

# ***REGULATION CHANGES AND AUCTION PERFORMANCE: OIL AND GAS LEASES IN BRAZIL***

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## **Section 1: Overview**

Governments across the world usually need to balance competing considerations when setting contractual terms for their resource sector. On the one hand, they want to obtain revenues from the resource activities. On the other hand, countries also need to attract investment and associated technology to develop their resource base, so contracts need to offer competitive profits given the risks involved. In this paper, I compare two different auction and contractual designs used for oil and gas leases in Brazil to show how the execution of projects and government revenues was affected by the introduction of a new type of contract for blocks located offshore.

Initially, the government chose a scoring auction for the allocation of oil and gas leases. A scoring auction uses a choice rule (scoring rule) to transform multiple bid dimensions into a single score. Then the firm with the highest score wins the auction. After the auction, winning companies signed contracts under a concession regime, where payments to the government were in the form of royalties, income taxes and special taxes with rates based on production thresholds. With the significant reserves of high-quality oil and natural gas in what is now known as the Pre-Salt fields, policymakers changed the allocation rule to a one-dimensional auction with the sole criterion being the share of profits accruing to the government, but also requiring minimal investments and signature bonus. In addition, the new contractual arrangement for the Pre-Salt fields was a Production Sharing Contract. In the process, the government halted auctions until Congress approved the new legislation, which reduced opportunities for firms to keep exploring in the country.

While some authors consider the legal reforms were necessary to allow the government to capture higher rent, others believe the initial contractual and fiscal regime would have delivered similar high rents even in the context of massive discoveries. Moreover, cost recovery mechanisms in both contracts introduce incentives for investment, but the scoring auction format gives more flexibility to firms in their investment commitments and the cash bonus they will pay. This comparison of contracts and auction formats, and its effects on bids and project execution, is not only of interest for oil and gas projects but also for other projects such as those in mining, renewables or infrastructure.

## **Section 2: Research approach**

My methodology integrates a model of optimal development of exploratory blocks into a scoring auction model (see Sant'Anna, 2018 for an application of the scoring auction model to the Brazilian oil and gas case). Using data on bid dimensions and forecasts of oil and gas production and prices, several distributions for the operational and investment costs, I estimate the distribution of firms' operational and investment costs. From these estimated distributions, I simulate the optimal bids and optimal extraction rates under the Concession and Production Sharing regimes. Under different price and geological risk assumptions, the model allows me to simulate government revenues under each regime. In my model, companies have an expectation about the amount of oil in the lease area and oil prices, and they choose bonuses and investment in their bid to maximize expected profits, and later they need to decide whether they move to a development stage (if they win the auction), and how much oil they will extract.

Most of existing literature on auctions for oil and gas leases assumes that the value of a block is exogenous. By introducing a stage of exploration and development of a field (following Smith, 2014), I can show how bidding decisions affect the profitability of a project. It also extends the work on contingent payment auctions, applied to the oil and gas case, since it allows the study of extraction adjustments at the intensive margin. In the case of Brazil, the model allows me to simulate the geological uncertainty in the Pre-Salt discoveries, different oil and gas price trajectories, but also the different types of contracts, so I can isolate the effect of contract design from other factors affecting firms' valuation of the block.

### **Section 3: Results**

I use information about discoveries and reserve estimates in the pre-salt area for projects auctioned since 1999. This information allows me to estimate the spatial distribution of reserves, to account for the geological uncertainty firms face. Using information about the fiscal regime under each type of contract (concession and PSC) plus the auction data, I can estimate the operational and investment costs for each firm. Auction data corresponds to Rounds 7-13, conducted between 2005 and 2013, including 232 bids from those fields located in the pre-salt area, while the data on PSC auctions includes Rounds 1-5, conducted since 2013.

Preliminary examination of the data not only suggests spatial correlation of these paid bonuses, but also that for bidding rounds made after the large discoveries in pre-salt, bonuses are higher than those observed for the PSC blocks in neighboring areas, which suggests that at least from the comparison of bonuses, the concession regime allows for higher revenue collection. However, a more comprehensive comparison requires an estimation of tax collection under each contract, accounting for project execution. Preliminary simulations also show that depending on the cost recovery assumptions and the distributional assumptions on the probability of winning, concession contracts, could have an execution rate higher for those fields originally allocated under a production sharing contract with the profit share as bid dimension. As a consequence of this higher execution, the use of scoring auctions with the existing tax structure could allow for higher government.

### **Section 4: Concluding remarks and further research**

Balancing objectives such as government take and investment in the oil and gas sector requires an understanding of how ex-ante decisions affect ex-post profitability, particularly in the face of price and geological risk. This not only concerns auction mechanisms, but direct negotiations and other forms to allocate oil and gas and their conditions. While companies may be aggressive in their investment programs or payments to host governments, this could also lead to delay or abandonment of projects if market conditions are not appropriate. This situation not only concerns oil and gas projects, but it is also important for countries that want to move faster in developing projects for renewable energy while lowering costs, and in general, projects where there is uncertainty regarding prices and costs. In the case of oil and gas auctions, allowing dimensions such as the profit split as part of the bid can elicit bidder preferences regarding the field and higher transparency, but it can also lead to problems in the selection of bidders and, if lease expiration dates are far ahead, could lead to delays in projects, as bidders value the option of developing a project.

### **References**

- Sant'Anna, M. (2018): "Empirical Analysis of Scoring Auctions for Oil and Gas Leases," Working paper.
- Smith, J.L. (2014): "A Parsimonious Model of Tax Avoidance and Distortions in Petroleum Exploration and Development," *Energy Journal*, 26, 53–68.