate to 47% (EIA, 2013). No such targets or announcements have yet been made south of the border.

The improvement of recovery rates may be relatively straightforward for Sudan and South Sudan. Indeed the Sudanese target implies that investment in the sector can overcome geological constraints to raise the recovery rate from very low levels. This potential may be present on the South Sudan side of the border since they share a common geology. This would imply that the newly independent state could be targeting similar improvements in the near term.

There is quite likely to be potential of applying standard techniques of increased oil recovery (IOR) in the South Sudan context. For example, some fraction of what is extracted from a given well is typically water, which can be injected back into the well. This helps maintain the pressure in the well and thereby increases the fraction of oil that is possible to extract from the well. Injecting the water back into the well also typically has positive side effects for the environment, as the "water" in question contains potentially damaging substances and therefore has to be cleaned before it can be used above ground. Injection of the spill water therefore has the potential to increase recovery rates and mitigate environmental damage that might otherwise occur. Importantly, the sooner this technique is put to use, the more of the oil can ultimately be extracted. The technology for more widespread use of injection of spill water should be available to South Sudan, and there may still be potential of using it in existing wells, subject to additional investment. The fact that such a technique is more potent the earlier it is put into use illustrates the general point that allowing a setting supportive for long-term planning by the actors in the oil sector is essential.

An essential question is why such IOR-techniques may not have been used to its full potential in the sector up to now, or may fail to be utilised looking forwards. Increased recovery rates from oil wells are typically associated with greater sunk investments and thus a longer investment horizon. In the context of South Sudan, the geology and technology may be favorable for IOR, while the market conditions allow for ease of export and sale of South Sudanese oil, subject to pipeline operation. The pipeline capacity itself should not

be a limiting factor, pointing to under-utilisation at present. The answer might be found in the risks perceived by the oil companies. With historical unrest, a period of wait-and-see during the CPA 2005-2011, the interruptions to production in 2012, and generally a new policy environment, it may not be surprising that the companies are hesitant to make large capital outlays at this point in time.

The key question is then: what can the government do to reduce the perceived risk and create an environment in which existing and new oil companies feel ready to invest in exploration and extraction activities. We discuss this at an overall level in section 6, however the design and prioritisation of such measure most likely to induce increased investment should be considered further, in conjunction with oil sector experts.

5.3 Institutions in South Sudan

As in our global picture, it is likely that the institutional setting shapes investor incentives in South Sudan. South Sudan faces a variety of institutional and governance challenges that relate to the oil sector and more broadly. As a newly independent state emerging from a period of conflict South Sudan faces severe capacity constraints as it seeks to build political and governance structures. Key institutions and agencies have been created from scratch, while new legislation and policies have been tabled.

Perhaps unsurprisingly given the nature of South Sudanese independence, political stability and neighbour relations have been strained. Indeed in January 2012 a dispute around revenue sharing, in combination with other issues, led to suspension of pipeline operations between Sudan and South Sudan, thus effectively halting exports. This suspension lasted 16 months. During this time international companies were unable to export oil thus halting their own operations.

Similarly, weak institutional capacity has led to allegedly widespread theft and corruption by government officials. In May 2012, President Kiir wrote to 75 officials demanding repayment of stolen oil receipts and offering amnesty for those who came forward. It is alleged over 4 billion USD has been stolen since independence, mostly from oil. The President went on later in 2012 to dismiss all Ministers, leaving the country without a cabinet for ten days. This not only creates practical challenges of governance but can send signals to investors around political stability going forwards. Relating to this stability and investor certainty, the country's interim constitution is only valid through to 2015. Delays have meant the country is yet to agree upon their permanent constitution to replace this, which creates further questions around how natural resources will be managed going

forwards.

6 What can the government do?

6.1 General investment promoting policies

Attracting oil exploration activity is about attracting foreign investment to the oil sector, and the findings of Cust and Harding (2013) indicate that attracting oil investments may not be very different than attracting investments to other sectors. Promising geology alone is typically not enough. The literature on foreign direct investments has found that information asymmetries are a critical issue for developing countries. Harding and Javorcik (2011) and Harding and Javorcik (2013) find that efforts by investment promotion agencies have the potential of increasing flows of foreign direct investment to developing countries. One problem the investment promotion agencies seem to help solving is an information problem; foreign investors have limited information about the business potential and the business climate in a country like South Sudan. For South Sudan it is therefore likely to be important to provide information to foreign investors about the known potential for oil companies in the country. Although extractive sectors may not be the main area of focus for many investment promotion agencies, Australia, Chile and Peru are examples of countries using their agencies to market the opportunities in their mining and petroleum sectors.¹⁷ The brochure "Invest in South Sudans petroleum" is an example of efforts that may be helpful for investors seeking information about South Sudan.¹⁸ These are relatively cheap policy interventions, which do little harm if they are designed sub-optimally, but which can have quite high returns (Harding and Javorcik, 2011). There may still be non-sensitive information held by the government about the oil sector and other relevant aspects for investors, which the public and the oil sector could benefit from having access to. Furthermore, as quite little reliable information is yet available on South Sudan, the task for South Sudan is not only to facilitate the dissemination of information, but also in gathering good quality data. Examples of good practices are the efforts by the National Bureau of Statistics (NBS) and the background chapters of the South Sudan

¹⁷See for example <http://www.austrade.gov.au/Invest/Opportunities-by-Sector/Resources>, <http://www.foreigninvestment.cl/images/stories/pdfs/opportunities/Mining.pdf>, <http://www.proinversion.gob.pe/0/0/modulos/JER/PlantillaSectorHijo.aspx?ARE=1&PFL=0&JER=6066>

¹⁸See <http://www.southsudanembassydc.org/PDFs/Invesment/South%20Sudan%20oil%20Brochure.pdf>

development plan 2011-2013 (Government of the Republic of South Sudan, 2011).¹⁹.

To emphasize the importance of what may seem like a rather innocent issue, practitioners in the Norwegian oil sector argue that information sharing has been an important ingredient in the development of the Norwegian oil sector and the oil directorate has been given a central role in this work.²⁰ Explorations activities are found to benefit from experiences in other licenses and exploration areas. The companies in the sector may have incentives not to share information from their exploration wells, in the hope of improving their competitive position and increasing chances to win future licenses. To circumvent this issue, the companies in Norway are by law obligated to report results from drilling to the oil directorate immediately. The information is then made available to facilitate the learning across firms in the sector. This is an example of where the state plays an essential role in making the sector as a whole function better.

Moreover, much of the research activity on the geology of Norway has been undertaken by universities in Norway, which has also helped in spreading essential knowledge across the oil sector. However, this may be less relevant for South Sudan, as the capacity of the public institutions may not be at the necessary level and it may be better to tap into the knowledge base and research capacity of leading international oil companies. If the international oil companies are similar to other multinational companies, which seem quite likely, a large body of research on the effects of foreign direct investment (FDI) has shown that multinational companies are important developers of new technology and know how and that they bring this technology with them into the countries in which they invest. Furthermore, the research has also shown that there often are important spill over effects to other firms from multinational companies.²¹ For South Sudan, there seem to be no alternative to invite leading international oil companies to develop the sector at this stage.

In addition to the issue of asymmetric information, many investment promotion agencies also help in solving issues related to red tape; they often help investors manoeuvre through bureaucratic procedures. And they help investors find local partners. Oil investments may sometimes be large enough to bypass much of the general procedures other investors are subject to and negotiations take place at a higher level. However, experiences from other countries have shown that there also in the oil sector is room for smaller actors, for example firms delivering services like drilling etc. Norway has seen a tremen-

¹⁹For the NBS, see <http://ssnbs.org/>.

²⁰See <http://www.npd.no/en/> and <http://npd.no/en/Publications/Facts/Facts-2013/>

²¹For more the effects of FDI, see for example the literature survey in Harding and Javorcik 2012.

dous growth in smaller companies active in the sector, which seems to be at least partly due to changes in policies in the early 2000s (Norwegian Petroleum White Paper 2010/11, Government of Norway 2011). As in other sectors, competition is likely to be important in the oil sector. At the same time, a balance may need to be struck between competition and economies of scale in some of the projects.²²

The role of expectations formation is important. Information and signalling that the government is serious about getting the oil sector going, that it is determined to create a stable business climate in which the sector can invest and operate is likely to be important for the investments that will materialise in the oil sector. Clearly, signals are credible to the extent they are backed up by actions, and the government can earn credibility over time via investor friendly policy choices.

6.2 Rwanda and Doing Business reforms

A notable example of the interaction between the institutional environment, economic decisions and government reform efforts can be found in Rwanda. Since President Paul Kagame took office in 2000, Rwanda has pursued a concerted and comprehensive strategy to both improve the domestic institutional setting while reaching out to international investors and the Rwanda diaspora to help rebuild the nation's economy. A key pillar of this strategy has been a targeting of the country's 'Doing Business' ranking, based on the World Bank annual measures. Rwanda has recognised that investment decisions can be strongly influenced by non-economic factors, and as a post-conflict and fragile state, the policy environment is both of critical importance to investors, but also something within the domain of control of the government.

By the World Bank's 2011 Doing Business report ranked Rwanda the second most pro-business reformer globally, and 58th in terms of ease of doing business, up from 70th a year earlier. By 2013, Rwanda is now up to 52nd on ease of doing business and 8th on ease in starting up a business. By 2017 the country wants to be in the worlds top 30 places to do business. It is already the second most improved nation globally and the top improved in sub-Saharan Africa since 2005. Direct targeting of the countries score on the Doing Business index presents two distinct benefits to Rwanda. First, the criteria for the index are measures of key business environment characteristics thought to be important to international and domestic business alike. By fixing these, Rwanda is following a roadmap of reform that can help them prioritise key measures. The second

²²The particular tuning of the different policies are not the subject for this note, but more pointing to key factors the government needs to keep in mind.

distinct benefit to the country is the signalling power. By measuring, scoring and ranking countries associated with these important criteria, the World Bank provide an accessible and highly visible indicator of the strength and pace of reform efforts. This can help signal to investors the country's seriousness about business climate and mark them out amongst other emerging economies.

Through policy reforms, strengthening of business regulation and rule of law, including a zero-tolerance for corruption, Rwanda has put itself on a trajectory toward greater self-sufficiency; reflected by strong economic performance: GDP growth reached 7.8% in 2013, making it the ninth fastest growing economy in the world. Foreign direct investors include Visa Inc., which has invested in cashless banking and payment processing, while ContourGlobal, a New York-based company, are working to extract methane gas from the waters of Lake Kivu to generate electricity. Domestic firms are also now beginning to flourish including boutique hotels, restaurants, small IT shops, event planning, and tourism. In 2010 alone, 18,447 new businesses were registered in Rwanda.

6.3 Oil sector policies and governance

One tool available to evaluate the current state of oil sector policies and governance in South Sudan is the Resource Governance Index 2013, developed by the Revenue Watch Institute. As discussed in section 4, the various categories of the RGI: the composite score, the Institutional and Legal Environment, the Reporting Practices, the Safeguards and Quality Controls, and the Enabling Environment, are all positively correlated with oil production levels across countries, and the same pattern is expected to exist also for exploration drilling. Consistent with the work of Cust and Harding (2013), measures of sector governance may in fact bear a causal relationship to investor incentives and thus levels of exploration investment. If this is indeed the case, opportunity for improvements and strengthening of sector governance may improve investor perceptions and improve the overall investment climate, thus inducing critical investments in exploration and oil recovery.

The 2013 Index provides a useful roadmap for possible policy actions or implementation steps that would strengthen South Sudan's score and ranking, and by implication the governance environment. The Index places South Sudan 50th out of 58 countries assessed. It scores and ranks countries according to measure of transparency and governance relating to the natural resource sector. South Sudan received a failing score of 31 out of 100 overall, placing it between Cameroon and Cambodia in the rankings. While

its performance on the Institutional and Legal Setting component was strong, it received failing scores on all other components, including the governance enabling environment, reporting practices in addition to checks and balances.²³

The country has made important progress since independence in terms of sector policies and legislation. Indeed this is recognised by the RGI scores, achieving an impressive 80 out of 100, ranking South Sudan 11th out of 58 in the category of 'Institutional and Legal Setting'. The RGI report noted that South Sudan's high score was due to an ambitious legal framework designed to promote transparent governance of the oil sector. This category focuses on policy and legal setting, and thus captures what rules and laws are in place that serve transparency and accountable governance of the sector.

While South Sudan has generally good sector legislation and reporting requirements, the RGI report suggested that implementation and enforcement is weaker and there are clear suggestions for improvement. In 'Reporting Practices', the RGI report is highly critical, noting that South Sudan releases "almost no data on the oil industry" resulting in a "failing" score of 17 out of 100. However clear opportunities for improvements are detailed. Publishing of licensing processes, and information around the renegotiation of contracts originally made between oil companies and the pre-division Khartoum government would represent a strong signal. Prior to independence, a joint committee on oil revenue sharing release limited information on production volume, prices, and value of exports, but these reports stopped in May 2011. Re-starting this timely reporting would not only signal a commitment to transparency but likely place useful information in the hands of investors. Starving investors and country observers of sector information is unlikely to build understanding and confidence. According to RWI's RGI report, the only oil data the government of South Sudan has published is a December 2011 press release from the Petroleum and Mining Ministry on export earnings.

Challenges relating to the country's state owned oil company also exist. For example Nilepet, the entirely state-owned company, is required by the Petroleum Law to release comprehensive audited reports on the company's finances, but it is yet to do so.

In other areas South Sudan has very good laws and procedures in place, but are yet to be tested. The Petroleum Law calls for open and competitive licensing practices - considered international best practice, a good protection against elite capture and corruption, as well as a tool to secure value and help government overcome informational asymmetries with the private sector. However no licensing rounds have so far been conducted since

²³For more information, see: http://www.revenuewatch.org/sites/default/files/countrypdfs/south_sudanRGI2013.pdf.

independence. It will be important that South Sudan follow these processes effectively in the event of a future licensing round.

The report recognises the clear division of roles among key government agencies; that of the National Petroleum and Gas Commission in approving exploration licenses and setting policy, the Petroleum and Mining Minister negotiating contracts and handling regulation of the sector, and the Finance Ministry handles revenue. Further the report notes positively that South Sudan has expressed interest in becoming a member of the Extractive Industries Transparency Initiative (EITI), but have not yet achieve candidate or compliant country status, thus limiting sector disclosures. Taking the next step along this process would be a powerful and highly visible international signal. EITI now records 39 candidate or compliant countries around the world.

In the area of contracts, South Sudan could follow in the footsteps of other emerging producers adopting international best practice by disclosing contracts for the benefit of citizen scrutiny and to ensure political robustness of contracts over time. This can be important where sector investments involve significant capital outlay- transparency contacts can help insure them against future governments challenging the terms or legitimacy, which might serve to destabilise investor relations. The RGI 2013 report notes that a confidentiality provision in the Petroleum Law, allowing information to be withheld if it might damage industry competitiveness, which could act as a practical impediment to disclosure.

South Sudan could utilise the Resource Governance Index in much the same way as Rwanda has targeted the Doing Business Rankings. By taking serious efforts to match their score in the category of Institutional and Legal Setting, South Sudan could rise from 50th where it ranks overall, to as high as 10th, where it ranks on this single category. Like the Rwandan case study the benefits to South Sudan would likely be twofold. First, the Index provides a useful roadmap to the kind of reform efforts likely to yield significant gains in the governance of the oil sector. Furthermore targeting of this high profile international measure, South Sudan would send a clear signal to international investors regarding their seriousness in creating a stable and certain investment climate and governance framework. Both these aspects could serve to increase the level and longevity of investments made by companies into the South Sudanese oil sector. This in turn could support increased recovery rates and reserve additions through further exploration and discovery.

7 Concluding remarks

South Sudan faces a significant challenge and opportunity in its management of the oil sector. Inheriting an oil industry at a relatively mature stage of development from a technological and operational standpoint, a major task facing the government is to build the governance and instructional framework needed to effectively regulate and oversee a high value and complex sector. Doing so has large potential payoffs. Good governance can act as a protection against elite capture, rent seeking and corruption. However, this note argues there are more direct gains to the country also. An open, accountable and stable institutional environment is consistent with improved investment climate, which in turn could raise recovery rates and reserve additions.

The necessary conditions for an investment climate to trigger higher investments are likely to include factors such as a stable peace between South Sudan and Sudan, peace and security within South Sudan and a legal and institutional framework in South Sudan providing the predictability and incentives for long run investments.

South Sudan has designed oil laws and regulations that are judged to be of high quality by practitioners and the RGI-ranking of the Revenue Watch institute. This has been achieved by ambitious local policy makers making use of international support, in particular from partner countries like Norway and the US. As the country leaves the phase of the design of the fundamental laws and regulations, implementation moves to the foreground for the few years ahead. Actions demonstrating that the laws and regulations will be matched by effective implementation will serve to foster a stable business climate. This is likely to be driver for future investments in oil exploration and investments in increase recovery rates going forward.

The IMF projects in its October 2013 World Economic Outlook that GDP per capita of South Sudan will be back at the 2011-level in 2017. This is likely to require that the government is successful in implementing growth promoting policies in the non-oil sector as well as in the oil-sector. South Sudan should have an enormous potential in both sectors and international experiences have shown that getting the governance issues right is a necessary condition to unleash the economic growth.

The upshot of this note is that there is an important role for the government to play in developing the oil sector. This is a positive message in the sense that the government can work to implement policies likely to unleash the potential the oil sector may have in South Sudan. It is at the same time a message of caution; investors pay close attention to

government actions and therefore it matters what choices the government makes.

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Supplementary figures and tables

Table A.1: RGI scores for countries with ranking for hydrocarbon sector

	Country	iso code	Composite	Institutional and legal setting	Reporting practices	Safeguards and quality controls	Enabling environment
1	Algeria	DZA	38	57	41	28	26
2	Angola	AGO	42	58	43	52	15
3	Azerbaijan	AZE	48	57	54	51	24
4	Bahrain	BHR	47	38	40	59	58
5	Bolivia	BOL	53	80	47	63	32
6	Brazil	BRA	80	81	78	96	66
7	Cambodia	KHM	29	52	13	46	20
8	Cameroon	CMR	34	63	33	25	17
9	Canada	CAN	76	67	72	74	96
10	China	CHN	43	43	46	46	36
11	Colombia	COL	74	75	73	91	58
12	East Timor	TMP	68	77	82	70	28
13	Ecuador	ECU	58	70	64	65	28
14	Egypt	EGY	43	40	44	48	40
15	Equatorial Guinea	GNQ	13	27	14	4	4
16	Gabon	GAB	46	60	51	39	28
17	India	IND	70	60	72	83	61
18	Indonesia	IDN	66	76	66	75	46
19	Iran	IRN	28	26	33	26	23
20	Iraq	IRQ	47	57	52	63	9
21	Kazakhstan	KAZ	57	62	58	76	32
22	Kuwait	KWT	41	28	43	36	57
23	Libya	LYB	19	11	29	15	10
24	Malaysia	MYS	46	39	45	39	60
25	Mexico	MEX	77	84	82	81	53
26	Mozambique	MOZ	37	58	26	37	37
27	Myanmar	MMR	4	8	5	2	2
28	Nigeria	NGA	42	66	38	53	18
29	Norway	NOR	98	100	97	98	98
30	Qatar	QAT	26	15	14	20	66
31	Russia	RUS	56	57	60	62	39
32	Saudi Arabia	SAU	34	30	35	31	38
33	South Sudan	SSD	31	80	17	35	8
34	Trinidad and Tobago	TTO	74	64	83	86	52
35	Turkmenistan	TKM	5	13	4	0	3
36	United Kingdom	GBR	88	79	91	83	93
37	United States	USA	92	88	97	89	90
38	Venezuela	VEN	56	57	69	67	18
39	Vietnam	VNM	41	63	39	31	30
40	Yemen	YEM	43	57	46	52	16

Table A.2: Average oil production 1980-2012 vs. RGI scores

	(1)	(2)	(3)	(4)	(5)
	ln Prod	ln Prod	ln Prod	ln Prod	ln Prod
Composite	0.041* (0.020)				
Institutional and legal setting		0.005 (0.018)			
Reporting practices			0.054* (0.027)		
Safeguards and quality controls				0.023+ (0.015)	
Enabling environment					0.031** (0.014)
ln Area	0.164+ (0.103)	0.239** (0.105)	0.118 (0.116)	0.200* (0.108)	0.218** (0.082)
Landlocked	-2.349*** (0.573)	-2.443*** (0.687)	-2.021*** (0.690)	-2.518*** (0.512)	-1.937** (0.730)
Constant	0.517 (2.175)	0.869 (2.207)	0.757 (2.213)	0.670 (2.217)	0.235 (1.975)
Observations	30	30	30	30	30
R-sq	0.18	0.10	0.25	0.13	0.16

Notes: + $p < .13$, * $p < .10$, ** $p < .05$, *** $p < .01$. Robust standard errors in parentheses. Dependent variable is the log of mean daily oil production over 1980-2012.

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