

METHODOLOGY APPENDIX

Introduction

The following internal discussion papers were developed by the panel, through the course of their work, to clarify the principles and priorities for discussing the issues and information presented to them. They are presented at this time, because they provide a more comprehensive explanation of important economic principles which deserve a fuller explanation that was possible in the text of the report.

The first part deals with the concept of “economic rent” and how it relates to the question of deciding a fair share for Albertans. The second part discusses Marginal Effective Tax Rate (METR) as it impacts competitiveness and investment incentives.

How the Panel Views “Fair Share”

A primary objective of the Royalty Review Panel is to review the current fiscal system¹ in Alberta and determine whether Albertans are receiving a “fair share” of our non-renewable energy resources. “Fair share” is a difficult, and indeed malleable, concept. It is inherently subjective and involves a value judgment that can reasonably differ between individuals; fairness is very much in the eye of the beholder. Nonetheless, some general principles can be invoked to help frame the discussion.

The concept of *economic rent* is particularly important in this regard. Economic rent is, quite simply, the value of the undeveloped resource in the ground, or *in situ* (which means “in place”). This value reflects the price at which the resource can be sold upon extraction as well as the cost of finding and extracting the resource. All else being equal the higher the price of the developed resource (now and in the future), the higher is economic rent. The cost of extraction includes the cost of all of the inputs employed in the extraction, such as labour, energy, materials, etc., as well as a return on capital required by the companies

¹ The fiscal system refers to the combination of royalties, taxes, bonuses, and land rental fees applied to a given production activity. For Alberta the system is a combination of bonus payments, royalties, land rental fees, and both federal and provincial corporate income taxes.

engaged in finding and developing the resource. The higher the cost of extracting the resource, the lower is economic rent.

Economic rent can therefore be thought of as the maximum price that the owner of the resource – the citizens of Alberta – can charge companies for the right to produce the undeveloped resource. In principle, *and in the absence of various constraints*, the owner of the resource should be able to charge this maximum price and receive all of the economic rent accruing to the resource. And indeed, this price might reasonably be viewed as “fair” in the sense that it reflects the provision of an adequate, market determined return on the capital employed by the companies engaged in the production of the resource.

An important consequence of basing a fiscal regime on the concept of economic rent is that doing so does not, in principle, distort the incentive to develop the resource, and therefore does not impinge upon the amount of economic activity associated with the resource. As will be discussed subsequently, there are some important caveats to this observation.

The presence of economic rent associated with a natural resource seems to offer us with an ideal way of dealing with the “fair share” issue – simply charge the maximum price that we can for the resource and in so doing collect all of the economic rent. Unfortunately, it is not quite that simple. Our ability to capture the full value of economic rent is hindered by various constraints.

The first type of constraint might be thought of as informational constraints. While economic rent is a convenient theoretical concept, in practice it is difficult to measure. The primary difficulty lies in measuring the costs associated with extraction, in particular the required return to capital. A related difficulty lies in the distinction between expected (*ex ante*) rents, based on expectations regarding future prices and costs, and realized (*ex post*) rents. The oil and gas business is risky. There is a great deal of volatility in both prices and costs. This volatility imposes costs on both the owners and producers of the resource which lowers the value of economic rent. Unfortunately, the costs associated with this uncertainty are very difficult to measure.

Other informational problems that arises in the collection of economic rents are associated with allocating expenditures on overhead, exploration, research and development, etc. across different projects, particularly in the case of multi-jurisdictional and multi-national firms as well as firms engaged in several projects and/or expansions. There are hundreds of thousands of producing oil and gas wells in Alberta, and thousands of new wells drilled every year. Allocating costs across these wells to determine economic rent on a well by well, or project by project, basis is a very difficult task.

While the measurement and allocation of the costs associated with discovery and extraction is perhaps the most problematic part of rent determination, there are problems on the revenue side as well. One problem of particular relevance to Alberta is the lack of a liquid market for bitumen. Bitumen is the heavy, viscous oil that is produced in the Alberta oil sands. Bitumen must be treated to convert it into upgraded synthetic crude oil (SCO) before it can be used by refineries to produce gasoline, diesel fuels and other products.

Upgrading may take place on site, or at some other location, in which case the bitumen must be mixed with a diluent so that it may flow in the pipeline. Many of the existing, and projected, oil sands projects are integrated mine/upgrader projects, which means that much of the bitumen is traded on a non-arms length basis. This presents problems in measuring the value of the bitumen extracted for royalty purposes.

Because of these various informational constraints, most actual fiscal systems applied to oil and gas activities do not directly employ the concept of economic rent, but rather are based upon things that are easier to measure and administer – gross revenue, production, net revenue, rental fees, financial income, etc. Some of these concepts are a better approximation of economic rent than others.

The second type of constraint that limits the ability of the owner of a resource to collect the full amount of economic rent involves resource constraints on the part of the oil and gas companies themselves. Oil and gas companies face various input constraints, particularly with respect capital (both financial and physical), specialized labour and materials. These constraints are particularly important for the very large, lumpy projects that typify the oil sands.

The resource constraints facing oil and gas companies suggest that they must prioritize, or rank, the various projects that they may undertake. As such, projects compete with each other (and indeed with themselves over time) for access to these scarce resources.

Many of the companies involved in the oil and gas business in Alberta operate internationally, and for them the market for oil and gas projects is literally world wide. Even putting aside the informational constraints discussed above, this means that the owners of the resource may need to leave some economic rent “on the table” in order to attract development. The international competitiveness of the fiscal regime is a key consideration in this regard, and indeed may be viewed as another constraint on the ability of the resource owner to realize the full amount of economic rent. Quite simply, if the owners of the resource attempt to retain “too high” a share of economic rent relative to relevant international comparators, the resource may not be developed in a timely fashion.

It is important to emphasize that the competitiveness of the fiscal regime is not the only consideration that determines the overall attractiveness of an oil and gas resource (and indeed, it is arguable as to how important the fiscal regime is at all). Other important features include the geology of the resource, market access and political (including legal and fiscal) stability.

In sum, the determination of what share is appropriate can be compared to the pricing of any commodity. The price ultimately charged depends on the quality of the product being offered, compared to similar products offered by competitors, and on the price that other competitors charge for their product. Jurisdictions with attractive resources – higher quality products, measured on several dimensions – can capture a higher share.

Another issue that arises within the context of economic rent as it relates to the “fair share” issue concerns what is called “rent dissipation.” Rents can be dissipated in several ways. One is through activities related to protecting, or obtaining, economic rents; this is sometimes referred to as “rent seeking.” For example, oil and gas companies may devote resources to maintaining, or increasing, their share of economic rents, and in the process dissipate some of them. Another is through inflationary cost pressures associated with high levels of activity. High levels of activity in the energy industry can lead to inflationary increases in expenditures on inputs, such as labour, capital, etc. These pressures can threaten an economy’s overall competitiveness, including the competitiveness of the energy sector itself. Leaving “too much” economic rent “on the table” can lead to precisely this type of rent dissipation whereby neither the resource owner nor the oil and gas companies developing the resource benefit due to rising costs.

A problem related to the pace of development in the oil and gas sector concerns the appropriate rate of extraction of the resource. While it is sometimes said that “oil left in the ground has no value”, this could not in fact be further from the truth. Because it is a finite resource, oil in the ground has “scarcity value” – extracting it now means that it cannot be extracted in the future. Indeed, this scarcity value is precisely what gives rise to some of the economic rent associated with the resource. This suggests that there is an optimal pace at which the resource should be developed. The owners of the resource may have a different view of this pace than oil and gas companies. This can occur, for example, if the resource owner and the resource companies have different views on how to value current versus future extraction, as manifested in differences in the rate at which they discount the future.

If the owners of the resource have a lower discount rate than the oil and gas companies (as is typically believed), the pace of development preferred by the owners will be lower than the rate preferred by the oil and gas companies if left to their own devices. A fiscal regime based solely on economic rent does not necessarily lead to the optimal pace of extraction, which suggests that the owners of the resource may want to put in place other fiscal measures, and/or a regulatory environment, to regulate the pace of development.

Notwithstanding the practical difficulties associated with economic rent and its implications for determining “fair share”, the Panel viewed the concept and its related principles as a useful guide to its deliberations. While the issues are complex and the tradeoffs are many, as a first order approximation the Panel viewed the “fair share” question as one of maximizing the present discounted value of economic rent accruing to Albertans from our oil and gas resources subject to the various constraints outlined above: maintaining an internationally competitive fiscal regime, maintaining an appropriate and sustainable pace of development for the sector and the economy as a whole, within the context of a clear and transparent fiscal regime.

Having said this, in the final analysis the appropriate “fair share” is, and should be, ultimately determined by what resource owners want. This is ultimately determined by the weight that resource owners, directly, and indirectly through their political

representatives, place on related issues such as royalty and tax rates, pace of development, incentives, investment activity, economic diversification, and employment.

Government Take and the Marginal Effective Tax Rate on Capital: A Brief Explanation

The Panel employed two types of models to analyze the current fiscal regime facing oil and gas companies in Alberta, and to investigate the implications of the recommendations: Project Analysis, or Discounted Cash Flow, models; and Marginal Effective Tax Rate models. In this section a brief non-technical explanation of these modeling approaches is provided.

The Marginal Effective Tax Rate

Neo-classical investment theory tells us that business investment decisions are made at the margin. Simply put, a firm will invest in capital up to the point where the revenue generated by the last increment of capital invested (marginal revenue) is just equal to the cost of that incremental unit of capital (marginal cost – often called the cost of capital). Thus, the marginal revenue generated by the very last increment of capital invested in exactly equals the cost of capital. As such, the marginal unit of capital generates no economic rent, as the associated revenue exactly equals its cost. It is important to emphasize that this is not to say that an entire investment project may not generate positive rents – to the extent that so-called inframarginal units of capital invested in a project generate economic rent, these rents will be taxed and will generate government revenue – only that the last unit of capital invested just breaks even.

The neo-classical investment model can be modified to incorporate all sorts of taxes and royalties – corporate income taxes, capital taxes, sales taxes on business inputs, gross royalties, net royalties, and other taxes which impinge upon the return to capital. Taxes and royalties impose on investment decisions by affecting both the marginal revenue and marginal cost associated with an incremental unit of capital. Marginal revenue is affected (lowered) as revenue generated by the investment is included in the tax base and subsequently taxed. Marginal cost is also lowered as the cost associated with the incremental investment is (may be) allowed as a deduction in the tax base (this is not the case for gross royalties, as will be discussed below).

It is now generally accepted that the neo-classical investment model is a “good”, empirically validated, model of investment behavior. In particular, several empirical studies over the past decade or so have confirmed that taxes imposed on capital do effect investment through the channels suggested by the neo-classical investment model. Though the magnitude of this impact is subject to some debate, the range of plausible estimates suggests is relatively narrow and suggests that the impact of taxes on investment is not insignificant (more on this later).

The concept of the *marginal effective tax rate* (metr) on capital, which is derived within the context of the neo-classical investment model, provides a summary measure of the extent

to which taxes impinge on investment decisions. It is measured by calculating the amount of tax paid as a percentage of the pre-tax return on the marginal (break even) unit of capital that would be required to cover the taxes and the financing of that capital with debt and equity.

For example, if a business invests in an incremental unit of capital that yields a pre-tax rate of return equal to 10 percent and, after taxes and royalties, the rate of return is equal to 6 percent, the metr is 40 percent (10 minus 6 percent divided by 10 percent). Thus, in this example, 40 percent of the pre-tax rate of return on a marginal unit of capital is required to pay the taxes and royalties associated with the capital.

METR vs Project Analysis Models

Project Analysis models involve taking the cash flows from a “typical” oil and gas project and calculating, among other things, the discounted cash flow of the project (net present value), its internal rate of return, the profitability index, and discounted and non-discounted government take.

How does the idea of the metr on capital compare to the type of analysis undertaken in the project analysis, or discounted cash flow models. To address this question, we need to look a little closer at the idea behind the metr. As discussed above, the very last increment of investment (the marginal unit of capital) just breaks even and generates no economic rent. The metr tells us the effective rate of tax imposed on this last increment of capital. Thus, if the metr is equal to zero this tells us that the tax and royalty system does not impinge upon the investment decision (it is said to be neutral), and constitutes a tax on pure economic rent – because the marginal investment generates no economic rent a neutral tax/royalty system will collect no revenue from a marginal investment. It is important to emphasize that a tax/royalty system which generates a metr equal to zero does not mean that the system collects zero revenue for the government, only that it collects zero revenue from the marginal unit of capital; revenue can be collected from the income generated by inframarginal units of capital.

A positive metr means that the tax/royalty system discourages investment by imposing a tax on a marginal investment which generates no rent. Likewise, a negative metr means that the tax/royalty system encourages (subsidizes) investment. In the above example, the metr of 40 percent suggests that the tax/royalty system (significantly) discourages investment by imposing a 40 percent tax on a marginal investment which generates no economic rent.

The concept of “government take” which is calculated from project analysis models is related to the idea of an *average* effective tax rate (aetr), as opposed to a *marginal* effective tax rate. The aetr calculates the share of the **total**, marginal plus inframarginal, rent (or income) collected by the government. Whereas the metr calculates the share of the before-tax rate of return on a marginal investment collected by the government.

The *netr* (government take) is well suited to investigating the impact of various tax and royalty systems on the government's share. It is not as good at evaluating the impact on investment as it does not consider the impact of the tax system **at the margin**. The *netr* is better suited to analyzing the impact of a tax/royalty system on the incentive to invest, but is not an appropriate metric to measure the government share/take. The *netr* analysis also allows us to see how the fiscal regime imposes differentially on the incentive to invest across different sectors.