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Reliable in the long run? Petroleum policy and long-term oil supplier reliability ☆

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ABSTRACT

Accelerating oil import dependence in energy consuming nations highlights the importance of having energy supplies at sufficient levels and at stable and reasonable prices. Consequently, it is crucial that oil exporters realize their full production potential. Current debates on energy security are often focused on short-term risks e.g. sudden disruptions due to wars, domestic instability, etc. However, when it comes to assessing oil supplier reliability it is equally important to assess their longer term ability and willingness to deliver oil to the global market. This study analyzes the effects of petroleum investment policies on crude oil production trends in 14 major oil producing countries (2000–2010) by focusing on the political–institutional frameworks that shape the investment conditions for the upstream oil sector. Our findings indicate that countries with less favorable oil sector frameworks systematically performed worse than countries with investor friendly and privatized sectors. The findings indicate that assessments based on remaining reserves and planned production capacities alone could inflate expectations about future oil supplies in a world where remaining crude reserves are located in countries with unfavorable investment frameworks.

1. Introduction

Europe, already importing approximately 80% of its oil, will like most other major importing nations, including the U.S., Japan, China, and India remain or grow increasingly dependent on imports for its oil needs over the next few decades (IEA, 2009, p. 116–117). This highlights the importance of having reliable energy suppliers ready and able to supply consumers with the needed quantities of oil as far as their potential allows. This leads to the following question: How likely are major oil producers to be reliable suppliers in the longer run? Current debates on oil supply security are often focused on mitigating short-term risks related to the possibility of sudden disruptions of oil flows or volatile energy prices or they are focused on the peak oil debate. This is not surprising in light of the Russian oil and gas cut-offs in recent years and the political upheaval in the Middle East and North Africa. However, oil suppliers have rarely cut oil supplies historically (Lacher and Kumetat, 2010; Schaffer, 2008, p. 33–34).[1] And although the world's crude oil reserves will run out sooner or later, no one has a clear idea of when this will eventually happen. Thus, when it comes to assessing the reliability of oil suppliers it is of equal importance to assess their ability to deliver to global markets over the long term.

Insufficient investment in the upstream oil sector is routinely highlighted as a main concern for future supply security by the International Energy Agency when assessing oil/gas production trends in supplier countries (IEA, 2010). Sufficient investment is first and foremost the responsibility of the oil companies, but they do so in a political–institutional framework. Accordingly, this study attempts to answer the question of how important political–institutional investment frameworks are for whether oil suppliers may prove to be reliable or erratic under-achievers in the long run.

Drawing on existing studies on national oil companies (NOCs) and resource nationalism, we investigate to what extent it makes a difference whether the investment framework is favorable or

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[1] Major deliberate oil supply cuts happened in 1956 during the Suez crisis and in 1973 during the Yom Kippur War. Russia cut oil supplies to Belarus in 2007, while Russian gas giant Gazprom reduced gas flows to Ukraine in 2006, 2008, and 2009. Major oil supply disruptions also took place during the 1967 Six Day War as well as in 1979, during the Iranian revolution and the outbreak of the Iran-Iraq-war in 1980

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unfavorable to private investors in terms of long-term supplier reliability. In recent years resource nationalist trends in some major oil producing countries, including Russia, Venezuela, and Kazakhstan has spawned a growing body of literature on this topic. According to the literature, state-owned NOCs enjoying domestic monopoly status are more likely to underperform over the long term compared to private oil companies due to inefficiencies and distorting political influence. Conversely, oil producers with upstream oil sectors favorable to private companies may be more reliable over the long term in terms of maximizing the potential of a country's oil reserves.

To assess this argument, we analyze the impact of favorable and unfavorable investment frameworks on upstream production trends in 14 major oil producing countries between 2000 and 2010 (Angola, Azerbaijan, Canada, Iran, Iraq, Kazakhstan, Kuwait, Libya, Nigeria, Qatar, Russia, Saudi Arabia, United Arab Emirates, and Venezuela) organized as follows: First, drawing on the existing literature, we elaborate on why sectors dominated by state-owned NOCs risk underperforming over the longer term. Second, we utilize production data from our 14 oil producers in order to assess the impact of this variable. Finally, we summarize our findings and expand on their implications.

2. Argument

There are several key factors that affect global oil production, including natural decline, geologic make-up of reserves, etc. This study, however, is concerned with political–institutional factors such as the investment framework in oil producing countries that may affect long-term oil production. Government policy regarding investment frameworks for the upstream oil sector matter because they set the terms, conditions, and investment risks under which oil production and exploration can be conducted. By implication, these politically determined frameworks also influence how attractive or viable it is for private oil companies to operate in a country.

2.1. Why oil sector investment frameworks may matter

A growing body of literature has been published recently concerning the declining global market share of private major international oil companies (IOCs)[2] and the increasing global importance of state-owned national oil and gas companies due to growing resource nationalist policies, whereby governments limit the operations of private oil companies (see e.g. Bremmer and Johnston, 2009; Brumberg and Ahram, 2007; Domjan and Stone, 2010; Eller et al., 2007; Hartley and Medlock, 2008; Jaffe and Soligo, 2007; Kretzschmar et al., 2010; Luong and Weinthal, 2010; Marcel, 2006; Nell, 2010; Stevens, 2008, 2009; Wolf, 2009). Both logical reasoning as well as empirical evidence indicate that investment frameworks in oil producing countries and the oil sector ownership structure is likely to be highly important for their performance. Arguably, private oil companies in a competitive market are relatively better able to make efficient and commercially viable investment choices than their state-owned counterparts. So, in order to have an economically efficient development of a country's upstream oil sector, a substantial sector share of private companies is in all likelihood needed.

Private oil companies are likely to be relatively more efficient at developing the upstream oil sector than state-owned companies for several reasons. First, in contrast to private companies, state-owned oil companies typically operate with non-commercial objectives. For instance, such companies often play a social role as major employers, resulting in excessive employment and an inefficient allocation of funds. Second, state-owned companies may be obliged to sell their products at below-market prices to domestic consumers. As is well-known, direct fuel subsidies for domestic consumers is widespread in many oil producing countries e.g. in the Middle East and Latin America, leading to losses for the state-run energy company as well as domestic over-consumption (Luong and Weinthal, 2010, p. 52). Third, due to government involvement, state-owned oil companies may be more prone to make suboptimal investment decisions, not in the least because of diverging objectives from purely commercial ones. For instance, since revenue from state-owned oil companies often play an important role for government budgets; politicians with short-term time horizons have a major incentive to financially exploit state-owned companies, leaving them with too few resources for (re)investment in developing future resources. As argued by Luong and Weinthal (2010, p. 52), cabinet ministers in oil producing states with state controlled ownership in the petroleum sector routinely treat the national oil company as an extension of the state budget. This means that revenue needed for (re)investment in new exploration/production or maintenance is transferred away from the company, which may result in the underdevelopment of the country's energy resources (Eller et al., 2007; Hartley and Medlock, 2008; Jaffe, 2009, p. 85; Marcel, 2006, Ch. 6). This does not necessarily mean that private investors always pursue optimal investment strategies in the short and long term. As observed by Paul Stevens, private oil majors have proved reluctant to invest in new oil exploration and development in the early 2000s due to the collapse of oil prices in 1998 as well as changing management strategies focusing on high-returns to their shareholders rather than long-term investment (Stevens, 2008, p. 22, 27). However, arguably, private investors remain relatively better investors and the reluctance of some companies to pursue long-term may also reflect the fact that private international oil majors have limited long-term access to reserves today.

Finally, Hartley and Medlock (2008, p. 2461) argue that state-owned oil companies also lack performance incentives relative to private companies because the commitment to government ownership means that the firm can expect to be backed by government guarantees if it gets into financial difficulties. In contrast, private oil companies, lacking such insurances, care about the resale value of their shares, which will depend on the future profitability of the company. Because of this, shareholders are likely to have incentives to ensure a sound trade-off between current income and future profitability (Hartley and Medlock, 2008, p. 2461), provided they have long-term prospects for producing from an oil field. Also, managers from national oil companies have a higher likelihood of deliberate "mismanagement" to enrich themselves, which is facilitated through non-transparent entities. In contrast, managers in private companies are more likely to be held accountable for their managerial performance by shareholders who expect a return on their investment. (Luong and Weinthal, 2010, p. 52–53, 56).

The inherent problems in state-ownership of the petroleum sectors are exemplified by Eller et al. (2007) who, building on previous research by al-Obaidan and Scully (1991), investigated the technical efficiency[3] of 80 private and state-owned oil companies between 2002 and 2004. They show that state-owned companies do systematically perform worse than private oil companies. Measured against an efficiency scale, state-owned companies on average have

[2] According to a recent Petroleum Review article NOCs control approximately 70% of global oil reserves, see Nell (2010). Shift in Power to NOCs. Petroleum Review, February, 2010, p. 20–21.

[3] By technical efficiency the authors understand the degree to which a firm maximizes the production for a given set of inputs (oil reserves and employees). The authors construct a production frontier by standardizing measures of inputs and outputs and compare firms based on these metrics. This results in a measure of 0–1, where 1 signifies a technical efficiency that fully maximizes production given the inputs.

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an efficiency of approximately half as that of private major oil companies when it comes to making revenue. The National Iranian Oil Company (NIOC) is a good example. According to Brumberg and Ahram (2007, p. 24), the NIOC plays a key role in Iran's state-oriented and redistributive political economy, including selling its products at domestic prices far lower than production costs. In addition, the NIOC is a huge employer with a bloated payroll and its revenues serve as the all-important source of income for the Iranian government. Another example is Mexico's national oil company Pemex, which as global oil prices were reaching all time highs in the late 2000s ran a huge deficit, only keeping itself afloat though extensive borrowing (Smith, 2004). But, how much of the variation in oil output trends of producer countries can actually be explained with reference to investment frameworks favoring private investors or state monopoly ownership?

2.2. Assessing investment frameworks

Determining whether an investment framework is favorable to private investors or to state-owned ones is far from straightforward. In a recent study, Luong and Weinthal (2010) investigate how ownership structure may affect the type of overall fiscal regime chosen by oil producing countries of the former Soviet Union. The authors suggest that ownership should be determined according to whether the "relevant legislation mandates that the state owns rights to develop the majority of petroleum deposits and hold the majority of shares in the petroleum sector" combined with the types of contracts private oil companies can sign signaling the degree of state control. This results in four ideal typical ownership structures including: (1) State-ownership with control, (2) State-ownership without control, (3) Private domestic ownership, (4) Private foreign ownership Luong and Weinthal (2010, p. 8–9). As is clear from this distinction the biggest efficiency problems related to state-ownership should belong to type 1 of this typology while the most efficient investors would likely be private companies competing in a free market.

However, apart from clear-cut cases where national legislation clearly gives a monopoly status to a state-owned or a privately owned national company, a straightforward comparison of different types of contractual setups across countries is extremely difficult if at all feasible as the particular incentives and disincentives for private investors is a complicated mix of contract-types and taxation systems. Thus, attempting to determine whether a certain oil contract type (e.g. royalty/tax systems vs. product sharing agreements, joint ventures or subcontracts) is more favorable to private oil companies than others may not yield reliable results because of overlaps and differing specific contractual and taxation terms (see e.g. Johnston, 2008). Also, the availability of comparable data on oil sector regulation is scarce. Thus, in determining the type of investment framework in an oil producing country, we rely on qualitative assessments of broader political–institutional conditions and a quantitative assessment of actual market shares. Utilizing market shares has the advantage that it indirectly reflects the extent to which a particular national investment framework is deemed favorable by private companies themselves or whether the upstream oil market in the country is open to them in the first place. This assessment would be reflected in their actual decisions to be present in that market.

One may question whether investment frameworks are independent from the broader political system in a country i.e. whether there is a problem of spuriousness in treating investment frameworks as an independent variable. Do for instance autocratic countries also produce investment frameworks that are less favorable to private investors? Scanning the political landscape in oil producing countries located in the Middle East and North Africa there is little doubt that autocratic government is a frequent type of government and that they typically have unfavorable investment frameworks which will be apparent in the following section.[4] However, the form of government is a rather abstract variable having many broad impacts in society. Potential effects on petroleum output trends related to the form of government must be transferred through various channels including investment frameworks. Arguably, spuriousness is a major methodological problem when an omitted variable influences both the independent variable and the dependent one directly (Sieberer, 2007). In our case the potential effects of the type of government would be transmitted through investment frameworks and thus not affect petroleum output directly. Also, investment frameworks are likely to be affected by other factors as well e.g. the financial capacity of a country and the maturity of the upstream oil sector in an oil producing country.

3. Methodology and data

To investigate the relationship between investment frameworks and oil production trends we utilize a comparative case study approach analyzing 14 major oil producing countries. Our specific case selection is based on three criteria.

First, we selected 14 major oil producers based on a production to reserves ratio (RPR) of 20 (18) years because we seek to isolate as much as possible the impact of investment frameworks from geological effects such as natural depletion. Thus, we needed to focus on countries with substantial remaining oil reserves. 14 countries worldwide had major remaining reserves between 2000 and 2010 and were potentially able to sustain oil production for at least another 20 years at current rates (see Fig. 1).

Second, to reduce the risk of predetermining outcomes (King et al., 1994) our cases were selected with an eye to ensuring systematic variation on our independent variable (type of investment frameworks). Accordingly, six of 14 countries had investment frameworks deemed favorable to private investment on average across 2000–2010, while eight had less favorable frameworks.

The third criterion is an unintended, but useful, most 'dissimilar' case study design. The core idea of a most dissimilar design is that differences cannot explain commonalities (King, 2003, Ch. 12). This criterion is useful in order to limit the influence of omitted variables. Arguably, our sample of countries across the globe is very dissimilar in most respects including geology, politics, culture, economics, etc.

4. Results

In this section we evaluate the potential impact of investment frameworks for oil production trends in our 14 selected countries (2000–2010). First we describe and compare the investment frameworks for our two main groups of countries. We then analyze and compare the two groups in terms of changes in upstream oil production across the decade. Second, we conduct within-country-case studies of states that had fairly favorable investment frameworks for private investment in the beginning of the 2000s, but gradually undermined the attractiveness of their upstream sectors to private investors over the decade.

[4] Hence the notion of an "oil curse" hindering democratic development and sustaining poverty. See Friedman (2006). The First Law of Petropolitics. Foreign Policy, May/June, 28–36, Ross (2001). Does oil hinder democracy? World Politics, 53, 3, 325–361, Schaffer (2008). Energy Politics. University of Pennsylvania Press, Philadelphia, Wantchekon (1999). Why do Resource Dependent Countries have Authoritarian Governments? Leitner Working Paper 99-12. Yale University, New Haven, CT.

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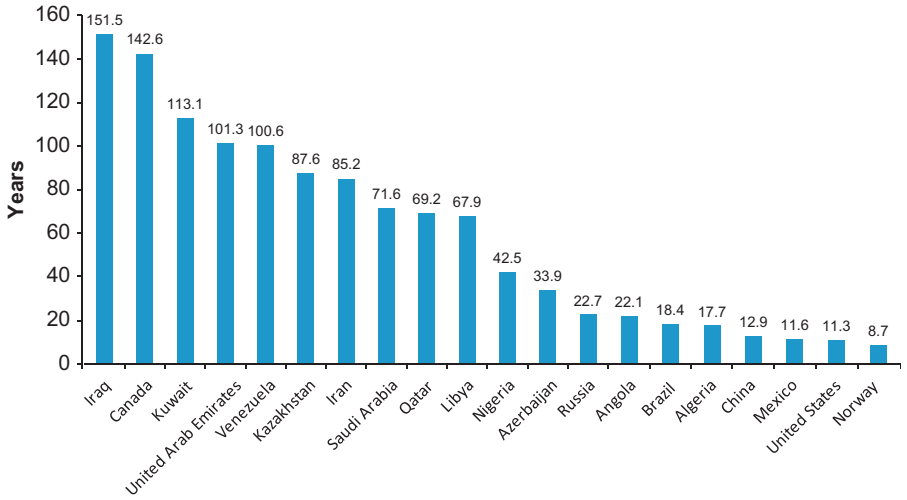

Fig. 1. Top-20 remaining reserves to production ratio 2000–2009.
Source: BP statistical review of world energy 2010.

4.1. Investment framework and oil production trends (2000–2010)

The investment frameworks in terms of openness to private oil sector investors differed in our sample of oil producers. Angola, Azerbaijan, Canada, and Nigeria had relatively favorable investment frameworks for private investors while the remaining cases (Iraq, Kuwait, Libya, Qatar, and UAE) were less open, or barely at all in the case of Iran and Saudi Arabia. Kazakhstan, Russia, and Venezuela began with favorable investment conditions but gradually made their sectors less favorable to private investors during the decade.

Favorable investment frameworks: Measured in terms of our indicators (government policy and ownership shares of private energy companies) Angola, Canada, Kazakhstan, Nigeria, and Russia can be said to have had investment frameworks conducive to the efficient development of their oil sectors. Thus we would expect a positive trend in these countries' oil production over the period under investigation. However, in the case of Kazakhstan, Russia, and Venezuela conditions for private investors worsened over the decade. Here, we would expect an initial positive production trend followed by a production decline (this will be discussed in detail below).

Countries in the favorable group all employed relatively stable regulatory frameworks, which allowed extensive private ownership in their petroleum sectors. Canada and Russia mainly employed a royalty/tax system for their oil sector tax revenue generation, while Angola, Azerbaijan, Kazakhstan, and Nigeria relied mostly on production sharing agreements (PSAs) in joint ventures with domestic and foreign oil companies. Under this arrangement oil companies could recover their exploration costs before paying taxes from the remaining "profit oil". Russia initially also employed PSAs in the 1990s. However, the PSA approach was abandoned after 1998. Canada retained unlimited access to exploring its mineral wealth for private oil companies and Azerbaijan kept its model in place of PSA joint ventures with 25% participation of its NOC, Soccar. In contrast, some restrictions on foreign companies were gradually introduced in Kazakhstan and Russia from the mid-2000s, which will be discussed in more detail in the following section. Nigeria nationalized its oil sector in 1971 and established the national oil company NNCP but stayed comparatively open to private investors as they could continue based on PSAs in joint ventures with NNCP with private shares of up to 50%. However, in the late 2000s the Nigerian government introduced stricter legislation for private investors, including increasing taxes and renegotiating the terms of PSAs to introduce "nigerification" clauses. The worsening security situation in the socially marginalized oil rich Niger Delta also contributed to a declining business climate (see discussion on alternative explanations at the end of this section). Table 1 provides a brief overview of the policies relating to the investment frameworks.

The relatively favorable terms for private investment in Angola, Azerbaijan, Canada, Kazakhstan, Nigeria, and Russia are reflected in Table 2 with substantial private market shares. The private market share of the Russian petroleum sector was close to 80% in the early 2000s as Russia had privatized most of the sector in the mid-1990s (Hill, 2004, p. 10–11; Hill and Fee, 2002). As can be seen from Table 2, this share decreased during the 2000s. However, approximately 53% of the Russian oil sector remained formally in private hands by 2008.

Less favorable investment frameworks: Compared to the group of favorable countries, the upstream oil sectors of our remaining cases were less favorable to private investors. Thus, we would expect a stagnating trend in these countries' oil production over the period under investigation. The oil producing countries with less favorable investment frameworks can be divided into two main groups: (1) totally closed upstream sectors and (2) partially closed upstream sectors. In the first group are Iran, Iraq, Kuwait, and Saudi Arabia. These four countries all nationalized their oil sectors in the 1970s and 1980s and closed them to private investors by setting up state-owned NOCs with monopoly status to upstream oil production and exploration.[5] Over the course of the 2000s some attempts were made by Kuwait and Iran to liberalize their sectors allowing for so-called service contracts (buy-back contracts in the case of Iran).[6] These contracts would allow private operators to invest in short-term exploration or upgrade existing fields in return for a fixed fee. The service contracts, however, did not succeed in attracting much interest from private investors.

[5] In Saudi Arabia, Texaco (later Conoco) retained one concession in the neutral zone between Saudi Arabia and Kuwait.

[6] Since 1987 the Iranian Petroleum Act has allowed for so-called buy-back contracts which grant private companies the right of oil exploration. But once production starts, the companies receive remuneration and production rights are transferred back to the state. This provides private companies with little incentive to be involved in the Iranian oil sector because they bear all the risk of a potentially non-productive exploration (dry holes) and have no prospects for long-term income from a productive exploration.

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Table 1
Petroleum investment framework policies for upstream exploration and production.
Source: BMI various years.

Government policy for upstream exploration and production 2000–2010		
Country	**Contract scheme**	**Gov. policy summary**
Angola	PSA, JVs, private majority allowed.	NOC Sonangol (1976) is responsible for co-coordinating and controlling all petroleum activities. Main strategy is to enter into JV's with private oil companies. 36 new E&P contracts signed in 2006. Companies recoup expenditures through cost oil and share excess profits on a sliding scale. Royalty payments and signature bonuses when exploration blocks are auctioned.
Azerbaijan	PSA, JVs, private majority allowed.	Government administers oil and gas sector including licensing policy and contractual terms for joint ventures with private companies, mostly on PSA-basis. National oil company SOCAR (1992) participates in all oil/gas exploration/production concessions with private companies with a preferred ownership share of min. 25% and runs the country's oil/gas imports/exports. Azerbaijan's legislature ratified three PSAs in 2005.
Canada	Concession based on royalty/tax model. Provinces legislate.	Government involvement in petroleum sector limited to regulatory issues and issuing of concessions. Full final privatization of PetroCanada in 2005. No restriction on private domestic or foreign ownership. Provinces play a leading role in exploration and development of their respective subsoil resources. Taxes range from 1–50% depending on provincial legislation, oil prices, and conventional or unconventional oil production. In 2007–2009 Alberta initiated a new royalty framework to increase its tax take from oil sands, although subsequent temporary tax breaks were granted and a 5% flat rate on all new exploration in 2009–2010 was implemented.
Kazakhstan	PSA, JVs, private majority allowed.	The state determines licensing and dictates terms for JV partners. A 2005 law limited foreign participation in new Caspian Sea production JVs to 50%. Existing contracts were left unaffected. In October 2005, legislation was adopted allowing government pre-emptive rights on all strategic assets or resources. A law passed in 2007 allows government unilaterally to break contracts with foreign investors and make retrospective changes to existing contracts with domestic and foreign energy companies. Government intention to revise 1990s PSA, making these subject to 2009 mineral tax code. PSAs from 1990s taxed using a tax-stability clause. Later, PSAs were taxed using excess profit tax system where tax is levied progressively on remaining income after corporate income tax is paid. 2009 tax code introduced a new mineral extraction tax on energy companies (not 1990 PSAs).This tax burden is partly offset by a reduced corporate tax rate.
Nigeria	Joint Ventures based on PSA with NNCP in majority role.	Since nationalization in 1971, the Nigerian oil sector is controlled by national oil company NNCP. Foreign private companies are allowed extensive shares in JVs with NNCP (up to 40%). Reforms launched in 2000 to privatize NNCP and deregulate the oil sector. Reform bill presented in 2008 to increase government take and reduce government investment in oil and gas projects and to pass on costs/risks to private companies. The new legislation requires foreign companies to increase share of local employment and implement social community schemes. Oil and Gas Industry Content Development Bill (2010) requires oil/gas companies to use a greater share of indigenous service companies and personnel and to deposit 10% of annual profits in Nigerian banks. Flare up of violence in Niger Delta in 2000s over social and distributional issues. Government unable to solve tension although 2009 amnesty program for militants in the Delta dampened violence in the short term.
Russia	Concession based on royalty/tax model. A few PSAs from 1990s	Few PSAs signed in 1990s, but approach was abandoned after oil price surge post-1998 with priority given to domestic private oil companies. In 2003 the Russian government accused major oil company Yukos of large-scale tax evasion and in 2004 most Yukos assets were auctioned off. In 2006 Yukos was declared bankrupt and remaining assets sold to state-owned oil/gas companies Rosneft and Gazprom. A new 2008 law limited sales of shares abroad in strategic industries to 25–30%, including minerals. New legislation of 2008 set minimum government share in new offshore oil/gas projects to 50%. In 2008 mineral extraction tax and export duties hiked to app. 68% on gross revenue but minimum tax threshold raised. In 2009 tax exemptions were granted for Black Sea and Sea of Okhotsk explorations.

Table 2
Upstream oil sector: market shares of key players.
Source: BMI various years.

Country	Private				State				Other state/private			
	2004	**2006**	**2008**	**2010**	**2004**	**2006**	**2008**	**2010**	**2004**	**2006**	**2008**	**2010**
Angola	51.1	64.7	58.6	51.2	47.0	35.3	35.3	37.0	1.9	0.0	6.1	11.8
Azerbaijan	34.2	45.1	53.6	35.7	62.0	52.7	46.4	44.1	3.8	2.2	0.0	20.2
Canada	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kazakhstan	58.1	48.3	31.0	37.0	7.4	12.0	26.1	35.7	34.5	39.7	42.9	27.3
Nigeria	44.0	44.0	41.0	46.6	56.0	44.0	44.0	45.7	0.0	12.0	15.0	7.7
Russia	79.0	72.0	54.9	52.7	n.a.	23.0	32.5	33.9	21.0	5.0	12.6	13.4

The Iraqi oil sector was nationalized in 1972 and was wholly state-owned until the regime change in 2003. The post-2003-Iraqi oil sector remained closed to private investors as the new elected parliament debated the introduction of a new petroleum law that would eventually open the upstream sector to private investors. Meanwhile, the Kurdish Regional Authority initiated its own legislation and committed to several production sharing agreements with foreign oil companies in the late 2000s despite doubtful legality.

In contrast Libya, Qatar, UAE, and the Venezuela, all allowed for some domestic and foreign private investment in their

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upstream oil sectors. The oil sectors of Libya, Qatar, and Venezuela were all controlled by state-owned oil companies, but experiments were made in the late 1990s and early 2000s to liberalize and allow for greater private participation in upstream oil production and exploration. Particularly Venezuela reversed course by the mid-2000s and tightened the terms for private foreign ownership through new petroleum and tax legislation. Libya and Qatar sustained their qualified openness to private investment. The UAE never fully nationalized its oil sector and has a long history of allowing international oil company participation in its upstream petroleum sector based on a joint venture/PSA-basis. In Abu Dhabi, by far the most important oil producer of the UAE, private participation in joint ventures is, however, mostly limited to app. 40%. Table 3 summarizes the policies.

The comparatively unfavorable terms for private investment in the 8 countries mentioned above are reflected in relatively minor or non-existent private market shares (see Table 4). Evidently, Saudi Arabia, Iran, Iraq, and Kuwait had 100% state-owned upstream sectors (2000–2010) whereas the private domestic and foreign markets shares varied somewhat in the other 4 oil producers. At the lower end was Venezuela with a private market share of approximately 10–12% shared by numerous international oil majors and independents. Libya (after 2003–2004), Qatar, and the UAE all had private markets shares in the area of at least 20%.

To summarize, the state of government policies and market structures in Iran, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, UAE, and Venezuela are comparatively less favorable to private investment in the upstream oil sector. To the extent that the theoretical arguments in section two hold true, this leads us to expect anemic growth in oil output over the 2000–2010 period. In the following section we investigate the actual production trends and compare across the two groups of oil producers.

Table 3
Petroleum investment framework policies for upstream exploration and production.
Source: BMI various years.

Government policy for upstream oil exploration and production 2000–2010		
Country	**Contract scheme**	**Gov. policy summary**
Iran	Buy-back contracts	Constitution forbids foreign investors equity stakes or concessionary rights in upstream sector. 1987 Petroleum Act introduced short-term buy-back contracts. Foreign investors receive fixed rate of return and bear all risk. All operations transferred to the state when contract expires. Since 2007 buy-back contracts can be extended up to 20 years. Since 2008 U.S. and European foreign investors froze Iran investments due to U.S. and UN sanctions over Iran's nuclear program.
Iraq (post 2003)	Service contracts of up to 20 years	After the 2003 US-led Iraq war, the new Iraqi government decided in 2008 to cancel earlier oil contracts with foreign companies signed under Saddam Hussein's government. Kurdish Regional Government of Iraq (KRG) adopted its own petroleum legislation in 2007 based on a PSA approach. This was opposed by the central government. A new Iraqi hydrocarbon law under discussion since 2007 but not concluded by 2011. Two biddings rounds for existing fields held in 2008–9. In 2009 an oil bidding round for new exploration was announced offering fields under long-term service contracts.
Kuwait	Service contracts of up to 20–25 years in joint ventures with KPC.	Constitution forbids foreign ownership in the oil sector since nationalization in 1970s. Upstream oil sector exclusively run by national oil company KPC. Kuwaiti plan to boost crude oil output to 4 mn b/d by 2020 based on plan "Project Kuwait" from late 1990s. Draft legislation presented in 2003 envisaging foreign oil company participation to achieve plan. Foreign participation to be based on service contracts with fixed fee payments and KPC participation in all projects. First service contract signed with Royal Dutch Shell in 2010.
Libya	Joint ventures based on PSA with NOC. NOC retains majority share in JVs.	Oil industry run by state-owned NOC. U.S. and U.N. sanctions against Libya from mid-1980s were lifted between 2003–2006 opening for return of foreign oil companies. Major bidding rounds for PSAs held in 2005–2006 with numerous foreign investors bidding for oil exploration and production contracts. In 2009 Libyan leader Muammar Qadhafi called for the renationalization of Libya's oil industry.
Saudi Arabia		Upstream oil sector closed to foreign investors since 1975 save for one Chevron license in Partitioned Neutral Zone shared between Saudi Arabia and Kuwait. Chevron license extended in 2008 for 30 years. The key OPEC producer Saudi Arabia aims to maintain 1.5–2 mn b/d in spare crude oil production capacity.
Qatar	PSA, JVs, private majority allowed.	National oil and gas company Qatar Petroleum responsible for exploration and production licenses and regulation of the nationalized up- and downstream petroleum sector. Government launched process to increase oil and natural gas output in late 1990s and to extend lifetime of existing oil fields. Assistance of foreign oil companies deemed necessary to reach this goal. PSAs were introduced allowing foreign private investors majority shares in production and exploration projects.
UAE	Joint ventures based on PSA (Abu Dhabi). Foreign investor share max. 40% in most cases.	Long history of involvement of private domestic and foreign oil companies in upstream oil sector. The seven emirates control their own resource development, most allow private investment in upstream oil sector. Abu Dhabi's NOC ADNOC secured privileged position as private foreign investors are allowed max. 40% share in joint ventures.
Venezuela	Joint ventures based on PSA with minority role for foreign investors since 2007	Nationalized upstream oil sector since 1975. In 1990s PSAs were offered to private foreign investors. 2001 hydrocarbons law ensured NOC PdVSA holds a 51% stake in any new exploration. Major strikes in PdVSA over government reforms in 2002, government firing of 19,000 employees. Between 2005 and 2007 government revised existing oil concession agreements with foreign oil companies, transforming these into joint ventures with PdVSA being the major shareholder and operator. Also, tax authorities issued a number of back-tax claims against foreign oil companies. Several major foreign oil companies subsequently exited Venezuela. 2009 law permitted government to expropriate oil service companies when deemed to be in national interest.

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Table 4
Upstream oil sector: market shares of key players.
Source: BMI various years.

Country	Private				State				Other state/private			
	2004	2006	2008	2010	2004	2006	2008	2010	2004	2006	2008	2010
Iran	2.1	5.0	2.4	1.3	97.7	85.0	85.2	94.0	2.3	15.0	14.8	5.5
Iraq	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Libya	11.8	27.2	23.9	22.6	51.2	43.0	42.7	50.8	37.0	29.8	33.4	25.3
Qatar	22.4	16.5	11.4	23.0	58.7	46.2	46.2	33.0	18.9	37.3	42.4	44.0
Saudi	0.0	1.0	1.0	1.0	100.0	99.0	98.6	99.0	0.0	0.0	0.4	0.0
UAE	21.8	21.0	21.5	19.3	60.0	60.0	69.0	68.0	18.2	19.0	9.5	12.7
Venezuela	12.8	20.0	9.2	8.5	55.0	71.0	70.0	70.0	32.2	9.0	20.8	21.5

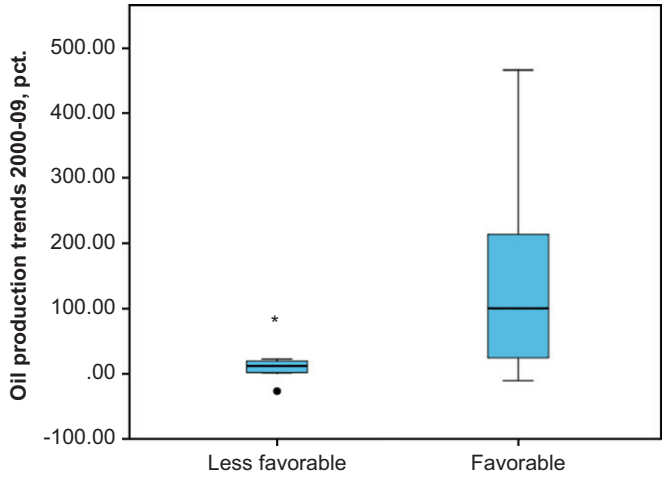

Fig. 2. Oil output changes 2000–2010, favorable and less favorable investment frameworks.

4.2. Upstream oil production trends 2000–2010

When analyzing oil production trends across our 14 cases it is immediately clear that many of them, irrespective of private or state-ownership, managed to increase their oil production. However, there are noticeable differences in the percentage changes and extent of increases. As we demonstrate below, it is plausible that these changes may be systematically linked to whether the investment framework encouraged or discouraged private investment.

Looking at the 6 cases with favorable investment frameworks for private investment, they all displayed positive growth in terms of output over the 2000–2010 period. The median change was app. 101% in output over 10 years. However, the variability between the 6 cases was considerable with Nigeria showing a growth of −11% while Azerbaijan at the other extreme increased output by 467% (see Fig. 2). Russia also increased output by approximately 61% while crude oil output from Canada, Angola, and Kazakhstan went up by 24%, 141%, and 214%, respectively.

The high growth rates in Kazakhstan and Azerbaijan is probably linked to the fact that oil production there only began after gaining independence in 1991. Thus, oil production grew from a very low base. Angola, Canada, and Russia, on the other hand, were mature oil producers by the 2000s with Canada beginning to exploit its vast but technically challenging Albertan tar sands. Nigeria stood out with a decline of 11%, which can probably not be seen in isolation from the poor security situation in that country.

Among the countries with less favorable investment frameworks for private investment the median change was app. 11.5% growth. However, there was significant variability. At the bottom was Venezuela with an output decline of approximately −25% over the decade, while at the other extreme in this group was Qatar with an output growth of 94%. Most of the 8 cases in the "less favorable" group, however, saw increase in the range of 1–15% (see Fig. 3).

In terms of the box plots from Fig. 2, it is quite clear that the countries with favorable investment conditions appeared to have higher output growth compared to the less favorable group. However, since the global economic crisis had major implications for global crude oil demand we also compare the years 1997–2007 before the crisis and over the entire 1997–2010 period in Fig. 3.

1997–2007 covers a period of slowly increasing global crude oil prices (disrupted by the 2001 recession) and this is why we would expect some positive output growth in all countries given that the hypothesis is correct. It is evident that the "favorable" group responded more strongly to the price incentive. However, irrespective of the specific choice of timeframe, the pattern seems consistent in that countries with favorable investment frameworks for the hydrocarbon sector and sizable private market shares displayed higher output growth than the "less favorable" group, albeit with quite some variability within each group.

The variability in each group renders the results somewhat ambiguous, however. Contrary to our expectation, Canada displayed slower growth than Qatar for instance. Although we do not disregard contrary evidence, the Canadian case probably cannot be seen in isolation from the fact that the costs of extracting oil from the Canadian tar sands are higher than onshore/offshore conventional oil production in the Middle East, for instance. Nevertheless, it is again noteworthy that all countries with investment frameworks favorable to private investors are in the top half of the sample. Also, it may be no coincidence that strong output growth in Qatar coincided with that country's opening of the upstream oil sector to private investors in the late 1990s and early 2000s.

Of course, our conclusions have to be made with some caution as our sample of 14 major oil producers is a small one rendering a statistically meaningful hypothesis test difficult. Nevertheless, a non-parametric Mann-Whitney test analyzing if there is systematic variation between the two groups results in a p-value of 0.06 indicating that the null-hypothesis (i.e. no effect of inv. framework) should be retained. However, controlling for Nigeria (riots in oil producing regions) yields a p-value of 0.02 i.e. significant. However, due to the very small numbers, it is difficult to make strong statistical conclusions. In short, we have reason to believe that investment frameworks may be an important explanation for the variance in output trends in major oil producing countries.

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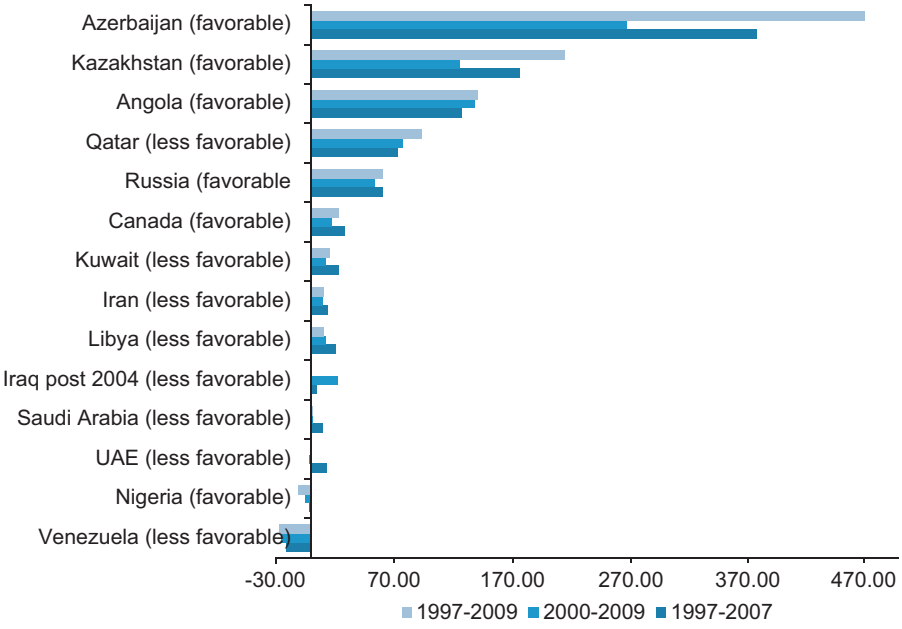

Fig. 3. Upstream oil production change, pct.

4.3. *From favorable to less favorable petroleum investment frameworks*

While the petroleum policies regarding investment frameworks were relatively stable in most of the countries under study here in 2000–2010, three stood out with significant policy changes during the course of this decade: Russia, Venezuela, and Kazakhstan. These three states initially had favorable investment frameworks for private investors but changed policy over the decade towards stronger resource nationalism. According to the argument presented in section two, this would lead to the expectation that growth trends in their production output would be affected negatively (with a time lag). In the following we conduct a more detailed analysis of these three countries.

Russia: The Russian upstream oil sector was gradually carved up and partially privatized in the mid-1990s. What ensued in 1993 was the creation of a series of private domestic oil companies including LukOil, YUKOS, Surgutneftegaz, TNK, and Sibneft alongside Russian state-owned oil company Rosneft (Hill and Fee, 2002, p. 4). The privatization program persisted to the early 2000s, during which the government continued to relinquish its oil sector assets. By 2004, Russia's private domestic oil companies collectively produced more than 85% of the country's oil (Luong and Weinthal, 2010, p. 129). Foreign private investment in the Russian oil sector remained quite low throughout the 1990s compared to private domestic investment. However, by 2001 BP entered a joint venture with TNK and ExxonMobil committed 4 billion USD to its Sakhalin 1 oil and gas development in Russia's Far East (Hill and Fee, 2002, p. 6–7).

The Putin presidency beginning in 2000 is associated with a gradual turnaround in the Russian oil sector policy of the 1990s in what may be termed a "creeping renationalization". Initially, Putin continued the privatization policy of the previous decade. It was not until 2003, when the Russian government accused major oil company Yukos of large-scale tax evasion, that the state took a major step towards renationalization. By 2004, most of Yukos' assets were seized and auctioned off, with Baikalfinansgroup being the major buyer. Several days later, news emerged that state-owned company Rosneft had purchased 100% of the Baikalfinansgroup. In 2006, Yukos declared bankruptcy and its remaining assets were sold to state-owned oil/gas companies Rosneft and Gazprom. The state's increasingly assertive stance towards private investors, often through claims of license infringement, served to further heighten uncertainty in Russia's investment climate. This was evidenced by the dilution of Shell's interest in the Sakhalin II PSA, the 'negotiated' purchase of BP's interest in the giant Kovytka gas field, and the recent corporate governance issues at TNK which led to the resignation of the BP elected CEO (DB-Research, 2010, p. 193). By the end of the decade a series of new laws also exerted greater pressure on private oil companies operating in Russia. In 2008, the Strategic Investment Law was introduced which limited the sale of shares abroad in strategic industries to 25–30%, including minerals. In the same year, a new piece of legislation set a minimum government share in new offshore oil/gas projects to 50%. In 2008 mineral extraction tax and export duties were hiked to approximately 68% on gross revenue. In short, Russia's initial favorable investment framework gradually became much less friendly to private oil companies over the 2000–2010 period.

Kazakhstan: When it gained independence in 1991 Kazakhstan opened its hydrocarbon sector to private ownership, aiming especially to attract foreign investment. The Kazakh government chose not to nationalize its oil and gas sector, and so effectively relinquished direct claimant status to oil wealth proceeds (Luong and Weinthal, 2010, p. 261). In order to attract foreign investors, the state established a legislative framework that provided assurances and guarantees for foreign companies, including provisions in the constitution for private ownership of natural resources, and mechanisms for dispute resolution and contractual stability; a full-blown privatization of its petroleum sector followed. The government, through a competitive tender process, sold off the majority of its stakes (greater than 50%) in production, refining, and export facilities to a large number of foreign investors (Luong and Weinthal, 2010, p. 259). Licensing agreements in the form of both concessions and PSAs were negotiated on an individual basis and were awarded to a number of IOCs, including Chevron, ExxonMobil, and ENI.

This policy gradually began to change with the creation of the national oil and gas company Kazmunaigas (KMG) in 2002. The company was established to promote and represent the state's interests and enabled it to exert greater influence in the

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hydrocarbon sector. By January 2005, the hitherto favorable Kazakh policy towards private investors began to unravel as the government passed a new law concerning future offshore PSAs by limiting foreign participation in such ventures to 50% with no guarantee of operator status; KMG would claim the remaining 50% of each deal. The legislation left existing contracts unaffected, however. In October of the same year, a Subsoil Use bill was adopted granting the state pre-emptive rights on all strategic assets or resources up for sale in Kazakhstan. The law allows KMG to buy these assets and enables it to secure stakes in several of the country's biggest hydrocarbon projects, thus effectively crowding out private investors from new exploration projects (IEA, 2010). An additional amendment made to the law in 2007 further permits the state to make retrospective changes to any existing oil contracts or annul the contracts if they are deemed a threat to national security (EIA, 2010). Although the state has not reneged on its initial long-term licensing agreements, it has pressured private investors to re-negotiate existing contractual terms, thus contributing to greater uncertainty in the investment climate. In 2008, the Kazakh government officially announced that no new PSAs would be awarded. In the same year, the state's increasingly assertive stance towards IOCs was underscored when it negotiated a greater equity interest for KMG in the huge Kashagan oil project.

The legislative reforms of 2005 signified the beginning of a gradual change in Kazakhstan's hydrocarbon policy towards a greater state role in the oil sector. Within a decade, the Kazakh government went from being favorable to private investment in the hydrocarbon sector to increasingly limiting the scope of private oil companies over the decade.

Venezuela: Venezuela nationalized its upstream oil sector in 1975 and closed it off to foreign private investors. In the 1990s, this policy was reversed as the government through the so-called "Apertura"-policy sought to incentivize foreign investment into the country's oil sector and develop the heavy crude oil sands of the Orinoco Belt (Bremmer and Johnston, 2009, p. 153; DB-Research, 2010, p. 387). The state offered companies a low royalty rate of 1%, a minority stake for the national oil company PdSVA, and an income tax of 34% (Witten, 2008). By the late 1990s almost 60 foreign companies, including ExxonMobil, ConocoPhillips, Chevron, BP, and Total, had invested heavily in one or more aspects of Venezuela's oil sector.

The Apertura-policy was abolished with the electoral victory of President Hugo Chavez in the 1998-elections. In 2001, a new Hydrocarbons Law was enacted that raised royalty rates, required PdSVA-majority in all new joint ventures with the exception of those projects targeting extra-heavy crude oil production, and stipulated that all new projects take the form of a joint venture with PdSVA. The royalty rate was increased to 16.6% from 1% in 2004 and back-tax claims amounting to approximately 4 billion USD were issued. The policy change continued in 2005 when the Venezuelan government annulled 32 existing oil exploration and production contracts and required their renegotiation under the terms stipulated in the 2001 Hydrocarbons Law. New terms included among other things a 51% majority share for PdSVA in JVs (Witten, 2008). Companies which failed to come to a compensation agreement, notably Total and ENI, effectively had their assets expropriated. In 2006, the government imposed a heavier fiscal burden on private companies by introducing a new 33.33% extraction tax and raised corporate income taxes to 50%, up from 34%. In addition, the government decided that PdSVA should take over operational control of all oil fields including four heavy-oil "Strategic Associations" in the Orinoco Belt. While many foreign oil companies agreed to the new terms, Chevron and ExxonMobil decided to pull out of the country with their stakes consequently being absorbed by PdSVA (Witten, 2008). In May 2009, the National Assembly passed an oil services sector law reserving to the state all primary hydrocarbons activity. This legislation laid the foundation for the expropriation of nearly 80 oil services companies (U.S. State Dep. 2010). In short, little doubt remains that the previous open-door policy from the 1990s underwent a radical change since 2001, which made it increasingly more difficult and unpredictable for foreign private oil companies to do business in Venezuela.

4.4. Trends

Russian oil production increased 61% in 1997–2009. However, the increase primarily took place between 1997 and 2004, with an increase of 49% or an average of 5.8% annually. Production growth drastically tapered off in 2005–2009, posting only a 5.2% increase, or an average of 1.3% annually. In Venezuela oil production decreased by 26.3% in 1997–2009. The trend was a steady decline interrupted by a small rebound in oil output in 2004–2005, after which the decline continued. In contrast, Kazakh oil production steadily increased, although the rate of increase slowed from 2005 onwards when compared to the 1990s and early 2000s. Over the 1997–2009 period, production increased by 214%. However, in 1997–2005, production increased by 253%, or 12% annually, but only by 18% in 2006–2009, or 4.2% annually (see Fig. 4).

The main argument analyzed in this paper seems to be corroborated in all three case studies, but with different grades of impact. The hypothesis was that the change from favorable policy frameworks incentivizing investment by private oil companies towards less favorable policies would negatively impact production trends over time. In all cases, a shift in government policy from a favorable one to a less favorable one was followed by stagnation (Russia), outright decline (Venezuela), and slower growth (Kazakhstan).

No doubt, the Russian output increase in the late 1990s and early 2000s may be related to the peculiar circumstances in the country during the early economic transition phase in the mid-1990s. In this period Russia's oil sector was rebounding from the economic turmoil after the Soviet breakup in late 1991. However, it is hard to avoid the conclusion that the policy of privatization played a key role in Russia's production output trend as the strong growth in Russian oil production coincided with privatization. Also, it is striking that growth wore off as the state-owned market share was increased after 2005 as government ownership of the oil sector grew and private investors faced an increasingly uncertain regulatory environment, although this could also be partly attributed to the depletion of old fields. However, depletion of old fields and their non-replacement may also reflect a lack of re-investment in new exploration exactly due to an increasingly unfavorable investment framework in the country. Although the global financial crisis no doubt played a role in some of the stagnating production after 2008, the stagnation had already set in by 2005 in a time of very high oil prices.

The precipitous decline in Venezuelan oil production may be attributed to the decrease of the private market share of oil companies as a result of increased fiscal burdens, the annulment/renegotiation of contracts and expropriations. In addition, the country's trend toward nationalization, heavy fiscal burdens, and increasingly unpredictable investment climate for private oil companies made it more difficult to attract necessary foreign capital investments and competitive bids from qualified oil service companies. At the same time, the number of PdSVA employees nearly doubled from when Chavez was elected into his first term. This may have placed an even greater financial strain on an already overburdened company and diverted financial resources away from re-investing in new oil projects.

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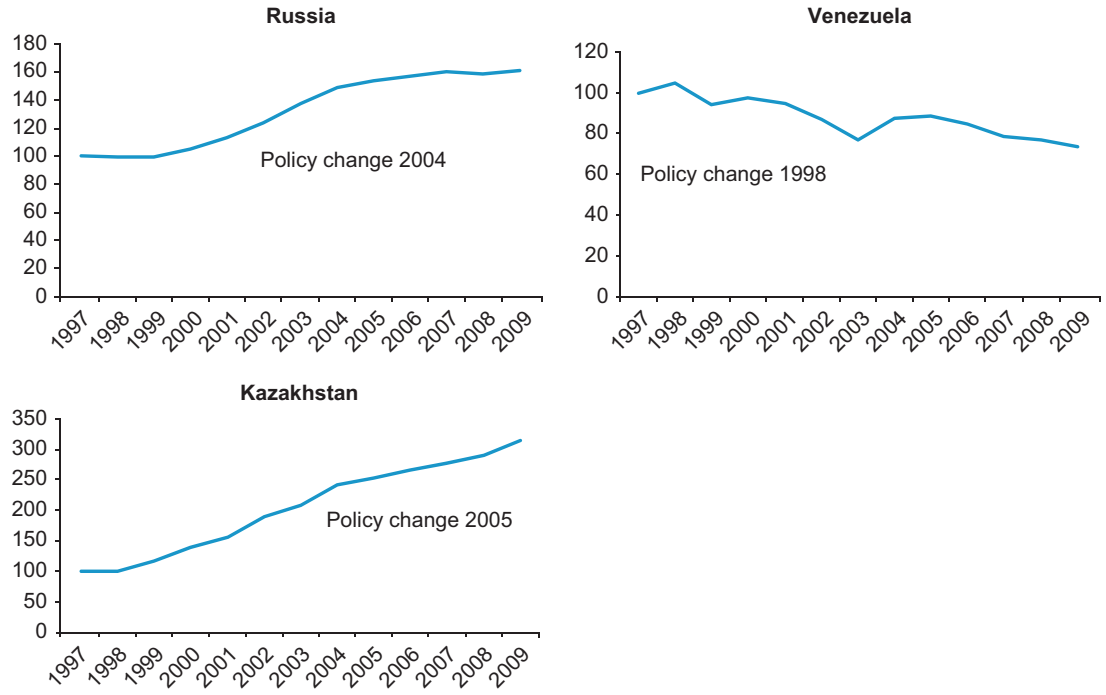

Fig. 4. Indexed oil production trends, 1997–2009.

In Kazakhstan, the initially very strong production growth rates coincided with its privatization efforts in the mid-1990s to early 2000s. It is interesting to note that it was not until 2005, where oil sector investment policy changed, that the rate of oil output declined. However, despite the government's efforts to expand control over its domestic oil market, private companies still managed to maintain a relatively large market presence, which may have contributed to the continued positive, albeit slowing, growth rates in oil production. An additional factor impacting production growth may have been the financial crisis in 2008; however, the break in growth trends occurred before the crisis. In short, the results of our case studies support the general argument outlined in this paper.

4.5. Alternative explanations

As in any factor-centric study we have to deal with the possibility that our selected independent variable explains less of the variability in the dependent variable than other factors that may also affect this. As already mentioned in the methodology section, we sought to reduce the impact of alternative explanations by choosing cases with a 20-year RPR, ensuring systematic variation in our independent variable, and profiting from a most dissimilar research design which helps to isolate potential effects of country-specific factors. Still, a few important omitted factors merit further discussion: OPEC, the cost of oil extraction, and exceptional country-specific issues related to Iran, Iraq, and Nigeria.

OPEC: OPEC represents a potentially powerful alternative explanation. As an oil cartel, it naturally has a vested interest in keeping output growth low in order to limit the global oil supply and keep prices high. Indeed, there is a close overlap between OPEC membership and countries with relative slow output growth (2000–2010). OPEC quotas could thus potentially explain oil production trends in the member states vs. non-OPEC. This said, there are marked differences among OPEC members. For instance, Angola showed strong output growth in 2000–2010, and this coincided with a favorable investment framework for private investment. Conversely, Venezuela demonstrated a decline of app. 25% in output and consistently produced below its OPEC crude oil production allocations. In fact, in a 2010 study, Reynolds and Pippenger find that Venezuelan production has nothing to do with OPEC quotas at all and suggest that institutions (petroleum policy) are a major cause (Reynolds and Pippinger, 2010). Qatar staged impressive growth and consistently breached its production allocations. Although OPEC undoubtedly does account for some of the variation in upstream oil sector trends, this indicates that it is unlikely to be the whole story. In general, OPEC experts agree that the cartel had its heyday in the early 1970s but has been much less powerful since, not least owing to collective action problems within the organization. Although OPEC has had some success in slowing the growth in new oil production capacity, compliance with the organization's production quotas has historically been quite low. Violations of OPEC quotas is more the rule than the exception, with member countries not complying with the set quotas 86.78% of the time (1982–2001; Dibooglu and AlGudhea, 2007; Molchanov, 2003; Smith, 2008). Likewise Bremond, Hache, and Mignon in a recent study found that OPEC since the mid-1970s has acted like a price taker most of the time and that there are major divergences within the cartel (Bremond et al., 2010).

Extraction costs: Another potentially highly important omitted factor influencing upstream production trends is the ratio between oil extraction costs and the global oil price. Arguably, the cost of extracting oil and the risks of exploring new fields differ from country to country depending on geology, onshore or offshore drilling, water depths, as well as climate. For instance, extraction costs for Canadian tar sands and ultra deep offshore exploration are high compared to onshore Middle East/North African oil (Jojarth, 2008; Verbruggen and Marchohi, 2010). Taking extraction costs into account, however, strengthens the overall finding of the study. Thus, countries with the lowest extraction cost, e.g. the Middle East, demonstrated slower growth in upstream production on average (2000–2010) than countries with higher costs including the Canadian tar sands.

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Iran, Iraq, and Nigeria: Finally, exceptional circumstances are hard to ignore in the case of Nigeria, Iraq, and Iran (2000–2010). Before 2003, Iraq was under an international oil embargo. After the 2003 US-led invasion and subsequent regime change, Iraq was rife with political instability and violence, hence increasing risks to investors. For most of the decade Nigeria also saw a flare up in domestic violence in the Niger delta, where sabotage and terrorist attacks by groups fighting the central government and the international oil companies were operating. In the case of Iran, five UN Security Council resolutions (1696, 1737, 1747, 1803, and 1929) were adopted after 2006 to dissuade that country from its nuclear ambitions (in addition to US unilateral sanctions from 1995). While we cannot rule out that domestic instability substantially affected output trends in Iraq and Nigeria, in the case of Iran, sanctions were unlikely to have had a major impact. This is because the first two rounds of sanctions from 2006 and 2007 mostly targeted nuclear components, freezing financial assets and barring traveling for named individuals, and thus could not have already made a great impact on output trends between 2000 and 2010.

5. Conclusion

The preceding analysis lends support to the hypothesis that political–institutional conditions for upstream oil sector investment have an important impact on eventual trends in production. Drawing on existing literature regarding resource nationalism and NOCs, we suggested that whether the investment framework in oil producing countries favored private investors or discouraged them would be important. This is because state-owned domestic monopolies in the upstream sector would in all likelihood be comparatively less efficient investors than their private counterparts. The reasons for this include the fact that such NOCs are prone to managerial inefficiency and are caught in the middle of domestic politics due to their importance for government revenues. In short, countries with less favorable investment frameworks are likely to respond sluggishly (or not at all) to the global crude oil demand structure compared to private investors. Our analysis of investment frameworks in 14 major oil producers indicates that this factor explains a fair deal of the variation in oil production trends across countries, although it is not the whole story. Among the 14 countries, six had upstream oil sectors with reasonable favorable conditions for private investors with conditions changing in Russia and Kazakhstan over time. These countries were all in the top half of the sample in terms of production increases over the decade. Conversely, eight countries with less favorable investment displayed more sluggish growth or even negative growth. Qatar was the only country with less favorable investment conditions that showed more positive signs. Interestingly, it experimented with market reform during the 2000s. Of course, this is not the only important factor to take into consideration as oil production trends are influenced by many variables. Arguably, OPEC membership and differing cost of oil extraction are two important alternative explanations. However, the market power of OPEC should not be overestimated and oil extraction costs actually accentuate the central argument as costs were higher in countries with stronger output growth.

The main implication of the study is that when oil producing countries embark on a path of oil sector governance focused on state-ownership, the likelihood increases that oil exports from the country may suffer down the road as chances are the country will not fully maximize its full net export potential based on its reserves. The result is that less oil is released into the global oil market resulting in an upward pressure on the global oil price. This is bad news for the coming decade as the global oil demand is expected to pick up after the economic recession in 2008. Assuming an oil savings potential of 2–3%, the IEA projects global oil demand to increase from app. 85 mb/d in 2009 to 90–92 mb/d in 2015 (1–1.4%) while output is expected to rise from 91 mb/d in 2009 to 96.5 mb/d in 2015 (IEA, 2010). From this scenario it appears that there is sufficient spare capacity in 2015 to satisfy oil demand. However, whether production will actually be able to grow as much as expected remains a question when viewed against our findings.

References

al-Obaidan, A.M., Scully, G.W., 1991. Efficiency differences between private and state-owned enterprises in the international petroleum industry. Applied Econometrics 23, 237–246.

Bremmer, Ian, Johnston, Robert, 2009. The rise and fall of resource nationalism. Survival 51 (2), 149–158.

Bremond, Vincent, Hache, Emmanuel, Mignon, Valerie, 2010. Does OPEC Still Exist as a Cartel? An Empirical Investigation, Economix working paper 2011-05. University Paris Ouest, Paris.

Brumberg, Daniel, Ahram, Ariel I., 2007. The National Iranian Oil Company. James A. Baker III Institute for Public Policy, Houston.

DB-Research, 2010. Oil and Gas for Beginners. Deutsche Bank, Frankrfurt & New York.

Dibooglu, Sel, AlGudhea, Salim N., 2007. All time cheaters vs. cheaters in distress: an examination of cheating and oil prices in OPEC. Economic systems 31, 292–310.

Domjan, Paul, Stone, Matt, 2010. A comparative study of resource nationalism in Russia and Kazakhstan. Europe-Asia Studies 62 (1), 35–62.

Eller, Stacy, Hartley, Peter, Medlock, Kenneth B., 2007. Empirical Evidence on the Operational Efficiency of National Oil Companies. James A. Baker III Institute for Public Policy, Houston.

Friedman, Thomas, 2006. The first law of petropolitics. Foreign Policy, 28–36.

Hartley, Peter, Medlock, Kenneth B., 2008. A model of the operation and development of a national oil company. Energy Economics 30, 2459–2485.

Hill, Fiona, 2004. Energy Empire: Oil, Gas and Russia's Revival. The Foreign Policy Centre, London.

Hill, Fiona, Fee, Florence, 2002. Fueling the future: the prospects for Russian oil and gas. Demokratizatsia 10 (4), 462–487.

IEA, 2009. World Energy Outlook 2009. International Energy Agency, Paris.

IEA, 2010. Medium Term Oil and Gas Markets. International Energy Agency, Paris.

Jaffe, Amy Meyers, 2009. OPEC: an anatomy of a cartel. In: Luft, G., Korin, A. (Eds.), Energy Security Challenges for the 21st Century. ABC Clio, Santa Barbara, CA.

Jaffe, Amy Meyers, Soligo, Ronald, 2007. The International Oil Companies. James A. Baker III Institute for Public Policy, Houston.

Johnston, Daniel, 2008. Changing fiscal landscape. Journal of World Energy Law and Business 1 (1), 31–54.

Jojarth, Christine, 2008. The End of Easy oil: Estimating Average Production Costs for Oil Fields around the World, Working paper #72. Stanford University, Stanford.

King, Gary, Koehane, Robert, Verba, Sydney, 1994. Designing Social Inquiry: Scientific Inference in Qualitative Research. Princeton University Press, Princeton.

King, Ronald F, 2003. The Strategy of Research: 13 Lessons on the Elements of Social Science. Department of Political Science, San Diego State University, San Diego.

Kretzschmar, Gavin L., Kirchner, Axel, Sharifzyanova, Liliya, 2010. Resource nationalism - limits to Foreign Direct Investment. The Energy Journal 31 (2), 27–51.

Lacher, Wolfram, Kumetat, Dennis, 2010. The Security of Energy Infrastructure and Supply in North Africa: Hydrocarbons and Renewable Energies in Comparative Perspective. German Institute for International and Security Affairs, Berlin.

Luong, Pauline Jones, Weinthal, Erika, 2010. Oil is Not a Curse: Ownership Structure and Institutions in Soviet Successor States. Cambridge University Press, Cambridge.

Marcel, Valerie, 2006. Oil Titans: National Oil Companies in the Middle East. Chatham House, London.

Molchanov, Pavel, 2003. A Statistical Analysis of OPEC Quota Violations, Economics. Duke University, Durham, NC, pp. 1–31.

Nell, Johan, 2010. Shift in power to NOCs. Petroleum Review, 20–21.

Reynolds, Douglas B., Pippinger, Michael K., 2010. OPEC and Venezuelan oil production: evidence against a cartel hypothesis. Energy Policy 38, 6045–6055.

Ross, Michael, 2001. Does oil hinder democracy? World Politics 53 (3), 325–361.

Schaffer, Brenda, 2008. Energy Politics. University of Pennsylvania Press, Philadelphia.

Sieberer, Ulrich, 2007. In: Gschwend, Schimmelfennig (Ed.), Selecting Independent Variables: Competing Recommendations for Factor-centric and Outcome-centric Research Designs. Research Design in Political Science.

Smith, B., 2004. Oil wealth and regime survival in the developing world 1960–1999. American Journal of Political Science 48 (2), 232–246.

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Smith, James L., 2008. World Oil: Market or Mayhem?. Center for Energy and Environmental Policy Research, Boston.
Stevens, Paul, 2008. National oil companies and international oil companies in the Middle East: under the shadow of government and the resource nationalism cycle. Journal of World Energy Law and Business 1 (1), 5–30.
Stevens, Paul, 2009. The Coming Oil Supply Crunch. Chatham House, London.
United States State Department, 2010. Background Note: Venezuela. Washington D.C.
Verbruggen, Aviel, Marchohi, Mohamed Al, 2010. Views on peak oil and its relation to climate change policy. Energy Policy 38, 5572–5581.
Wantchekon, L., 1999. Why do Resource Dependent Countries have Authoritarian Governments? Leitner Working Paper 99-12. Yale University, New Haven, CT.
Wolf, Christian, 2009. Does ownership matter? The performance and efficiency of state oil vs. private oil (1987–2006). Energy Policy 37, 2642–2652.
Witten, Emeley A., 2008. Arbitration of Venezuelan oil contracts: a losing strategy? Texas Journal of Oil, Gas, and Energy Law 4 (1), 56–87.

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