

## Comment

**Federico Sturzenegger:** With the price of oil exceeding US\$100 a barrel through much of 2008, the issue of taxation of oil production has become particularly sensitive, as oil-exporting countries debate how to react to the price increases while oil importers assess how to cope with the large swings in oil prices. This is particularly important in Latin America because the region includes a number of oil and gas producers and exporters, such as Bolivia, Ecuador, Mexico, Trinidad and Tobago, and Venezuela, as well as importers such as the Central American countries. This paper, written by two knowledgeable economists who work on energy issues, provides a discussion of the determinants behind the different forms of taxation in the region. It is a welcome effort. However, while the authors successfully map out the main issues that are relevant for the problem, they are somewhat less successful in comprehensively tying their analytical framework to actual experiences. Granted, such a comprehensive approach may, in fact, be virtually impossible given the diversity of problems that need to be solved in setting up the best tax system, but I suggest a way this could be done below.

The main problems when one thinks about oil production contracts can be summarized as follows. First, there are rents associated with the production of oil and gas, so a tax system needs to appropriate these rents without distorting productive objectives too much. Second, there is a time-inconsistency problem, because the government cannot commit not to change taxes later on. Third, there is a problem of asymmetric information between the operator and the state, which creates problems when an optimal contract is designed. Finally, there is an agency problem with state production itself. The interplay of these different problems makes the writing of a successful contract very difficult. To solve the distortion problem, the best solution is to auction off the fields for an initial lump sum with no taxes thereafter, but this maximizes the expropriation risks, particularly if exploration is successful or prices increase. To reduce expropriation risks and asymmetry of information, government

production would be best, but this typically creates important agency problems. In addition, governments generally bring in multinational companies because they lack the capital to pursue the investments themselves, so the problem is linked to imperfections in capital markets.

Because the optimal solution differs according to how acute each of the four problems is, countries have pursued a wide range of paths. Outcomes differ even for countries that take the same path, depending on the specific constraints faced by each country. Brazil, for example, focused its strategy on its national oil company, but the government not only allowed for partial privatization, but also forced the company to compete in the local market for new fields. This fairly reasonable institutional framework led to a successful expansion of Petrobras and of the oil sector generally. Ecuador's reliance on a national oil company led to failure, however, as the company found itself mired by governance problems and lack of funding. Argentina and Bolivia auctioned off their reserves but then decided to change taxation when prices increased, whereas Colombia kept the terms of engagement of the private sector virtually unchanged.

The description of these complexities makes this paper interesting, although the authors do not provide a synthesis of how the complexities are linked to analyzing the optimal system for each country. Should Argentina and Bolivia have taken a different path? Given that the authors have clearly identified the fundamental problems, there should be a way to construct a matrix in which institutions, agency problems, management effectiveness, field characteristics (in terms of the steepness of the cost function), and the uncertainty of oil prospects can be integrated to suggest the right framework given these considerations. Then, once the mapping has been laid out, how do the data fit the model? For example, a country with credible institutions, poor government management, and certain prospects on very productive fields should go for a one-off auction of the resources, because time inconsistency or risk premiums will not be a large problem, government production is out of the question, and income taxes or royalties would be very distortionary. On the other hand, a country with high exploratory uncertainty, very productive fields, good management, and good institutions should opt for government production.

The question is whether reality fits this framework. Unfortunately, the case studies focus on a descriptive history, rather than on mapping the constraints identified by the theory into policy outcomes, thus leaving the reader uncertain as to how to tie the conceptual framework to the data. For example, the authors point out that with royalties, the government's take falls as the oil

price rises, which exacerbates the expropriation risk. Why are contracts written this way to begin with? Is it because of the other constraints?

The authors do provide some clues, however. For example, a formal model compares royalties to an income tax. The model strongly favors an income tax (leaving unexplained why royalties are so prevalent) and illustrates why the distortions are smaller in marginal fields (where the supply curve is more inelastic). This result sheds some light on why the recent price increases have led to royalty hikes in Argentina (typically with marginal fields) and in Venezuela's marginal fields, but not elsewhere. It does not explain why royalties have increased for Bolivia's giant gas fields. Once again, the devil is in the interactions between the different problems that need to be addressed.

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