The transaction costs of oil and gas lease auctions: the Brazilian local content policy

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Local content policy has been widely used by countries rich in natural resources as a mechanism to promote national industries. Nonetheless, the design of the institutional arrangements required to put in place this kind of policy is often controversial. To shed light on this topic, we study the case of the Brazilian oil sector. In it, the mechanism that decides which firm has the right to explore a region (block) is a scoring auction. Such auction combines bids in several dimensions besides a price bid according to a pre-defined rule to define the winner. One of those dimensions is the amount of local content that they are willing to implement. In that context, we study the question: is the auction the best mechanism to decide on local content programs? Literature on scoring auctions have proved that they perform better than other mechanisms when all criteria are measurable and contractable upon. However, local content programs are subject to significant uncertainty and complexity. In the case contract clauses are not fulfilled, penalties or renegotiation create significant mal-adaptation costs. We develop and empirical study to analyze both the bids and the ex-post

mal-adaptation problems associated with the local content clause that have been already observed. As predicted by the theory, we observe high transaction costs associated with rigid long-term contracts in presence of uncertainty and complexity. The results of the Brazilian local content case are in agreement with public procurement literature. They also point at some of the key challenges to define efficient arrangements to implement local content policies.

Key words: Local content; Auction design; Adaptation costs; Oil and gas leases.

Extended abstract

When the product is difficult to standardize, auctions face implementation problems. In the case of oil and gas industries, it is difficult to measure and predict the costs associated with implement local content policies. The case for the use of auctions has to do with transparency and information disclosure. There are extensive literature describing the advantages of auctions in relatively simple settings. When the characteristics of the item are less simple, theoretical results are much more limited. Unfortunately, many situations including oil and gas lease auctions are characterized by these not-so-simple characteristics. This motivates a significant amount of empirical literature dealing with practical auction design in these case, see for instance (Cramton, 2007).

In this paper, we are concerned with the allocation of items with more than one dimension. This is an abstract representation of the fact that prices do not contain all the information that characterizes the item. This problem is often dealt with by identifying it with one of "quality". That is, besides prices, the complete characterization of the item requires defining its quality –in that view, the item is defined by two dimensions, price and quality. Traditionally, the tools to cope with that kind of item were some standardized administrative process by which bidders first sent the information to a central authority, and then the central authority chose one of the proposals. This kind of administrative process is often called "beauty contest".

These administrative processes lacks transparency and are considerably subject to corruption. In that view, auction design literature has proposed the use of scoring auctions, (Che, 1993) or (Branco, 1997). The idea is that, when quality is measurable and contractable upon, they perform better

than traditional beauty contest. In that context, (Asker & Cantillon, 2010) shows that, in a context where quality is contractable, scoring auctions perform better than other mechanisms, including sequential negotiation. This result can be understood as the extension of (Bulow & Klemperer, 1994).

One of the most important motivations for the use of scoring auctions to oil markets is the need to decide on local content policies. Lease auctions are multidimensional, among other factors, because governments have preferences on the local-content characteristics of potential producers' plans. From that point of view, such policies would be a type of "quality" dimension. Hence, the government would implement a scoring auction where the relationship between the price offered by the bidder and the local-content policy offered. The previous design hence relies on the assumption that local content policies are easy to measure and contract upon.

On the other hand, literature dealing with the costs of information complements the previous picture, and casts doubt on the previous "contractability" assumption. (Goldberg, 1977) analyzes the problem of competitive bidding considering that producing information is costly. In that view, players are often interested in information besides price. When the contract is complex, the provision (and acquisition) of information is more significant than the price dimension. Along these lines, (Bajari & Tadelis, 2001) showed that when contract are complex, ex post needs of adaptation requires frequent renegotiations, which in turn tend to be costly. In an empirical investigation, (Bajari, McMillan, & Tadelis, 2009) identifies several limitations of auction mechanisms in the context of the building sector. This view is closely related to the analysis developed in (Barzel, 1982), where measurement costs are identified as the source of contract incompleteness.

In Brazil, the oil and gas auctions for exploration rights are defined by a scoring auction where bids for bonus, production plan and local content are placed. The winner is defined by a formula defined *ex ante*, (Lévêque & Hallack, 2013). On the other hand, local content policies in oil and gas industries are typical cases of contract complexity. The government defines very detailed plans to implement local content, which may or may not be easily implemented by producers.When lease auction takes place, there is significant uncertainty about the geological characteristics of the blocks to be explored. This uncertainty also affects the tools that will be necessary to explore and produce oil. It is especially important in Brazil, where most of the oil fields are in deep-water areas, and such production frequently demands goods and services with specific, high technology components.

In this paper, we are concerned with the design of oil and gas exploration lease auctions. In particular, we investigate whether bidding for local content performs better than defining a required policy outside the auction and then implementing a simpler mechanism. Our argument rests on transaction costs theory: when information is costly, contract complexity and uncertainty reduces the adequacy of the auction to decide on local content policies. A well-functioning auction needs clear and rigid rules. But when projects are complex and subject to uncertainty, the need to renegotiate local content conditions creates considerable mal-adaptation costs.

To investigate on these ideas, we analyze 1725 bids in 12 rounds of lease auctions in Brazil. We observe that bids for local content have a pronounced pattern. In the first rounds they are more diverse among players. After that, players seems to 'learn' how to bid, and the differences among the bids in the local-content component decrease. We develop several non-parametric estimations, in order to minimize the

impact of our assumptions on the behavior of auction participants. We find that neither the properties of the items auctioned nor players' characteristics explain this behavior. We then turn to the analysis of strategic bids of local content. We show there is a change in bidders' strategies when auction rules change, as the change in the weight of local content in the final auction score and the creation of caps and floors for local content bid. Moreover, we show that there is a change in the players' strategy when measurement of local content compliance, and associated penalties, become more restricted and credible. The risk premium associated with the non-compliance of local content requirements dominates the other components of the bids. This is in close connection to the ideas developed in (Bajari & Tadelis, 2001), as strict specifications of local content requirements at the auction creates rigidity and transaction costs.

Local content is subject to significant uncertainty. Our analysis suggests that, in that context, the effect of sharing information in the auction seems to be dominated by the costliness of such information. In that context, the advantages of including local content bids in the auctions are limited, and hence the scoring auction might benefit from excluding those bids and limit them to bonus and production plan.

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