

ECONOMIC IMPACTS OF WESTERN AUSTRALIA'S DOMESTIC GAS RESERVATION POLICY: A DYNAMIC ANALYSIS

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Overview

Western Australia's domestic gas reservation policy essentially requires new gas export developments to supply the equivalent of 15 per cent of their export volumes to the domestic market. The policy secures additional domestic gas supply with the aim of supporting domestic industry. However, this has the effect of maintaining lower domestic gas prices than may prevail without the policy. In this sense, the policy is often characterised as a simultaneous tax on producers and subsidy for domestic consumers, with attendant welfare costs. While immediate consumers may benefit, the policy is likely to impose a net cost across all Australian households, since gas resources would be diverted inefficiently and the incentive to develop new resources would be reduced.

This paper builds on previous research to quantitatively assess the economic impact of the domestic gas reservation policy. A partial equilibrium, project-by-project model of the Western Australian gas industry is developed, which represents the key features of the upstream natural gas market. Each gas project faces heterogeneous costs and makes profit-maximising decisions to produce a homogeneous good. There are a number of large producers, suggesting oligopolistic pricing power on the domestic market. However, these large projects face a competitive fringe of smaller domestic-oriented gas projects.

In a key extension for this paper, the model includes dynamic investment decisions made by each project, based on the expected present value of that investment. Projects can invest in exploration activities to prove up additional reserves, although extraction costs increase as more marginal reserves are extracted. Projects also invest in domestic or export processing capacity, which can involve adding processing capacity to existing plants or constructing new projects. Fixed costs differ between projects, and are higher for liquefied natural gas (LNG) export projects than for domestic projects.

Key rigidities in the Western Australian gas market are incorporated into the model, capturing key effects of the large fixed costs faced by the industry. Investment involves long gestation periods before production can begin. Previous investment costs are sunk and existing capacity constrains production in any one period. In addition, due to the large upfront capital expenditures, many Australian LNG projects have agreed to long-term supply contracts, which also constrain short-run supply decisions.

The model is calibrated to publicly-available data representing individual gas projects in Western Australia. It is then used to evaluate a number of scenarios for the Western Australian gas industry. Firstly, the potential development of the WA gas sector without the reservation policy is examined. The outcome is then compared to a similar scenario in the presence of the reservation policy. The paper assesses the impacts of Western Australia's domestic gas reservation policy on production and investment decisions by each project as well as domestic gas consumption and prices. The overall welfare impact of the reservation policy is examined.

Methods

A dynamic partial-equilibrium project-by-project model of the gas industry is developed. The method draws on work undertaken by Hartley and Medlock (2008), which focusses on the extraction decisions of national oil companies. The modelling of oligopolistic behaviour is related to work by Tyers (2005, 2004) which includes oligopolistic interactions in a market with homogeneous products and fixed costs.

The model is calibrated to Western Australian data and used to assess the economic impact of policies to secure additional domestic gas supply at the expense of exports.

The partial-equilibrium approach contained in this paper will be extended to a general equilibrium framework in subsequent papers.

Results

This paper provides both theoretical insights into the operation of gas markets similar to Western Australia's, as well as quantitative results from an applied model.

In the absence of a reservation policy, the Western Australian gas market is likely to be segmented, with large deposits developed for export and small deposits oriented to the domestic market. Large fixed costs associated with liquefaction of gas for export mean that only large gas deposits can achieve sufficient economies of scale to be developed for the export market. In addition, large deposits are less likely to be developed for the domestic market because total domestic gas consumption in Western Australia is small in comparison. Developing a gas deposit to supply both the domestic and export markets involves incurring additional capital expenses, without increasing the total amount of gas produced because of constraints on reserves. Thus, an export project would only choose to also construct a domestic supply facility if domestic prices were sufficiently higher than the export price.

This market segmentation is observed in Western Australia. Only one of the eight projects currently operating is supplying both domestic and export markets, primarily due to historical reasons. The reservation policy, however, has required new export projects to construct new domestic plants, including the Wheatstone and Gorgon LNG projects currently under construction.

By distorting the market in this way, the domestic gas reservation policy is estimated to generate an overall loss to the Australian economy. The additional domestic gas supply reduces the domestic price and increases domestic consumption compared to what it otherwise would be. Projects required to supply additional gas to the domestic market reduce their investment in exploration and reduce the extent to which they extract the gas resources available to them. The policy may also prevent the discovery of potentially large new fields, or prevent whole projects from going ahead. In response to the additional gas supply from export projects, other domestic-oriented gas projects reduce production, with smaller domestic gas plants most affected. While the increase in supply benefits domestic gas consumers, producers suffer lower profits due to both lower prices on the domestic market and lower production quantities than would otherwise prevail. Overall, the losses to producers more than offset the relatively small gains to consumers and a deadweight loss is generated.

Conclusions

Policies which aim to secure additional domestic gas supply at the expense of exports, such as Western Australia's domestic gas reservation policy, involve economic costs because gas is diverted to lower-value uses and overall activity is reduced in the domestic gas industry. Although domestic consumers benefit from lower gas prices, the loss in producer surplus outweighs this gain.

In evaluating the costs of such policies, it is important to consider the features of the domestic gas market. In particular, the industry faces large fixed costs and constraints on short-run supply decisions imposed by both available reserves and processing capacity. The Western Australian market is also characterised by small overall gas consumption, which can give an opportunity for market power to be exploited by large projects.

References

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