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Exploration externalities and government subsidies: The return to government

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ABSTRACT

Governments have, for a long time, invested in the direct provision of basic geological survey information to support exploration and mining activity. Recently, Australian governments have also started to provide direct drilling subsidies to exploration companies. Using data for Western Australia we investigate the return to government from the direct provision of geological survey information and the provision of drilling subsides. We find no evidence that drilling subsidies are less effective than traditional geological survey spending in generating a return to government. We suggest drilling subsidies are effective because there is a dishonesty externality in the market for exploration equity capital that gives rise to a market for lemons problem, and that government programs to award drilling subsidies to exploration companies work as a third party certification system that addresses this problem. We conclude by showing that, with real discount rates of 5%, 7%, and 9%, and a narrow definition of benefits, the expected benefit–cost ratios for State government support for exploration are 9.0, 6.7, and 5.2.

1. Introduction

In this paper we find that, since 1990, for every $1M spent by the Western Australian government on support for the exploration sector there has been additional new private sector exploration spending of at least $5.5M. We also find that direct drilling subsidies are at least as effective as traditional geological survey spending in stimulating new private sector exploration activity. We interpret this finding as evidence government drilling subsidies do more than just lower the marginal cost of drilling at an individual firm. Specifically, we suggest that because exploration prospects can be marketed in equity capital markets honestly or dishonestly there is a market for lemons problem in the exploration equity capital market, and that the award of a government drilling subsidy works as a kind of third party quality assurance mechanism to mitigate this market for lemons problem. We conclude by showing that, with real discount rates of 5%, 7%, and 9%, and a narrow definition of benefits, the expected benefit–cost ratios for State government support for exploration are 9.0, 6.7, and 5.2.

1.1. Background

The mining industry is one of Australia's most important industries, and is especially important in Western Australia. For example, in the 2013 financial year the mining industry contributed 29% ($71B) of Western Australia's Gross State Product (GSP) (Government of Western Australian, 2014a, p. 2). Mining royalty income for the Government of Western Australia is also significant, contributing around $6B, or 22% of general government revenue (Government of Western Australian, 2014b, p. 88).

Exploration activity is a necessary precursor to mining, and in Australia, both State and Territory governments provide substantial subsidies to support the exploration sector. For example, in addition to the annual geological survey budget allocation of around $25M, over the period 2009–2017 the Government of Western Australia has committed $130M in spending to support greenfield exploration, including the provision of drilling subsidies.[1] Western Australia is not alone in increasing the level of government support for the exploration sector, and a review of State and Territory websites found widespread evidence of new government programs to support exploration activity.[2] The Commonwealth government, through Geoscience

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[1] Exploration Incentive Scheme: Available www.dmp.wa.gov.au/7743.aspx (accessed 13.05.15).

[2] Northern Territory: Available www.core.nt.gov.au/about.html; South Australia: Available www.pir.sa.gov.au/minerals/initiatives/pace; Queensland: Available www.dnrm.qld.gov.au/our-department/policies-initiatives/mining-resources/future-resources-program; New South Wales: Available www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/about/new-frontiers (accessed 05.12.14).

Australia, also has a commitment to the provision of a broad range of geoscience information services.

The economic literature concerning exploration and extraction is substantial, with Cairns, (1990) and Krautkraemer, (1998) providing reviews of relevant issues. Here, the intention is not to provide a complete review of the literature, but to focus on why governments may choose to provide financial subsidies to support mineral exploration, and to estimate the return to government from the provision of exploration subsidies.

Exploration activity is associated with an information spillover. The success or failure of a drilling campaign provides important information about the success or failure of other drilling campaigns in similar regions; where similarity could be defined in terms of geographic distance or mineralisation. Private sector firms involved in primary greenfield exploration work are therefore not able to capture all of the benefits of their investment. Early evidence provided in Peterson, (1975) illustrates that the information spillover effect is real. To address this issue Peterson concludes with a series of public policy recommendations, including the direct government provision of geophysical studies, or subsidies to the private sector to undertake these studies. Subsequent work, for example Dodds and Bishop (1983) also suggests a role for public information provision.

Public geological survey services have a good reputation. For example, in the US, going back to at least the 1850s, the provision of reliable government survey work has been identified as a critical element in the successful and rational development of resources that, in turn, led to the rise of the US as a global power (David and Wright, 1997, p. 227). In an Australian context, the general consensus in the literature is that Australian geoscience expenditure has more than paid for itself (Hogan, 2003; Productivity Commission, 2013).

The information spillover externality is not, however, the only externality issue in the exploration market. Junior exploration companies generally raise funds from equity markets, and the promoters of a capital raising for an exploration company know more about the quality of the geological prospects than the providers of equity capital. For an investor, even ex-post, it is difficult to know if the failure of a given drilling campaign was due to the poor quality of the original drilling plan or not. Combined, these circumstances allow for any given exploration company capital raising to be marketed in either an honest or dishonest manner. If we accept that preparing a high quality portfolio of exploration prospects is more expensive than preparing a low quality portfolio of exploration prospects, then the circumstances for a market of lemons to arise are met. In Akerlof's model this dishonesty effect drives the size of the market to zero, and the legitimate businesses that are driven out of existence are characterised as an externality cost (Akerlof, 1970, p. 495–6).

One reason there is not a complete collapse in the market for exploration funds is the existence of counteracting institutions. For example, the reputation of individual explorers is one mechanism that works to mitigate against a total collapse in the market for exploration equity capital; but there is a limit to the role individual explorer reputation can play. Company branding can also mitigate against the development of a pure market for lemons. For example, if the ABC Nickel Exploration company has been successful, then company management could launch the ABC Gold Exploration company, and through this type of 'chain' company branding signal that the same successful management practices used at ABC Nickel Exploration will be applied at ABC Gold Exploration. The role of the stock broker as a specialist advisor on prospect quality also helps to mitigate the development of a market for lemons, but the incentives for the broker are not the same as for the investor; and even if broker and investor incentives could be aligned, because people can free ride on broker research notes there would still be underinvestment in the provision of quality assurance information. Counteracting institutions do not, therefore, completely resolve the market for lemons problem.

Although the dishonesty cost disappears with vertical integration of the exploration function with the mine operation function, in the mineral sector the trend has been for large mining companies to outsource exploration. Outsourcing exploration is cost effective for large mining companies as for any given exploration program the health, safety, internal compliance costs, and labour costs at large mining companies are much greater than at junior exploration companies. Outsourcing exploration is also a safe business option for large miners as for any discovery significant enough to be of interest to them, a junior exploration company will not be able to raise the funds required to develop the project. This in turn allows large mining companies to enter the process at the post-greenfield exploration pre-mine development stage. As such, large mining companies retain access to significant new development sites even though the exploration function has been outsourced.

Here we estimate the return to the Government of Western Australia of spending to support greenfield exploration and augment our empirical modelling results with information found in ASX listed exploration company announcements that provide support for our empirical results.

2. Estimating the exploration response

If we think about the exploration process in generally, when commodity prices or government policy change it is unlikely firms will respond immediately. For example, it takes time to research the most prospective sites. It takes time to obtain management and board level approval for a specific exploration program. It takes time to source the equipment needed for a drilling program and then get the equipment on site, etc. Given this characterisation of the market, there is then a very real problem in assessing the impact of price and government policy changes. What is required for policy evaluation is a measure of the long-run exploration expenditure response; what is observed every period is the short-run exploration expenditure response. Here, to estimate the long run private sector response to government spending we use the Autoregressive Distributed Lag modelling approach of Pesaran and Shin (1999).

2.1. Data

The focus of the research is an evaluation of State government expenditure to support exploration in Western Australia. However, we also have details on funding allocated specifically to drilling subsidies, as well as the traditional geological survey allocation, and so we also estimate a model where these two expenditure types are considered separately. The drilling subsidy program is quite recent (see Fig. 1) and so it is necessary to be cautious when interpreting the results, but these initial results are still informative. The expenditure information has been provided by the Department of Mines and Petroleum, Government of Western Australia.

SNL Metals & Mining provides information on global exploration, development, and production activity. Based on information in SNL Metals & Mining (2014a), the most common deposits in Western Australia are gold, nickel, and iron ore; and over the last 35 years 96% of the discoveries with commercial potential were associated with one of these three minerals. We therefore include the Australian dollar price of these three commodities in our model. For consistency, both the price series and exchange rate values have been sourced from the London Metal Exchange.