Petroleum Contracts: What does Contract Theory Tell Us?

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Applied to the Energy Industry
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Introduction

- Increases in oil prices led to expropriations of oil and gas companies by countries.
  - Sizable expropriations like Bolivia and Venezuela.
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  - Sizable expropriations like Bolivia and Venezuela.
- What we do:
  - Describe the main characteristics of petroleum contracts.
  - Use contract theory to rationalize those contractual forms.
  - Try to understand why governments may be justified to renege on past agreements.
Outline of the talk

- Type of petroleum contracts that prevail. Emphasis on the most common ones:
  - Production Sharing Agreements and
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  - Moral hazard.
  - Hold-up.
  - Enforcement problems.
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- Conclusions
Prevailing contracts between countries and oil companies

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- Risk Service Agreements: Company supplies services and know-how to the State in exchange for a fee. It bears all the exploration costs. The State remains the owner of the produced oil.
- Joint Ventures: Ownership of the production is specified by the participation of the company and the government on the venture. Government is entitled to a share of profits, but it also bears a share of development and operation costs.
Production Sharing Agreements

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Concession Contracts

- Grant exclusive rights to explore, develop and export petroleum on a specific territory and for a specific period of time.

- State transfers ownership of the mineral resource to the company for the duration of the contract.

- Company has to secure the entire financing and technological capabilities and bears all exploration and production risks.

- Company pays royalties as a portion of petroleum production. Computed based on:
  - Surface area granted (surface royalty).
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Contracting Model

- Two parties to the contract: Company \((C)\) and State \((G)\).

3 periods: \(t = 0\), contracting and exploration; \(t = 1, 2\), production.

The contract assigns control rights and a profit sharing rule.

To start exploration: sunk, non-contractible investment \(I\).

An oil reserve is discovered with probability \(q(I)\).

Size of the reserve \(R\) is observed by both parties but not verifiable.

Production in period \(t\) requires a non-contractible effort \(e_t\), which costs \(\psi(e_t, I)\).

Production costs = 0.

Production is \(y_t\) is random. Depends on effort: Higher effort increases the probability of higher production.

Prices are unknown at \(t = 0\) but known before production.

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- At the end of periods 1 and 2, $C$ pays royalties, $T_t$, to $G$. Royalties can be
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  $$\pi_t = (1 - i_t)(p_t y_t - T_t) - \psi(e_t, I).$$
PSA

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\[ c_1 = \begin{cases} 
  I/p_1 & \text{if } p_1 \beta y_1 \geq I \\
  0 & \text{if } p_1 \beta y_1 < I 
\end{cases} \]

\[ c_2 = \begin{cases} 
  0 & \text{if } p_1 \beta y_1 \geq I \land p_2 \beta y_2 \geq I - p_1 \beta y_1 \\
  (I - p_1 \beta y_1) / p_2 & \text{if } p_1 \beta y_1 < I \land p_2 \beta y_2 < I - p_1 \beta y_1 
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\frac{l}{p_1} & \text{if } p_1 \beta y_1 \geq l \\
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0 & \text{if } p_1 \beta y_1 \geq I \\
\frac{(I - p_1 \beta y_1)}{p_2} & \text{if } p_1 \beta y_1 < I \wedge p_2 \beta y_2 \geq I - p_1 \beta y_1 \\
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Moral Hazard and Risk Sharing

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- Sources of uncertainty:
  - Existence, size and quality of the reserve unknown before exploration.
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- Hence, avoid MH by making the firm residual claimant.
Moral Hazard and Risk Sharing: Contractual Provisions

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- A concession contract with surface royalties makes the firm residual claimant $\Rightarrow$ guarantees efficient effort at production stage.

- Not true under PSA $\Rightarrow$
  - Contracts include work programs with commitments in terms of drilling and production.
  - This calls for monitoring effort from the State.
Hart and Moore (1988): Suppose that

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- Outcome is difficult to describe at the contractual stage (non-contractible).
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Then,

- Parties are exposed to opportunistic behavior (hold-up): share the benefits of the investment with the other party.
- Parties lower their initial investment.
Assets Specificity and Hold-up

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- Exposed to opportunistic behavior and hold-up once a discovery is made. Usually through adjustments in the tax system.
- Idea: It is ex-post optimal for the government to increase the tax rate when \( I \) is large.
- Hence, company invests less than the efficient level.
Assets Specificity and Hold-up: Contractual Provisions

- Make the state a partner in the exploration phase (share the costs):
  - Make exploration costs deductible from income-taxes.
  - State reimburses part of the exploration costs.
  - Assign residual control rights to C (Grossman and Hart, 1986):
  - Stabilization clause: State commits not to change its laws.
  - Allow the company to sell all its share of oil in the international market (avoid hold-up through exchange-rate policy).
  - Appropriate renegotiation design (Aghion, Dewatripont and Rey, 1994):
    - Renegotiation clause that makes explicit the conditions for renegotiations.
    - Duration of the contract structured in short-term phases. Company can opt-out at the end of each phase.
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Poor Enforcement: Framework

Suppose that

- There is a probability that the contract will not be fully enforced in the future.
  - This probability is likely to be increasing in the company’s profits (higher when prices are higher).
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Then,

- Company loses part (or all) of its assets ⇒ reduces the expected returns of the investment.
- Implicitly increases the company’s discount factor (values the present relatively more, while the contract is still enforced).
Poor Enforcement

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- This creates sovereign risk: unilaterally changing the terms of the contract or expropriating.
- Enforcement problems (say, possibility of expropriation) are associated with:
  - Inefficiently low levels of initial investment ($I$).
  - Too quick extraction rates: Early extraction.
Poor Enforcement: Contractual provisions

- Safeguard clauses to create mechanisms to resolve disputes (improve enforcement).
  - Disputes to be solved outside the State’s judiciary system. Credible and fair third party to mediate: International Commercial Arbitration.
  - Which law governs the oil contract? In general, the host State law. Sometimes, a combination of international law and the host State law.
  - Highly progressive income taxes (reduce temptation).
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- Extra contractual tools:
  - Reputation concerns on the State’s side: Compliance improves future contract terms. Loses power if government worry only about short-term.
  - Threat of not reinvesting in the country by the company. May lose power once oil has been found (easy to find a replacement).
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- Performance “within the letter of the contract” (enforceable) vs. performance “within the spirit of the contract” (non-enforceable).
- Contract works as a reference point for the parties’ perceptions of entitlement.
- Party who gets less than what he/she feels entitled to, reduces ex-post cooperation (provides only enforceable performance).
Ex-post Uncertainty and Grievance: Framework

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Then

- Under certainty, rigid contracts are efficient (no room for grievance).
- With uncertainty: trade-off between rigidity and flexibility.
Ex-post Uncertainty and Grievance

How can parties who feel aggrieved reduce ex-post cooperation?

- Cutting quality of the oil delivered.
- Delaying payment of royalties.
- Performing excessive controls.
- Changing regulations.
- Generating hostile feeling among the population about foreign firms.
- Generate inefficiencies in multiple aspects of the contract execution.
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Ex-post Uncertainty and Grievance: Contractual Provisions

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  - Oil quality is very high and the State wants to renegotiate.
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- Size of the reserve is low and company wants to renegotiate.
- Oil quality is very high and the State wants to renegotiate.

Make the contract more flexible to reduce this renegotiation-type grievance.
- Flexibility in concession contracts: Progressive royalty scheme based on some profitability indicators.
- Flexibility in PSAs through non-linear schemes for sharing profit-oil.
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Add short-termist governments: Renegade on previous agreements (expropriations).
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