MANAGING RESOURCE WEALTH

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1. Introduction

Exploitation of exhaustible resources has long been a significant component of economic activity in Australia and Canada, but had, until recently, been declining in its relative importance compared to manufacturing and services. From the turn of the century, rapid growth in demand for energy and minerals has been driven by industrialisation and urbanisation in developing countries. This strength in demand has translated into a resurgence of the energy and minerals sectors in both countries and has underpinned a period of sustained economic growth.

The strength of the energy and minerals sectors has also delivered revenue windfalls to government, enlivening public debate about how best to use the proceeds. In general terms, the revenue surge has enabled various forms of saving. These have included increasing investment in public infrastructure and education, accumulating financial assets and retiring debt, improving tax competitiveness by offering various forms of tax cuts, and offering tax incentives for private savings. This leads not only to questions of which combination of the above policies might be preferred in the circumstances, but also whether enough saving is being done overall.

The paper commences with an exposition of the economic theory underpinning exhaustible resources and the commercial and public policy forces that transform resource wealth into other forms of physical, human, social and financial capital. Public sector financial management is a central theme.

It is argued that the economic characteristics of resource rents, especially their temporary nature, present a case for governments to account separately for revenue derived from exhaustible resources. The case for resource-rich jurisdictions adopting a number of

supplementary fiscal policy indicators is examined, largely following work of the International Monetary Fund (IMF) and the World Bank.

Given the temporary nature of resource revenue, breaking the nexus between government expenditure and revenue surges can boost the capacity to run counter-cyclical fiscal policy and help reduce resource revenue dependence over time. Breaking this nexus usually implies saving the revenue windfall (but might equally involve returning some of the savings to the private sector at an appropriate time).

The paper also considers the merits of a particular set of policies aimed at converting such savings into a permanent store of public financial wealth. This has the objective of sustaining a level of permanent income that ultimately replaces resource revenue when they are exhausted. So designed, the income derived from the financial assets can then be spent on contemporary priorities without prejudice to the welfare of future generations.

The constitutional ownership of resources in Australia and Canada translates into a concentration of mineral wealth among sub-national governments. Accordingly, the paper examines the experience of the province of Alberta and the states of Queensland and Western Australia alongside the national governments of Australia and Canada. For each jurisdiction, supplementary fiscal indicators are presented, as are estimates of the financial impact of a policy of saving resource revenue.

The paper seeks to achieve three objectives:

First it presents, selectively, strands from the existing literature to construct a theoretical base for assessing public management of resource wealth;

Second, it documents the fiscal performance of two developed federations in Australia and Canada, and their resource hubs in Alberta, Queensland and Western Australia; and

Finally, it considers the merits of a number of policy prescriptions relating to saving resource revenue that might be relevant to both countries.

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2. Key concepts

This section introduces a number of theoretical concepts that help to define the scope of the paper and which constitute a framework for analysing resource wealth.

Exhaustible resources

The term exhaustible implies that the resources exist in finite supply. This is typically thought of in terms of physical limits, for example the finiteness of the world's oil stocks. However, exhaustibility has an economic basis as well (Hannesson [2001]). Should extraction costs escalate in the face of declining mineral quality, or should technological advances deliver substitutes, certain resource deposits may become unviable. While anticipating later discussion, it is noteworthy that there is typically only a single opportunity to collect the resource rents from the extraction of an exhaustible resource. Exhaustible resources then represent a finite source of revenue for governments (Sunley, Baunsgaard and Simard [2003]).

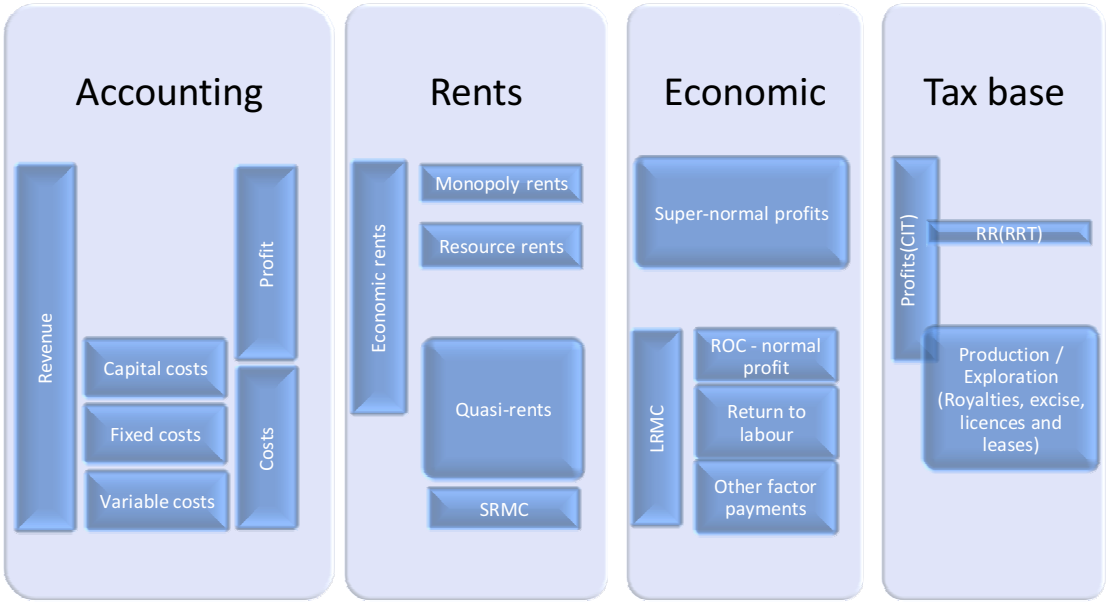
The focus on exhaustible resources is adopted for two reasons. First, it serves to limit the focus to energy and mineral resources in which Australia and Canada have significant natural endowments, while avoiding some of the complexity associated with renewable resources and associated theory addressing their optimal exploitation. Second, it corresponds quite closely with available statistics for the energy and mining sectors and within public sector financial accounts.

Economic rents and resource rents

The following discussion examines the concept of economic rent in the context of exhaustible resources. In defining the central concepts that are adopted in later discussion, a balance has been struck between achieving a simple, yet practically useful set of definitions against

theoretical rigour.[1] Figure 2.1 provides a useful navigational aid to the discussion of economic rents and the collection of resource revenue, and much of what follows:

Figure 2.1 – a visual guide to the key concepts



Abbreviations: short-run marginal cost (SRMC); long-run marginal cost (LRMC), return on capital (ROC), corporate income tax (CIT), resource rents (RR); resource rent tax (RRT).

We adopt a working definition of economic rent as the excess of the realised sale price over all of the necessary costs that are incurred in finding and extracting an exhaustible resource and maintain a given level of production (Hannesson [2001], Otto et al [2006]). The short-run marginal costs are the minimum level of costs that must be recovered if the firm is to operate an existing project and can be thought of as the variable costs of production. They would be the costs avoided if the extractive firm were to cease operations. Examples include wages, fuel and transportation.

[1] Alternative treatments can be found in Garnaut and Clunies Ross [1984], Boadway and Flatters [1993], Otto et al [2006] and Hannesson [2001].

Energy and minerals extraction is a capital intensive and risky proposition. In the longer-term, an extractive firm must receive a price that also allows it to recover the project investment, repay debt and generate appropriate returns to those who accept the risks. Otherwise a firm will have no incentive to undertake, maintain or expand its investment.

The long-run marginal cost then comprises the components of short-run marginal cost and quasi-rent. Quasi-rent is the component of long-run marginal cost that represents a risk-adjusted return on investment (competitive return on capital) and an allowance for depreciation/depletion (return of efficient level of capital). The collection of quasi-rent allows the extractive firm to recover its fixed costs over time (including costs of mineral exploration and development) (Otto et al [2006]).

If the sale price was to equal the short-run marginal cost plus the quasi-rent there would be no additional economic rents. However, in the case of exhaustible resources, there are a number of reasons why economic rents in addition to quasi-rent will exist, at least within a finite time horizon. We shall call these additional rents, and for simplicity divide them into resource rents and monopoly rents.

Resource rents comprise scarcity rent and differential rent (Hannesson [2001]).

Scarcity rent arises when the resource has intrinsic value in another use. In the case of exhaustible resources, this scarcity value is underpinned by the finite supply of the resource. The opportunity cost of extracting and using a resource is determined by its next best alternative contemporary or future use. This could include leaving it in the ground if the expected value in future use is sufficient.

Differential, Ricardian or quality rent arises if the superior grade of an ore deposit or its proximity to the surface or final markets makes the unit costs of its production lower than that of the highest cost supplier (Otto et al [2006]). At prevailing global prices, the difference in operating margins accrues as economic rent.

We shall consider monopoly rent to comprise both entrepreneurial rent and pure monopoly rent.

Entrepreneurial rent arises by virtue of an extractive firm's superior marketing, technology or the working conditions it offers its employees. Due to such factors, a firm may be able to achieve a higher price for its sales or a higher productivity in operations than its competitors. The surplus accrues as extraordinary profits. Arguably this form of rent should accrue to the owners of the firm if incentives to maximise it are to be preserved.

Monopoly rent arises due to the ability to charge a final price above that of a perfectly competitive market (Hannesson [2001]). The ability to extract monopoly rents may be offset where monopsony power is present, where there is downstream competition, or close substitutes exist. In well-functioning markets, this form of rent should be transitory.

While monopoly rent is theoretically distinguishable from resource rent, a degree of monopoly power is often evident in the resources sector. Given the coexistence of monopoly rents and resource rents, in practice it is difficult to distinguish between them.

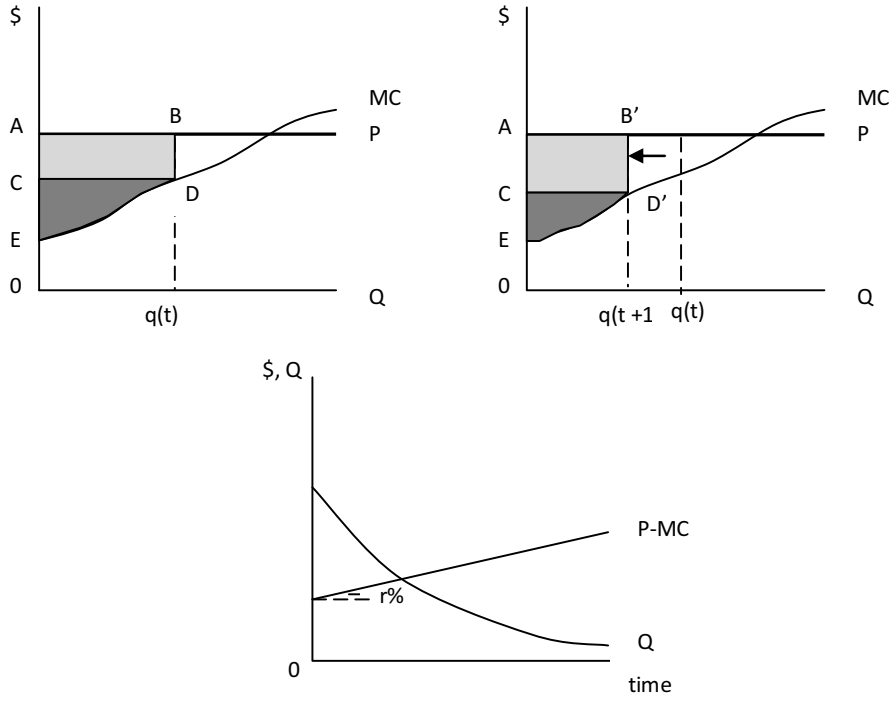
Optimal extraction paths

The economic theory behind optimal extraction of exhaustible resources is already well-established and is not the focus of this piece.[2] We have, as a starting point, the results of

[2] Pezzey and Toman (eds.) [2002] have compiled a volume of all the major contributions.

Hotelling [1931] concerning the optimal extraction path for exhaustible resources. The key result is that the owner of a resource will choose a path of extraction such that the net price (price minus marginal cost - the line segment BD in Figure 2.2) increases at the rate of interest. This must occur in order for the resource owner to be indifferent between extracting the resource now or keeping it in the ground to extract and sell in a future period.

Figure 2.2 – resource rents and extraction paths

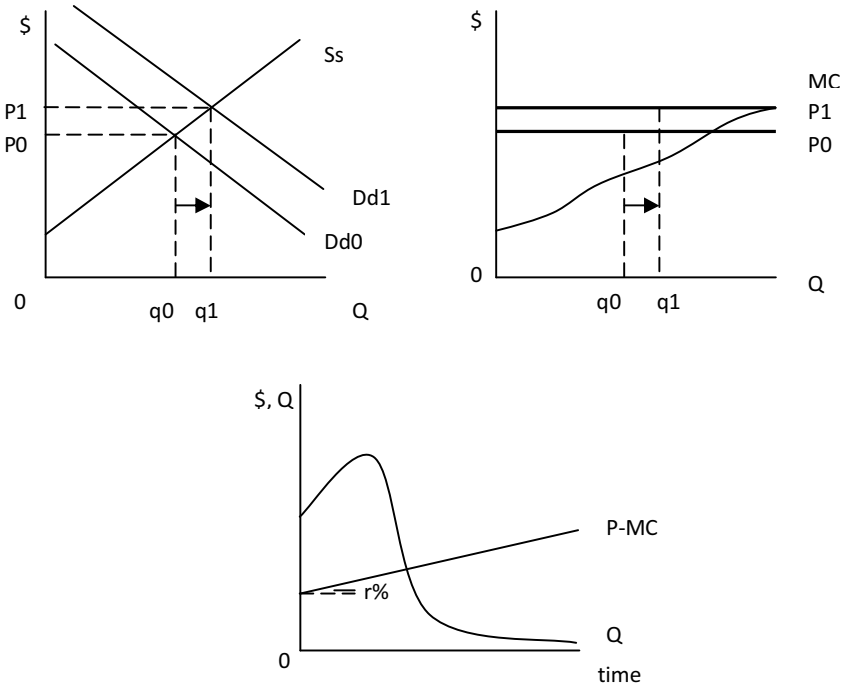


Assuming competitive markets and static prices and costs, the optimal extraction path entails the highest output in the initial period, and production approaches zero in the long run. Profit in period t is the area ABDE in Figure 2.2, comprising the rectangular area ABCD (resource rents) and the triangular area CDE (the producer surplus or infra-marginal or normal profit of the firm), OABq(t) is total revenue and OEDq(t) is the total cost of extraction. B'D' in period t+1 is 1+r times the distance BD.

To assist in understanding a point made in later discussion, note that a government's fiscal choices will determine the proportion of resource rents it collects. The residual amount of rent plus the normal profit will accrue to the firm's owners, although this income may in turn be subject to corporate tax.

Allowing prices[3] (or costs) to vary over time, as in Figure 2.3, can allow us to reach different results. We see that if the price of the exhaustible resource increases (for example due to an outward shift in the demand curve driven by population or income growth (Chapman [1993])) the optimal path of extraction can be increasing for a time. Given exhaustibility of the resource, the future reduction in extraction must be more rapid than under the benchmark case. While Hotelling's theory is usually associated with declining production, it need not be the case over short horizons. In much of what follows we permit the case in which resource output (and resource revenue) is anticipated to be on an increasing path.

Figure 2.3 – demand shifts and increasing extraction paths



[3] As per Chapman [1993].

Resource wealth

There is a direct correspondence between the concept of resource rents and resource wealth (Garnaut and Clunies Ross [1984] and Hannesson [2001]). Resource wealth reflects the present value of the stream of resource rents. Policies that impact on resource extraction or the distribution of rents have direct effects on resource wealth and its distribution among stakeholders. We can also think of resource wealth in terms of a process of transformation. Minerals *in situ* have an inherent value, but this can only be realised if extraction becomes a viable commercial proposition. Once extracted, the associated rents and wealth might be captured and transformed into other physical or financial assets; or used for consumption, in which case they are dissipated.

Governments must decide how to distribute resource wealth between private and public stakeholders. A decision to capture less than the full amount of resource rents is inherently one to allow resource wealth to accrue to private stakeholders. The shareholders and employees of extractive firms would be the direct beneficiaries of privately allocated rents, enjoying profits and wages at levels above those necessary to attract the supply of capital and labour.

Allowing resource rents to flow to the private sector will translate into indirect benefits to the local economy in the form of increased private investment and expenditure. Higher income and consumption tax receipts would also likely result. To the extent that these private stakeholders are located outside the jurisdiction, resource rents and resource wealth will be transferred abroad.

Resource revenue

The term resource revenue shall be used to define the estimated value of resource rents collected by government. The fiscal regime applying to exhaustible resources includes royalties,

leases, production excises and corporate tax applied to resource rents. In contrast to Busby [2008], this definition excludes some other, less direct, sources of revenue such as personal income tax or corporate tax on normal profits from the energy and minerals sector. These are taxes on the standard factors of production (labour and capital) that have an alternative use, and as such can be distinguished from the resource factor.

Once collected, Government decisions about how to spend or save resource revenue will then determine how the public share of resource rents is transformed into other forms of capital or further dissipated. Governments may use the resource revenue to finance program expenditure, invest in human, social or physical capital, or accumulate financial assets. There is also an intertemporal or intergenerational allocation inherent in such decisions.

In general terms, a fiscal regime for exhaustible resources can be thought of as comprising taxes on exploration and production activity on the one hand and taxes on profits and rents on the other.[4]

Exploration and production taxes such as royalties, excise, leases and licence fees tend to be levied on the volume or value of production (royalties and excise) or as fixed amounts (leases and licences). As such they impact directly on the marginal costs of production (area OEDq(t) in Figure 2.2) and induce direct changes in the extractive firm's behaviour (change in q(t)).

Profit (ECD in Figure 2.2) and rent (ABCD in Figure 2.2) taxes are imposed on net income of the firm, which can be defined in various ways. For example, corporate income tax tends to allow deductions for capital costs (such as interest and depreciation) and other taxes paid on

[4] Production sharing arrangement and state-owned equity are additional means of extracting resource revenue (Sunley et al [2003]), but are ignored in the current study, because they are not used by the jurisdictions in question.

production (such as royalties), with the result that it is applied to all forms of profit, both normal and super-normal.

Such taxes often recognise prior period losses, such that tax is payable once prior losses are recovered. Resource rent taxes are often applied on a project basis. However, they tend to allow a reasonable return on capital to be deducted and in this sense seek to tax only super-normal profit. A key point is that both forms of tax – profit and rent – will tend to capture a portion of resource rents, as well as other forms of economic rent.

When estimating the level of resource rents collected by governments, it is necessary to look beyond the revenue collected through primary instruments such as licence fees and royalties, and include an appropriate proportion of corporate tax receipts.[5] This approach is adopted later in the paper, but only where reliable estimates of corporate income tax attributable to energy and mining are available.

Given the nature of resource rents, economic theory posits that the collection of resource rents can potentially occur without distorting investment, production or consumption decisions (Garnaut and Clunies Ross [1983]). In practice, given the difficulty in measuring and collecting rents, the fiscal regime will inevitably introduce inefficiencies. Capturing any more than the full amount of resource rents would reduce production over time. Moreover, since the design of the fiscal regime will usually entail some distortions, some of the potential resource rents will be destroyed by the process of taxation.

[5] It is argued that only a part of total corporate taxation should be counted. Corporate tax receipts reflect a combination of tax on ordinary profits, tax on monopoly profits and tax on resource rents.

Sustainability and intergenerational equity

The Hartwick Rule (Hartwick [1977]) advises us that transforming resource rents (obtained from the efficient Hotelling extraction path) into reproducible capital (or maintaining capital in tact) is necessary to yield a constant consumption path equal to Hicksian permanent income. In the presence of exhaustible resources, if welfare is to be maintained, saving of is necessary both to cover the economic depreciation of resources and to offset the long-term deterioration in the resource-producing jurisdiction's terms of trade. More specifically, in the benchmark case, if all resource rents are invested, the growing earnings stream is exactly sufficient to offset any volume-based decline in normal profits.[6] A constant level of consumption can then be supported (Hartwick [2000]).

Our focus then returns to how to characterise the optimal (most efficient, most equitable) path of resource extraction and use.[7] The efficient path discussed above maximises social welfare in net present value terms. Perhaps the key assumption in deriving the efficient path is the appropriate way to compare benefits across time, that is, the appropriate rate at which to discount the future. A higher discount rate implies a bias in resource extraction and use toward current generations. At any positive discount rate, the distant future receives negligible weighting compared to the present. If the exhaustion of the resource base is sufficiently distant, it will have negligible effect on social welfare measured in present terms.

An alternative characterisation, the equitable path, draws more from concerns with intergenerational equity and the related concept of sustainability. It faces the same difficulties in balancing current and future benefits, but adopts a zero or very low discount rate, implying an

[6] In practice the total income stream (profits and rent) is split between the public and private sectors. Given difficulty in tracing the extent to which resource rents accrue to the private sector and are saved, this study focuses on the public sector only.

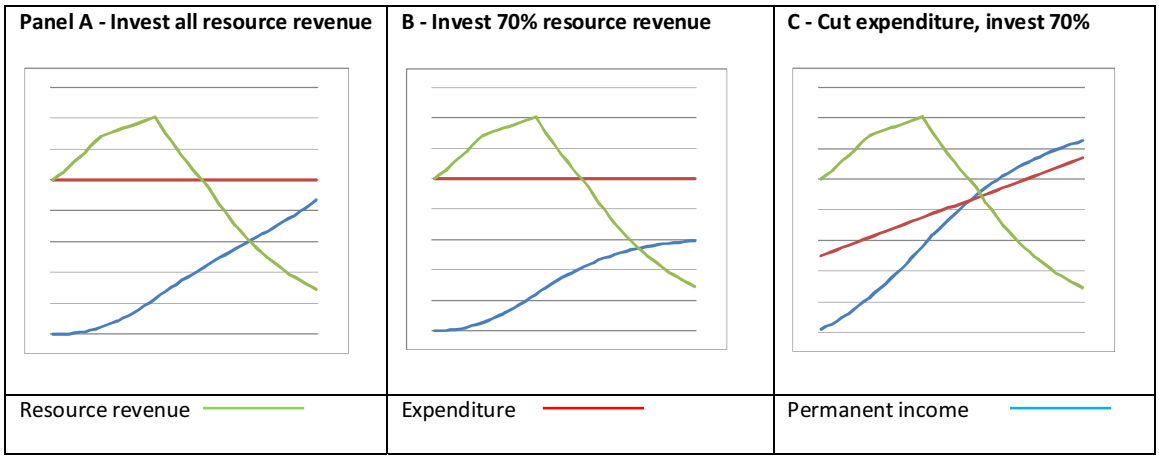
[7] The discussion broadly follows Arrow et al [2004].

equal or nearly equal weighting across generations. In broad terms, the condition of sustainability would require that the level of social welfare not be permitted to fall below existing levels in the future, particularly following exhaustion of the resource base. One possible criterion is real consumption per capita. Alternatively, broader measures of wellbeing could be adopted with non-monetary components.

We adopt one possible definition of a sustainable and equitable path as a non-decreasing path of government expenditure (using resource revenue), measured in real per capita terms. With finite resources, if expenditure were simply to match resource revenue, we see from Figures 2.2 and 2.3 that it must enter a phase of decline and eventually approach zero in the distant future. Hence spending resource revenue as it accrues can never be sustainable under our adopted convention. However, a declining revenue stream can be annuitized via the 'invest resource revenues in a fund approach' to yield a constant and perpetual income stream. The level of perpetual income or permanent income is used as a benchmark in this study.

If the expenditure path can be kept sufficiently below the path of resource revenue, a range of sustainable paths become feasible (with differing equity implications). The profile of resource revenue and the extent to which it is saved will determine the feasible path of expenditure that can be supported. A higher rate of saving will permit a higher permanent level of real per capita expenditure and may even permit an increasing level of real per capita expenditure over time.

Figure 2.4 – Sustainable expenditure paths given a particular profile of resource revenue



In panel A, permanent income will reach the level of expenditure before resource revenues are exhausted, and the expenditure path is considered sustainable. In panel B, the permanent income generated by saving resource revenues is insufficient to replace them by the time they are exhausted, and the initial level of expenditure is unsustainable. In panel C, the initial step of reducing dependence on resource revenue permits a sustainable path where real per capita expenditure increases over time.

Perhaps the most significant external force determining the future paths available in the face of exhaustible resources is technological change. If technology determines the degree of substitutability among inputs, it will then determine the extent to which exhaustibility will matter in the future. If viable substitutes can be developed, then exhaustibility becomes irrelevant. If, however, despite technological change, an exhaustible resource remains an essential input into production, then investment in depreciating assets cannot yield a sustainable path.

A recap and some points of theoretical departure

Two key points follow from the above theoretical discussion. First, resource rents are an economic signal that informs optimal investment in, and extraction of, exhaustible resources. Second, imposing taxation on extractive firms, in an effort to collect resource rents, inevitably involves some distortions[8] that impact on investment and production decisions. In turn this will affect the magnitude and profile of rents available, and the resource revenue that is derived from them.

This leads to a number of observations about the relationship between resource rents and public policy. The inherent value of resource rents, while obviously originating in a country's resource endowment, derives from the legal and policy frameworks that define property rights, enable commercial extraction of resources, and ultimately determine the distribution of rents between stakeholders. Resource rents can be dissipated by weak, ambiguous or non-exclusive property rights. In addition, poor choices by governments concerning the fiscal regime for collection of resource rents can further diminish their value.

The fact that both resource rents and resource revenues are finite and are expected to follow a declining path, even if in the distant future, suggests that governments need to take special steps to manage them, particularly if concerned about sustainability and intergenerational equity.

While grounded in the theory associated with the Hotelling and Hartwick rules, this study has three main areas of departure from the standard theoretical models, in order to more closely match the reality of the jurisdictions we are studying.

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[8] Samuelson devised a taxation scheme for companies that would neutralise distortions by effectively allowing firms to borrow at a lower after-tax interest rate to compensate for the reduction in the firm's economic value arising from taxation [Samuelson (1964)]. We assume this is not achieved in practice.

The first is that we assume that extractive firms are privately owned. Governments collect a share of resource rents through taxation of resource rents and profits. The residual revenue (normal profits and rents not collected by government) accrues to owners of the extractive firm. This is an important departure in the context of the Hartwick Rule. Even if following the optimal (Hotelling) extraction path, resource rents will tend to be distributed to both the private and public sectors. When analysing the prescriptions of the Hartwick Rule of investing resource rents, we are limiting our focus to the behaviour of the public sector.

The second is that by allowing for shifts in demand for resources, we have introduced the possibility of resource output and revenue following increasing paths. This is in contrast to the standard Hotelling case involving declining output.

A final point of departure is that we assume that when resource revenues are invested they can be placed at risk. The standard approach would typically assume that the interest rates on borrowing and lending would be equal. Instead we allow for higher rates of return to be achieved by placing capital at risk. This is done by applying a risk premium (a margin above the borrowing rate) when projecting the earnings on resource revenues saved.

3. Accounting for resource revenue

This section explores the rationale for assigning special treatment to resource revenue within the fiscal reporting framework of resource-rich jurisdictions. The following section is concerned with the case for saving resource revenue.

A general discussion of the rationale for supplementary reporting is followed by the introduction of three specific measures that could help to draw greater attention to the links between resource revenue and fiscal sustainability. These are:

- Primary balance
- Real net worth per capita of the general government sector or the broader public sector
- Adjusted net savings.

Whether a jurisdiction is sufficiently dependent upon resource revenue to warrant special fiscal reporting arrangements is essentially an arbitrary question. For example, in its 2004 version of the *Guide on Resource Revenue Transparency*, the IMF adopted the convention that countries that received on average more than 25 per cent of either fiscal revenue or export proceeds from hydrocarbons and minerals during the period 2000-03 could be considered resource-rich. A revised version of the guide was published in 2007 (IMF [2007]) which contains a list of countries considered to be resource-rich also corresponds with these thresholds.[9] Two points are noteworthy.

First, the sustained surge in resource demand and prices will have altered the membership of qualifying jurisdictions considerably. Although at the central government level resource revenue comprises only a small proportion of total revenue, at the margin, resource revenue has been central to Australia and Canada's records of recent fiscal success. Indeed, as

[9] The list is contained in Appendix I of IMF [2007].

documented in Section 5, even at the national level, resource revenue has made the difference between surplus and deficit in some years.

Since the early 2000s, Australia and Canada's energy and mineral exports have grown significantly (Table 3.1). Australia now meets the IMF's definition of a resource-rich country by virtue of strong export growth and Canada is on the cusp of qualifying (depending on whether primary metals are counted). The implication is that the IMF could consider both countries compliance with the Guidelines on Resource Revenue transparency in a future assessment of their compliance with fiscal transparency standards.

Table 3.1 -Resource revenue and resource exports – Australia and Canada

	Australia	Qld*	WA	Canada*	Alberta
Resource revenue : total revenue (2007)	1.6%	4.3%	13.5%	1.1%	29.0%
Resource revenue : total revenue (2002)	1.9%	3.6%	9.5%	0.8%	31.5%
Resource exports : total exports (2007)	37.0%	49.4%	86.0%	23.6%	67.1%
Resource exports : total exports (2002)	30.0%	38.1%	N/A	16.7%	N/A
* exports 2006					
Sources: see Appendix					

Second, IMF surveillance typically is focused at the country level. However, the importance of resource-revenue at the sub-national level in places such as Alberta, Queensland and Western Australia rivals that of many resource-rich countries. The implication is that these resource-rich jurisdictions might reasonably consider their own compliance with the IMF guidelines in pursuit of fiscal good practice.

If the relative significance of resource revenue can be resolved as an empirical question, then what is it about resource revenue that warrants special accounting treatment?

Barnett and Ossowski [2003] identify four characteristics of oil revenue and associated policy concerns that could be argued to apply more generally to revenue from exhaustible resources.

Exhaustibility leads to concerns about sustainability and intergenerational equity. Volatility and uncertainty lead to concerns about macroeconomic management and fiscal planning, as policy makers try to avoid the transmission of resource price shocks to the real economy. Finally, to the extent that resource revenue originates from offshore, changes to the fiscal balance might occur quite independently of underlying changes in domestic demand. The implication is that macroeconomic management is complicated by large flows of resource revenue.

Recall that resource rents are the financial proceeds of resource wealth, and resource revenue is the share of resource rents collected by the government. Resource revenue can then be considered as a form of compensation to the public for the depletion of the resource. By virtue of both commercial endeavour and fiscal choices, resource wealth is transformed into financial wealth. The financial wealth is distributed between private stakeholders and the public.

Hence revenue from exhaustible resources may be most appropriately viewed as a transformation from physical to financial capital, and not as a recurrent revenue stream (Barnett and Ossowski [2003]). This leads directly to the methodological question of whether resource revenue should best be accounted for as capital drawn down or as 'ordinary' income. As discussed later, regardless of the accounting approach, if the resource revenue is saved and annuitized, the annual income stream loses its special character – a declining revenue stream from exhaustible resource can be converted into a stream of permanent income equivalent in character to normal tax or dividend receipts.

Many jurisdictions[10] prefer to treat resource revenue as income and report their general government operating balances on this basis. If resource revenue was instead deemed capital

[10] Including Australia, Canada, Alberta, Queensland and Western Australia.

proceeds, resource-rich jurisdictions would tend to report systematic operating deficits, and the extent to which resource revenue was used to finance this deficit would be more apparent.

Recognising the unique fiscal challenges presented by resource revenue, the IMF has advocated that resource-rich jurisdictions present additional indicators of their fiscal stance, including separate accounting for resource revenue and reporting the primary (non-resource) fiscal balance in their budget papers.

There seem to be reasonable arguments for resource-rich jurisdictions to augment their fiscal framework to recognise resource revenue separately. In practice, this may be as simple as identifying resource revenue separately within the financial accounts and establishing some supplementary fiscal rules or targets (Davis et al [2003]). Or it may involve somewhat more complex arrangements, as in Norway, of isolating resource revenue from the operating budget altogether, accumulating resource revenue within a separate fund, and making even more transparent the sources of deficit financing (Skancke [2003]).

Isolating resource revenue can be important in complementing public savings objectives. Resource-rich jurisdictions may have a preference for a higher level of public savings for a variety of reasons. In the short to medium-term, saving may be motivated by the desire to stabilise expenditure in the face of volatile resource revenue. By accumulating windfalls during booms and running down saving balances during downturns, the path of expenditure can be smoothed. Of course the same result can be achieved by borrowing during downturns and repaying the debt during booms, but this is somewhat less politically palatable. In the longer-term, saving may be motivated by a desire to spread the benefits of resource wealth across generations.

Primary balance

Barnett and Ossowski [2003] argue for the adoption of additional fiscal measures and associated medium-term targets in the presence of significant oil wealth. As a preferred flow measure, they advocate the reporting of the **primary balance**[11], which excludes oil revenue but includes government expenditure in the oil sector.

By this convention, if total non-resource revenue is less than the operating expenditure of government, there is a primary deficit. A primary deficit must be financed, and by reporting the primary balance, it is more apparent the extent to which resource revenue is used as financing, compared to other means, such as debt or prior savings. Changes in the primary balance are argued by to be more representative of the underlying fiscal stance, representing more closely those matters within the government's direct control (Barnett and Ossowski [2003]).

It should be emphasised that a primary deficit is not indicative of financial sustainability problems *per se*. Barnett and Ossowski [2003] note that determining the sustainable level of primary deficit requires a degree of subjectivity. At one extreme, a 'bird in the hand rule', that is, an approach of limiting the primary deficit in a given year to the expected return on existing financial assets, is too conservative. This is because resource wealth will continue to be extracted in future periods, and as such, can be used to repay any necessary borrowings.

A less conservative, but perfectly reasonable, option involves targeting a primary surplus no greater than the expected return on resource wealth, given that resource wealth will, over time, be transformed into financial wealth. Of course adherence to this latter rule is complicated by the uncertainty surrounding the level of resource wealth at any given time. Due to this randomness in the level of income, Barnett and Ossowski [2003] propose estimating the return

[11] In the spirit of Barnett and Ossowski's [2003] definition we exclude all energy and mineral-related revenue, but do not exclude related expenditures, given the difficultly in accurately identifying the latter.

on resource wealth as a certainty equivalent, and that this should form the upper bound for any primary deficit.

Real net worth

In order to sustain a primary deficit over time, it is necessary to accumulate assets at such a rate that the return on these assets ultimately replaces the resource revenue. In contrast, it is not sustainable to draw down existing assets to finance a primary deficit. Accordingly various measures of **net worth**[12] that are increasing over time might be broadly indicative of financial sustainability. Whether the pace of asset accumulation is sufficient to sustain an ongoing primary deficit will depend on the size of the deficit, the rate of resource extraction and resources remaining.

In Australia, a number of jurisdictions have set themselves the objective of growing government net worth as part of their medium-term fiscal strategies. This measure is constructed in different ways. For example, the Australian[13] and Queensland[14] governments pursue increases in nominal net worth (as one of several financial targets). In contrast, the Western Australian Government[15] adjusts its net worth target to account for consumer price inflation.

The choice of deflator in such calculations is not trivial, with the broad options being consumer price deflators, GDP deflators and wage-based deflators. It is not intended to cover the details of this debate, merely to note that consumer price deflators are perhaps the least conservative choice available.

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[12] We adopt a definition of net worth as physical and financial assets minus depreciation or capital consumption minus liabilities.
[13] Australian Government, Budget Paper 1 2008-09, Statement 3, page 3-3.
[14] Government of Queensland, Budget Strategy and Outlook 2008-09, page 10.
[15] Government of Western Australia, Budget Paper 3, 2008-09, page 12.

The ability of the government to meet its future liabilities or to sustain a given standard of public infrastructure and services is also likely to be affected by population growth. In any case, if a given level of net worth is to be shared by a growing population, each person's share would be diminishing over time. Accordingly, real net worth per capita could be argued to be a preferable indicator of improvement in the public sector's net financial position.

In measuring net worth, the question of how broadly to define the public sector is another relevant consideration. The choices are between a narrow definition of the general government sector (core government) and a broader definition of the public sector (including government business enterprises and publicly-owned financial institutions). If the measure is employed to gauge the change within a jurisdiction over time, the choice should not be important. However, to compare levels of net worth across jurisdictions, the more narrow measure might be preferred, given quite different levels of government business activity across jurisdictions (reflecting, for example, different policy stances toward service provision and privatisation).

Adjusted net saving

The key criticism of the indicators outlined above is that they fail to take into account the depletion of the resource base over time. The public financial accounts record the resource revenue as income. To the extent this is not spent, it contributes to net worth. However, there is no corresponding entry (reduction in natural assets) to reflect the depletion of the value of the resource base.

Hamilton [1994], Pearce, Hamilton and Atkinson [1996], Hamilton and Clemens [1999] and others have developed a conceptual framework for a 'first approximation' indicator of

sustainability called 'genuine saving 'or 'adjusted net saving'.[16] Adjusted net saving is an extension of the concept of 'invest current exhaustible resource rents' in a distinct fund. In contrast to the above discussion, which focuses on resource revenue rather than resource rents, and on the financial statements of government, the adjusted net saving approach is an extension of national accounting concepts. It abstracts from the details of government revenue and expenditure.

There are a number of practical difficulties associated with obtaining reliable measures of saving, resource depletion and environmental externalities. As such, the measure adopts only a limited range of adjustments, for example, it only counts deforestation and carbon dioxide emissions toward the environmental externality component, whereas other costs, such as biodiversity loss or public health are not considered.

While the concept of adjusted net saving is broader (encompassing various forms of saving) and deeper (it considers depletion of mineral wealth) than the financial accounting measures above, it ignores the impact of population growth and technological change, which would imply reductions or improvements, respectively, in the economy's productive base (Arrow et al [2004]).

The World Bank makes its estimates of adjusted net savings available only at the national level. Separate studies have also derived estimates for Queensland for the period 1990-2001 (Brown et al [2005]).

In summary, the additional fiscal indicators that might be considered by resource-rich jurisdictions are as follows:

[16] Adjusted net saving is defined as gross national savings, minus depreciation of fixed assets, plus expenditure on education, minus rent from natural resource depletion (energy, minerals and forests), minus the costs of environmental degradation and pollution.

The primary balance, in order to record the extent to which resource revenue is being relied upon to fund the day to day operations of government;

Real net worth per capita of the general government sector, to compare the extent to which the accumulation of government-owned assets (net of depreciation) exceeds the growth in its total liabilities, inflation and population growth; and

Adjusted net saving, as an attempt to incorporate all forms of investment, both public and private, in physical and human capital, and recognise the depletion of natural capital and environmental costs.

4. Saving resource revenue

The discussion above outlined the case for accounting separately for resource revenue in order to construct alternative indicators of the fiscal stance of resource-rich jurisdictions. This section considers the merits of taking the additional step of deliberately saving resource revenue as a step toward securing fiscal sustainability. This can be considered in two distinct steps: the case for saving, and the case for establishing a savings fund.

The case for saving

The general case for saving resource revenue stems from the desire to avoid major reductions in expenditure to obtain revenue from alternative sources when the resource revenue is exhausted. In order to avoid large reductions in government expenditure or increased taxes in the future, a policy of accumulating financial assets and using their earnings to supplement and replace resource revenue could be pursued. As discussed above, saving entails curtailing expenditure growth in the face of growing resource revenues.

From a macroeconomic policy perspective, a policy of saving resource revenue, and especially resource revenue windfalls, is more likely to be counter-cyclical. Where monetary policy settings are generally counter-cyclical (such as in inflation targeting regimes), there are obvious benefits from the co-ordination of fiscal and monetary policies.

There is a well-established literature on the impact of resource wealth on economic development. The observation is that many countries that are highly dependent on resource wealth have struggled to establish vibrant and well-diversified economies. And throughout history developed economies have faced considerable structural adjustment in the face of commodity booms.

On the one hand, there are arguments that some of the proceeds of a resource boom need to be used by governments to ensure diversification of the economy and to attempt to offset the decline in competitiveness faced by the non-resource tradeables sector. Other reasons cited for increasing public investment during a boom relate to dealing with the localised inflow of labour and capital and raising the productive capacity of the economy.

An alternative view is that introducing a bias toward domestic public investment is counter-productive in a boom environment. If the investment is to occur during the boom, it will further exacerbate shortages of skilled labour, and divert resources toward the construction sector away from the manufacturing sector. By further reducing spare capacity of the economy, inflationary pressures will tend to push interest rates and exchange rates even higher; tending to further undermine the competitiveness of the manufacturing sector (Skancke [2003]).

Perhaps the appropriate balance to strike in this debate is that public investment must be considered on its merits (whether commercial or social net present value). The case for domestic investment certainly does not hinge on the availability of resource revenue as a source of funding. While there will very likely be a range of worthy projects at any given time, and even a backlog from previous neglect, there presumably comes a point at which diminishing marginal returns or the adjustment costs of public investment undermine the case for further investment. In addition, the appropriate incentives and investment screening discipline could be achieved by debt financing of public investment programs.

In such cases, the jurisdiction may be better served by investing resource revenue in financial assets or abroad and deferring the fiscal stimulus from domestic investment. Investing resource revenue in offshore financial assets can be viewed as a long term hedge against adverse commodity price movements and terms of trade shocks. There is evidence of strong correlation

between the value of the domestic currency and commodity prices in resource-rich jurisdictions, as well the tendency for exchange rates to overshoot. The process of investing offshore during commodity booms will reduce demand for domestic currency and the rate of currency appreciation during the boom. Moreover, when the terms of trade reversal eventuates, and the currency begins a phase of depreciation, the value of foreign currency assets will increase, offsetting the drag on national income.

There are a number of arguments as to why it may be unnecessary for resource-rich jurisdictions to target higher levels of public saving.

A first argument is that saving can take many forms, and there are other public policies that may be functionally equivalent or even preferred to establishing a store of public financial wealth. Returning resource wealth to the community through tax cuts or annual dividends, or increasing investment in education, public health, or public infrastructure are arguably all legitimate forms of saving. Indeed in many developed economies there is a strong preference for diverting any public surplus back to the private sector, in the belief that market-based mechanisms are more efficient in allocating capital to its best use.

Ultimately this is a distributional question. The level of aggregate savings and the distribution of benefits between stakeholders (contemporarily and over time) will differ according to the associated policy choices. However, nothing in this argument would appear to rule out the inclusion of a public fund in the mix of savings policies.

A second argument is that there would not appear to be a point in saving resource revenue if the government would otherwise have to incur debt to finance its primary deficit. This warrants some closer analysis, as it presumes that the primary fiscal position is prudent and should be continued into the future.

The very point of separately identifying resource revenue is that its use for financing recurrent spending is unlikely to be sustainable. A government that has become dependent upon resource revenue to finance its operating expenditure faces a difficult transition period during which expenditure growth must run at a lower rate than non-resource revenue growth. If such expenditure restraint is feasible, the diversion of resource revenue to savings will then outpace new borrowings to fund recurrent expenditure. Over time the dependence on resource revenue can be reduced, as the savings are used to replace the resource revenue by an appropriate share of income from the resource fund. It is not the process of isolating resource revenue that creates wealth and permanent income; rather it is the act of reducing dependence on resource revenue.

Finally, there is a rather compelling argument that future generations will be better off than current or previous generations, by virtue of inheriting the stock of existing assets including intellectual capital and the compounded benefits of technological change. Existing public assets, private bequests, and intellectual property do not need to be supplemented by a store of public financial wealth.

This would also appear to loom largely as a distributional question. The appropriate weight to give to future generations' welfare, and aversion to the risk of future generations being worse off might help to resolve the issue. In any case, this would appear to be a justification for saving less than the full amount of resource revenue, rather than saving none.

Finally, the issue arises as to what purpose additional savings may be put. From the perspective of intergenerational equity, the critical issue is whether or not the principal is preserved. If it is preserved, it would not appear necessary to determine the use up front, as priorities will change with time. If resource revenue is initially saved but is subsequently used to extinguish a future

liability, such as aged or public sector pensions, eventually the principal will be run down. Resource wealth, while temporarily transformed into financial wealth, will ultimately be dissipated. Similarly, if the proceeds are used to fund investment in depreciating assets, such investments will need to generate positive financial returns if they are to be replicated in the longer-term. Increasing the stock of publicly owned physical assets does not necessarily translate into a cash flow stream that can be used to replace resource revenue.

Alternatively, one can think of a government using the proceeds to purchase a perpetual income stream. In this way, resource wealth and its associated flow of resource revenue would be transformed into financial assets which in turn would yield a stream of earnings. If the principal is preserved, or better, supplemented to protect against inflation and population growth, the earnings can be considered permanent income. Only in this last case, would the act of saving serve to replace the resource revenue when eventually production ceases and rents vanish.

The case for establishing a savings fund

The second step, if a policy of higher savings is to be followed, is choosing an appropriate savings vehicle and asset allocation. Without reducing dependence on resource revenue, there is little point in establishing a savings fund. Simultaneously increasing assets (saving resource revenue) and liabilities (borrowing the same amount to fund recurrent expenditure) would not affect net worth except for any differential between the rate of return on the assets and the interest payable on borrowings. The case for establishing a resource fund is then quite separable to that of whether a greater share of resource revenue should be saved.

Humphreys and Sandbu [2007] take a strong stance on the merits of resource funds, insisting that “the economic case for natural resource funds is surprisingly weak.” They suggest that it is in fact expenditure smoothing in the face of volatile revenue which generates economic

benefits; and that resource funds are merely an institution which can support expenditure smoothing over longer time horizons. It is the policy of expenditure restraint, they argue, that serves to stabilise the economy and generate savings for the future. Since this implies that sound fiscal policy in the presence of substantial resource wealth requires a significant accumulation of assets, their argument is essentially that natural resource funds are merely a minor public sector activity, and are not good policy *per se*.

Eifert, Gelb and Tallroth [2003] note that the optimal strategies for managing resource rents are likely to depend on the level of development of political and social institutions. The environment in which rent-seeking behaviour occurs, and the institutions that place limits on the distribution of rents, determine how effectively resource wealth can be managed.

Davis et al [2003] note that resource funds can provide political cover for achieving a higher level of public savings. However, resource funds are not sufficient to achieve higher public savings themselves. A strong political and public will must also exist given the need for complementary fiscal strategies. In particular, there must be a commitment to sustainable budgeting and net wealth creation. This implies obvious expenditure restraint in the face of resource revenue windfalls.

However, the political will may not be sufficiently strong, or it may be transient. Problems are likely to arise in attempting to raise and then protect the level of public savings. To the extent that such a policy was successful, the accumulated benefits would be a rich bounty for future political campaigns that sought to redistribute the proceeds to preferred constituents. Competing political parties might conceivably campaign on the basis of alternative ways to distribute the proceeds, thereby dissipating resource wealth, at the expense of future generations.

Possible ways of addressing the risks inherent in large pools of public savings include legislative or constitutional protection of resource revenue saved. Resource funds have been established with this purpose in mind, but very few would appear to have the level of protection of their principal to defend against such risks. For example, while in Alaska the principal of the Permanent Fund can not be withdrawn without a plebiscite, Norway has no such protection for its Pension Fund, and part or all of the principal could be used to finance sustained non-oil deficits.

Empirical studies

There have been a number of empirical studies addressing the range of issues above.

Davis et al [2001] considered the question of whether the establishment of a non-renewable resource fund (NRF) was associated with better fiscal performance across a cross-section of resource-rich and ordinary countries. Their approach was to consider the extent to which changes in government spending could be explained by changes in resource export earnings and resource revenue. A statistically significant positive relationship would indicate that governments faced difficulty in managing expenditure in the face of resource revenue windfalls.

The authors found no statistical basis to conclude that countries with NRFs were able to achieve a greater degree of expenditure restraint in the face of revenue volatility. However, they found some countries with NRFs tended to have a more limited expenditure response to changes in resource revenue. The study was based upon a limited number of countries, and the authors acknowledge the difficulty in concluding whether expenditure restraint is a product of establishing an NRF or prudent fiscal policy more generally. In any case, the study demonstrates the close policy linkages between expenditure restraint and NRFs.

Steigum and Thogerson [1995] constructed a computable overlapping generations model to consider the extent of intergenerational redistribution inherent in a policy of consuming Norway`s petroleum wealth. Estimates of the value of petroleum resource rents in Norway range from 4.4 per cent (1990) to 13.0 per cent of GDP (1984). The authors compare two scenarios: one where the resource rents are saved, the principal protected, and all future generations enjoy the permanent income derived from such savings; the other where the resource rents are consumed (given back as tax cuts) over a 40 year period. They estimate the welfare of those aged less than 15 years or yet to be born would be 14 per cent lower in the second case.

The study usefully represents the long-term nature of the policy problem and the significant magnitude of the future welfare at risk from current policy decisions. The authors offer the proposition that failing to save resource rents is akin to increasing the level of public debt, with similar detrimental impacts on the welfare of future generations. For governments to be so openly concerned with reducing public indebtedness, it is somewhat surprising that there is not a matching concern or level of public debate around policies for preserving resource wealth.

5. Evaluating performance

This section presents a number of measures that evaluate the five jurisdictions' performance in managing resource wealth.

The measures correspond to the discussion above, and include estimates of the primary balance, real net worth per capita and adjusted net saving. The primary balance and real net worth per capita are presented for the period since 1998-99 for all five jurisdictions. Adjusted net saving data is available from the World Bank since 1970 albeit only on a national basis, with a state-based estimate derived for Queensland in a separate study (Brown et al [2005]).

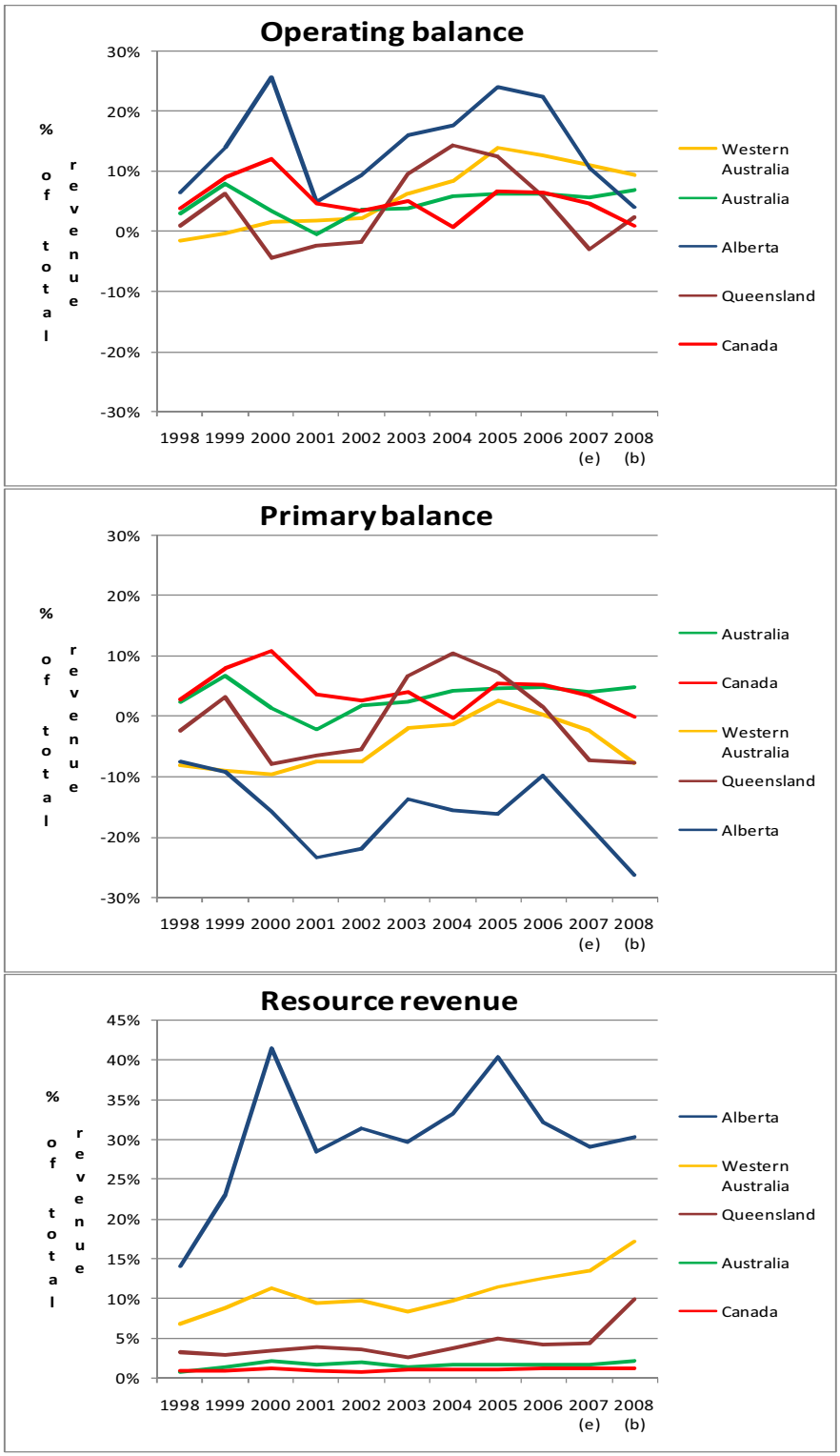
Primary balance

The operating balance, primary balance and dependence on resource revenue of the five jurisdictions are presented in Figure 5.1. Operating surpluses have become the norm, but, particularly at the sub-national level, these have been achieved on the back of strong growth in resource revenue.

The sub-national jurisdictions seldom achieved primary balance over the past nine years. A longer time series for Alberta indicates it has never achieved a primary surplus in the period since 1984. There has been a significant deterioration in primary balances of the sub-national jurisdictions of around 10 to 15 per cent of total revenue.

While resource revenue is not nearly as significant at the national level, it has been sufficient to turn operating surplus into a small primary deficit for Canada on two occasions. Australia is the only jurisdiction to be budgeting a primary surplus in 2008-09.

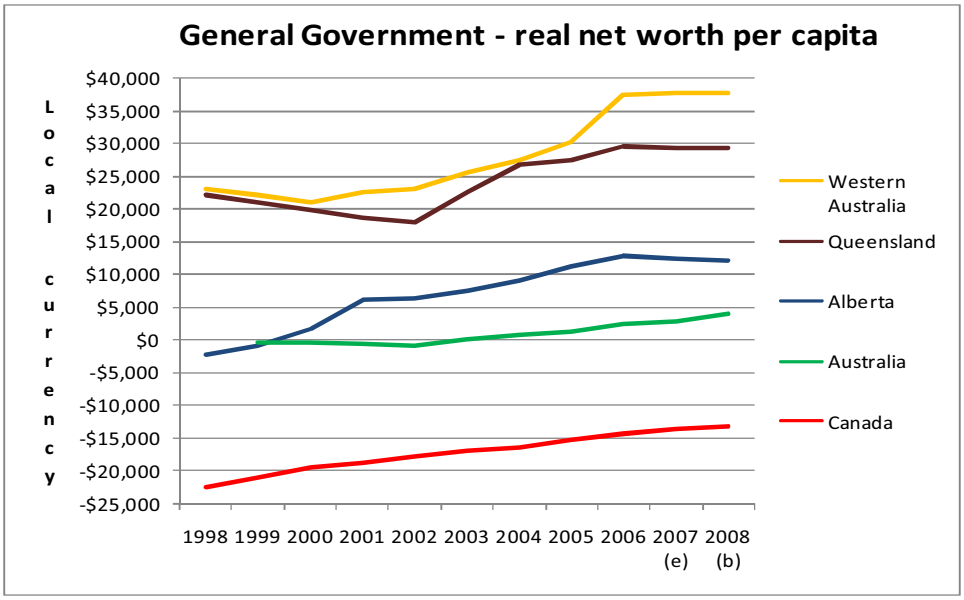
Figure 5.1 – Operating balance, primary balance and resource revenue



Real net worth

This section examines trends in general government real net worth per capita in the five jurisdictions since 1998-99.

Figure 5.2 – real net worth per capita



Real net worth per capita has increased in each jurisdiction over the period. However, progress has not always been consistent. Growth in net worth per capita has stalled and real net worth per capita has begun to decline slightly in the sub-national jurisdictions.

Comparing progress across jurisdictions is complicated by the fact that there may be quite different policy stances concerning the desirable size of, or growth in, government. For example, policies such as tax cuts and retirement saving incentives will serve to transfer wealth from the public sector to the private sector and keep measures of public net worth lower than

they would otherwise be.[17] However, if such policies can be delivered without a decline in real net worth per capita of the public sector, this may be more indicative of sustainability.

A decline in real net worth per capita could arise from multiple drivers: asset price fluctuations, inflation, population growth or using capital proceeds to fund recurrent expenditure. Privatisation should be broadly neutral in its impact on real net worth per capita. That is, to the extent that the proceeds are used to retire debt or to invest in other assets, privatisation policies would not detract from real net worth per capita. Similarly, major public works programs that are debt financed should be broadly neutral in their impact, since assets and debt increase in parallel. On the other hand, using resource revenue to fund public investment in physical or financial assets would, under current accounting conventions, make a positive contribution.

Steady upward progress in the measure of net worth per capita is presumably desirable, especially during boom periods. Overall, there would seem to be few reasons for real net worth per capita to be declining over time. Perhaps a more compelling benchmark than simple increases in the measure would be the change in nominal net worth per capita had resource revenue been invested. Either approach would likely engender greater fiscal discipline than the existing targets based on nominal or real net worth targets that ignore population growth.

Table 5.1 - Change in real net worth per capita 1998-99 to 2007-08

Alberta	WA	Canada	Qld	Australia*
$14,640.05	$14,583.96	$8,668.43	$ 7,123.79	$3,357.07

* Australia 1999-00 to 2007-08

[17] For example, in the period from 2000-01 to 2007-08 successive Australian governments are estimated to have delivered approximately $70 billion in nominal personal income tax cuts and retirement savings inducements. This is more than the estimated government net worth of $61 billion in 2007-08. The other jurisdictions have also maintained policies to improve tax competitiveness over much of the same period.

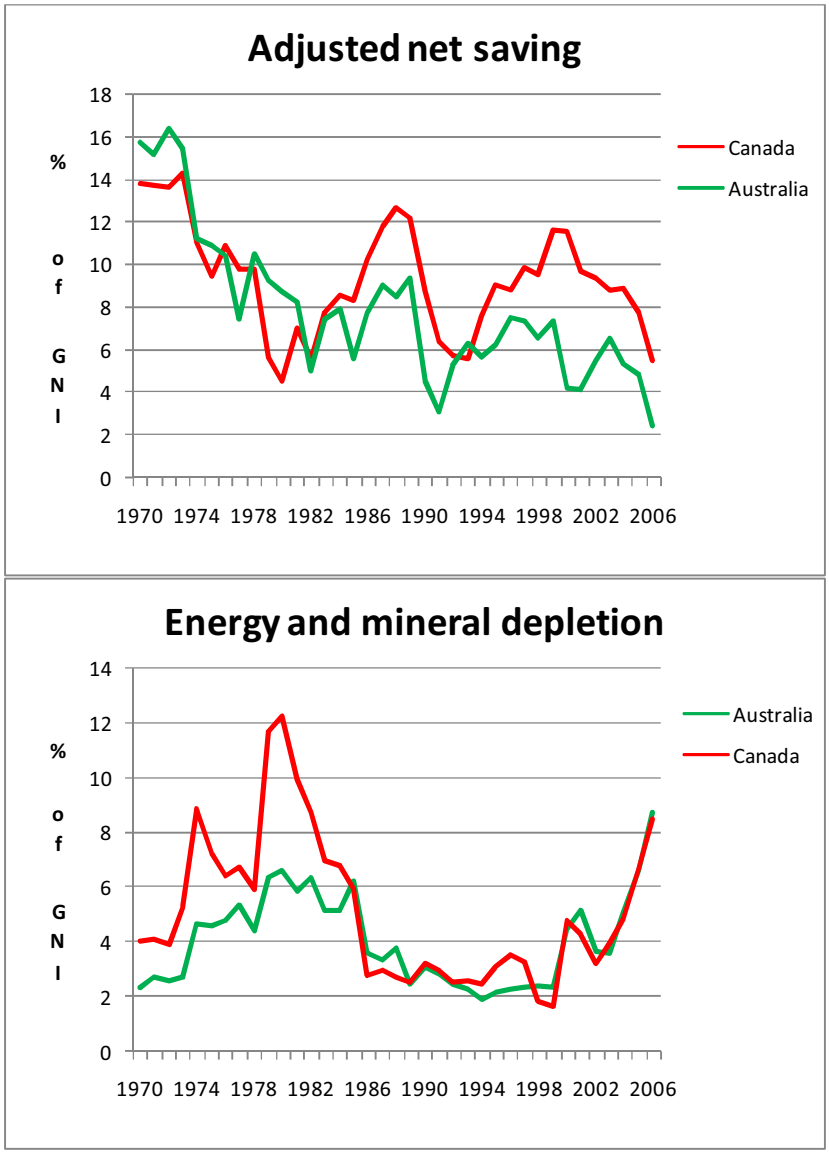
Adjusted net saving

As noted above, the various indicators presented so far relate only to the public sector, relate only to physical and financial investment, and fail to take into account the depletion of the resource base over time. Adjusted net saving compensates for these shortcomings.

Figure 5.3 shows that both Australia and Canada achieved positive adjusted net saving in each year since construction of the measure commenced. However, the current boom in resource extraction is driving adjusted net saving down to historically low levels. The latest data point is 2006, and it is likely that the downward trend has continued over the past two years.

Given an even greater dependence on energy and minerals at the sub-national level, higher depletion rates would likely translate into negative adjusted net saving. While the measure is not published at the sub-national level, a study by Brown et al [2003] found that Queensland's rate of genuine saving was some two per cent less than Australia's from 1990 to 2000. If we assume this differential has remained constant until 2006, Queensland's adjusted net saving would have been very close to zero, and is likely to have turned negative since 2006.

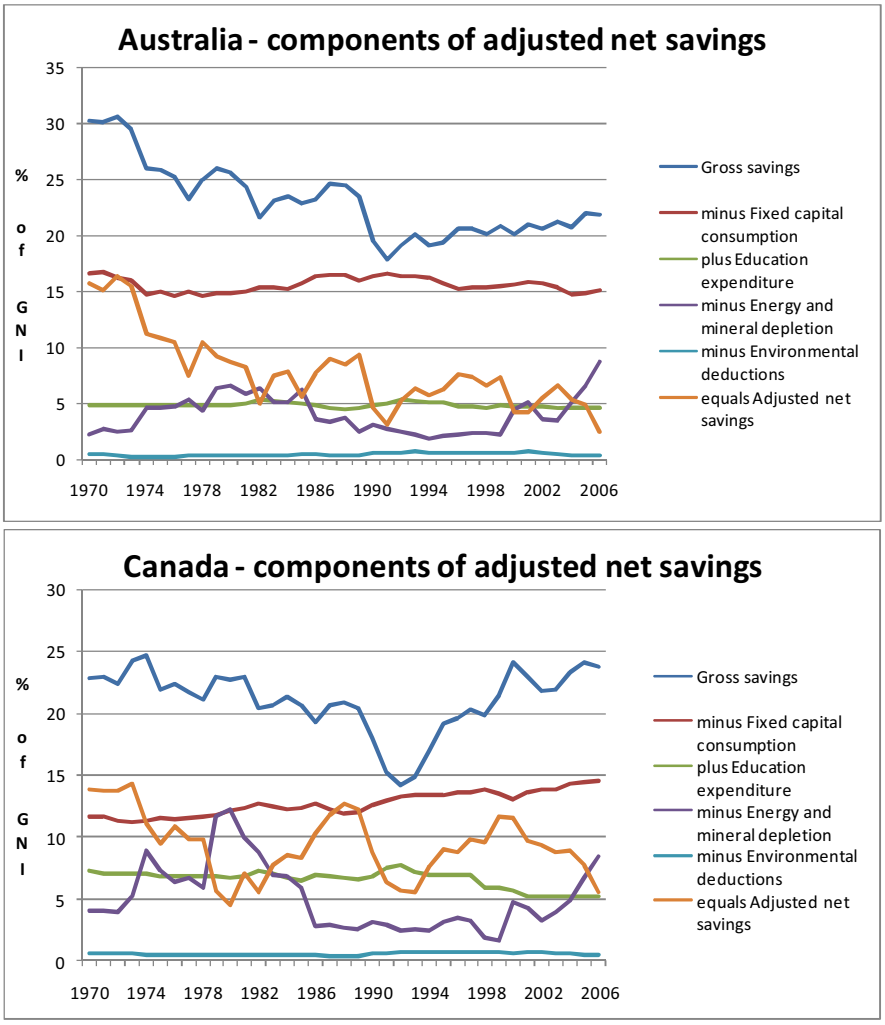
Figure 5.3 – adjusted net saving



Abbreviation: Gross National Income (GNI).

Comparing the components of adjusted net saving in Australia and Canada, we note in Figure 5.4 that the rates of fixed capital consumption, mineral depletion and education expenditure are nearly identical. The difference in adjusted net saving is then accounted for by Canada's higher rate of gross saving.

Figure 5.4 – components of adjusted net saving



Abbreviation: Gross National Income (GNI).

Policy simulations

A simulation model was constructed in Excel to address the following related questions.

1. At what rate must resource revenue be invested in order for the permanent income from net financial assets (net worth) to deliver a sustainable consumption path? How does the rate vary with different assumptions about the future profile of resource revenue receipts and uses, rates of return, inflation and population?

2. Given actual resource revenue over the past 10 years, how much would net worth have increased in each of the five jurisdictions had a benchmark savings policy been followed? How does this compare to actual outcomes?

Description of model

A technical specification of the model is contained in Appendix A.

Receipt of resource revenue

Initial resource revenue is assumed to follow a nominal growth profile. The central case involves growth at 10 per cent per annum for years 1 to 10, 5 per cent per annum for years 11 to 20, 0 per cent for years 21 to 30, and -2 per cent for years 31 to 50. Alternative growth profiles are considered. Receipt of resource revenue can readily be expressed in nominal, real or real per capita terms.

Use of resource revenue

Use of resource revenue refers to the degree to which they are used to fund recurrent expenditure. The model adopts the assumption that the use of resource revenue remains constant in real per capita terms at the first year's level. This assumption is also varied, to examine the case where there is zero dependence on resource revenue.

Investment rate and reinvestment rate

The investment rate determines the extent to which resource revenue received is invested in financial assets. A higher investment rate, given a particular profile of resource revenue use (expenditure), will result in a higher borrowing requirement in any year. Equivalently, resource revenue not invested is available to use, reducing the borrowing requirement. The required investment rate is the focus of the simulation.

Resource revenue saved accrues as principal in a resource fund. This is invested and produces earnings. The risk premium (return on investment in excess of the borrowing rate) is assumed to be 1.5 per cent in the central case. This assumption is also varied to allow for lower and higher rates of growth. The difference between the rate of return and the borrowing rate is a significant driver of the results.

The reinvestment rate determines the extent to which earnings are added to the principal of the fund. Earnings not reinvested are available to reduce the borrowing requirement, pay interest or retire debt.

Borrowing requirement

The borrowing requirement is the amount of debt the government must assume in order to fund the desired level of expenditure, given the profile of resource revenue and decisions about the investment and reinvestment rates. Interest on the debt is initially compounded. As resource revenue grows and the earnings of the fund grow, the borrowing requirement becomes negative. At this point the surplus earnings are available to pay interest and retire debt. Once the debt is retired, resource revenue and fund earnings that are surplus to expenditure needs are assumed to be applied to the fund at the investment rate.

Net worth

This is defined as the principal of the resource fund minus any outstanding debt.

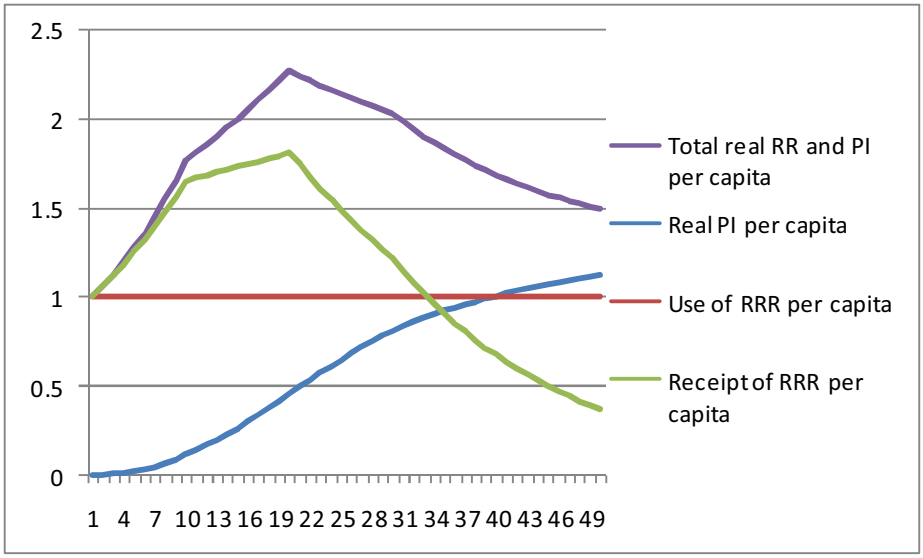
Permanent income

Permanent income is calculated at any point in time by assuming that the fund's principal is used to retire all outstanding debt. The remaining assets are then invested to earn a rate of return in perpetuity. By subtracting the rates of inflation and population growth from the rate

of return, the level of income derived from the assets can then be assumed to be constant in real per capita terms. As an example, assuming a 6 per cent borrowing rate, with the risk premium of 1.5 per cent, inflation at 2.5 per cent and population growth at 1.5 per cent, the permanent income rate in perpetuity is 3.5 per cent.

Results

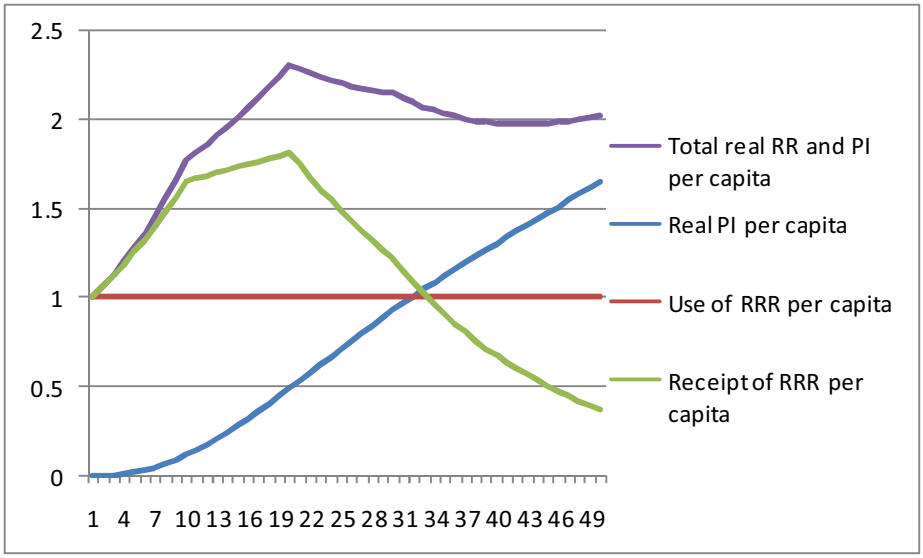
Figure 5.5 - minimum investment to replace resource revenue within 40 years (Case 1)



The above chart reflects a policy of investing 54 per cent of resource revenue and reinvesting 54 per cent of fund earnings (Case 1 below). This will, within a 40 year timeframe, produce real permanent income (blue line) sufficient to maintain constant expenditure in real per capita terms (red line). In the longer-term (from 40 years and beyond), as resource revenue approaches zero, the sustainable level of expenditure converges to around 1.3 times the initial level (between the blue and purple lines).

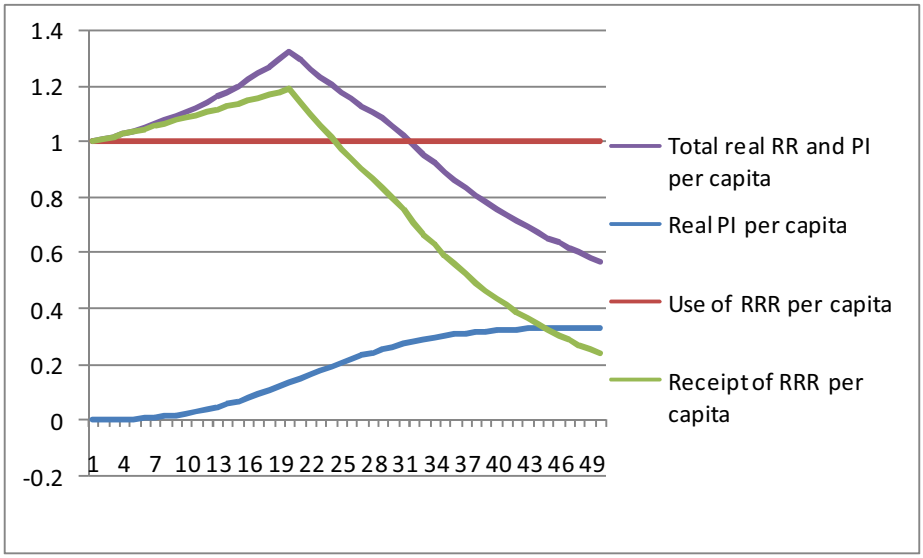
In contrast, a policy of allowing expenditure to follow resource revenue (green line), requires expenditure reductions after 20 years and results in lower than initial real per capita expenditure within 33 years.

Figure 5.6 – invest all resource revenue and reinvest 60 per cent of earnings (Case 2)



A policy of investing 100 per cent of resource revenue and reinvesting 60 per cent of fund earnings produces a profile of real permanent income per capita that permits an increasing expenditure profile (red line for 32 years then blue line thereafter). After 50 years, the sustainable level of expenditure is higher, being somewhere between 1.6 and 2.0 times the initial level, and tends to increase.

Figure 5.7 - slower revenue growth requires additional fiscal restraint (Case 3)



Case 3 presents the results assuming a slower resource revenue growth profile. This case involves resource revenue growing at only 5 per cent per annum for the first 10 years (instead of 10 per cent) with an investment rate of 100 per cent and reinvestment rate of 65 per cent. Maintaining real per capita expenditure at initial levels is not feasible. Additional fiscal restraint would be required – spending must be less than the initial level of resource revenue – to achieve a sustainable path.

Table 5.2 presents the results from the full range of simulations including the three cases above. Sufficient policies are those which will achieve the target of permanent income exceeding expenditure of resource revenues within 40 years.

The sufficient investment rates are lower the greater the difference between the borrowing rate and rate of return on fund assets. At higher rates of return, the funds invested grow more rapidly than debt, improving net worth. At lower rates of return, it is necessary to direct some

funds toward debt servicing and retirement to ensure debt is kept in check. At the benchmark risk premium of 1.5 per cent, it is optimal to use 40 per cent of fund earnings to service debt.

The optimum policy is defined as that which maximises net worth, or produces the highest possible permanent income per capita. In every case the optimum policy involves investing all resource revenue, but the optimum reinvestment rate varies depending on the difference between the borrowing and investment rates.

Table 5.2 – policy simulations

	Risk premium					Inflation			Population growth			Revenue growth profile		
	0.5%	1.0%	1.5%	2.0%	2.5%	2.0%	2.5%	3.0%	1.4%	1.5%	1.6%	A	B	C
Sufficient policy A														
Target earnings reinvested														
Investment rate	**	**	45%	26%	20%	21%	45%	**	32%	45%	68%	**	45%	19%
Earnings reinvestment rate	**	**	100%	100%	100%	100%	100%	**	100%	100%	100%	**	100%	100%
Sufficient policy B														
Target resource revenues invested														
Investment rate	**	**	78%	63%	54%	52%	78%	**	70%	78%	87%	**	78%	46%
Earnings reinvestment rate	**	**	0%	0%	0%	0%	0%	**	0%	0%	0%	**	0%	0%
Sufficient policy C														
Equal investment and reinvestment			Case 1											
Rate	**	**	54%	45%	40%	39%	54%	**	50%	54%	62%	**	54%	36%
Optimum policy														
Maximise permanent income per capita			Case 2									Case 3		
Investment rate	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Earnings reinvestment rate	0%	20%	60%	100%	100%	60%	60%	60%	60%	60%	60%	65%	60%	55%
Level reached in 40 years	67%	94%	131%	182%	252%	203%	131%	80%	143%	131%	119%	32%	131%	231%
Time to target	>50	>50	32	28	25	26	32	>50	30	32	35	>50	32	27
Target - real permanent income per capita exceeds real expenditure per capita within 40 years														
** target not achievable within 40 years														
Shaded cells reflect central assumptions														
Resource revenue growth profiles	1-10	11-20	21-30	31-50										
Profile A	5%	5%	0%	-2%										
Profile B	10%	5%	0%	-2%										
Profile C	10%	10%	0%	-2%										

We now turn to the second set of questions posed above: how does the performance of the five jurisdictions compare to what would have occurred had a benchmark savings policy been followed?

We compare the actual increase in nominal net worth to two benchmarks. Profile A, the lower benchmark, entails the policy of saving all resource revenue, reinvesting 60 per cent of fund earnings, and keeping dependence on resource revenue constant in real per capita terms at 1998 levels. Profile B, the upper benchmark, entails the policy of saving all resource revenue and reducing dependence on resource revenue to zero.

We also extend the analysis to consider what happens over a longer horizon using Alberta as an example.

Results

We see that since 1998 all jurisdictions have managed to increase net worth at rates that exceed the benchmark inherent in profile A. For example, Canada's net worth improved by approximately 10 times the amount required had it sought to invest all resource revenue, use only 40 per cent of the earnings, and maintain real per capita expenditure at 1998 levels. Queensland and Western Australia also comfortably met this standard.

More rapid resource revenue growth, in the case of Australia and higher initial levels, in the case of Alberta translate into more challenging targets under profile A. However, both jurisdictions' performance exceeded the standard in this case.

Neither Australia nor Alberta were able to achieve the higher benchmark associated with profile B. That is, their increase in net worth was less than it would have been had they been able to invest resource revenue and remove any dependence on resource revenue for funding recurrent

expenditure. Canada, Queensland and Western Australia all managed to increase net worth well beyond the target levels.

The simulations above are constrained by relatively short time series for resource revenue across the jurisdictions. However, in the case of Alberta, data is available back to 1984-85. A longer-term simulation for Alberta shows that its performance has missed the targets associated with the two profiles. Even assuming low rates of return (6.5 per cent) the actual increase in net worth in Alberta was only 62 per cent and 16 per cent of the respective targets.

Figures 5.8 and 5.9 record the estimated permanent income that Alberta could have enjoyed had the policies associated with Profiles A and B been followed since 1984-85. Had real per capita expenditure been maintained at initial levels[18], potential permanent income would presently be around 33 to 50 per cent of actual resource revenue. Had dependence on resource revenue been eliminated, potential permanent income would presently correspond to actual resource revenue. Such results could have been achieved within approximately 25 years.

[18] Alberta experienced a significant decline in resource revenue between 1984 and 1986. The simulations assume that it was necessary to reduce expenditure in each of these years, and that 1986 was established as the base year at which expenditure was maintained constant in real per capita terms. The alternative assumption that expenditure was maintained at the higher 1984 levels would have generated negative net worth.

Table 5.3 – actual vs simulated change in net worth

	Actual change in net worth	Profile A			Profile B		
($m of local currency)	1998 to 2007	0.50%	1.50%	2.50%	0.50%	1.50%	2.50%
Australia*	$ 67,831	$ 45,190	$ 47,746	$ 50,370	$ 71,424	$ 74,171	$ 77,046
Canada	$ 97,043	$ 8,020	$ 9,006	$ 10,022	$ 25,324	$ 26,391	$ 27,513
Alberta	$ 49,325	$ 28,499	$ 32,805	$ 37,234	$ 114,148	$ 118,799	$ 123,678
Queensland	$ 65,406	$ 2,609	$ 3,018	$ 3,438	$ 11,536	$ 11,977	$ 12,439
Western Australia	$ 48,776	$ 7,634	$ 8,241	$ 8,864	$ 17,494	$ 18,148	$ 18,834
(actual as % of target)							
Australia*		150%	142%	135%	95%	91%	88%
Canada		1210%	1078%	968%	383%	368%	353%
Alberta		173%	150%	132%	43%	42%	40%
Queensland		2507%	2167%	1902%	567%	546%	526%
Western Australia		639%	592%	550%	279%	269%	259%
	Actual change in net worth	**Profile A**			**Profile B**		
Alberta	1984 to 2007	0.50%	1.50%	2.50%	0.50%	1.50%	2.50%
$m of local currency	$ 37,230	$ 60,190	$ 81,800	$ 105,277	$ 235,828	$ 263,230	$ 295,083
actual as % of target		62%	46%	35%	16%	14%	13%

Profile A - real per capita expenditure constant at initial level

Profile B - zero dependence on resource revenue

*Australia's actual change in net worth 1999-00 to 2007-08

Figure 5.8 – Alberta's projected savings under Profile A

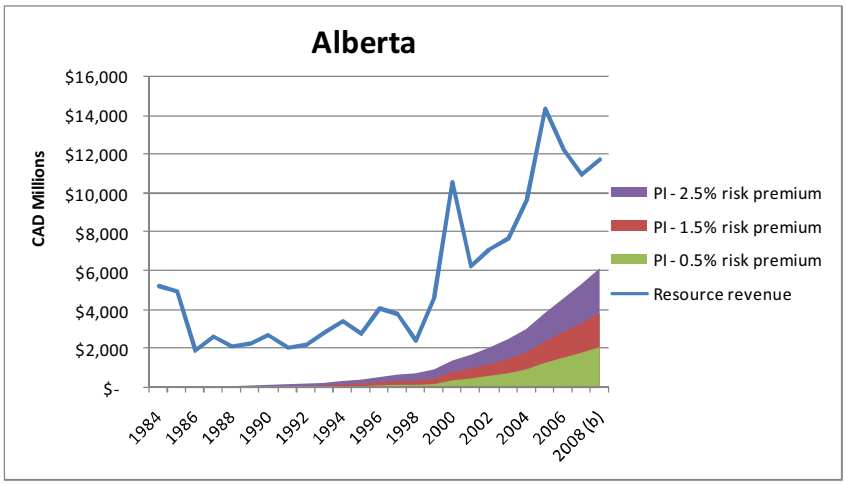
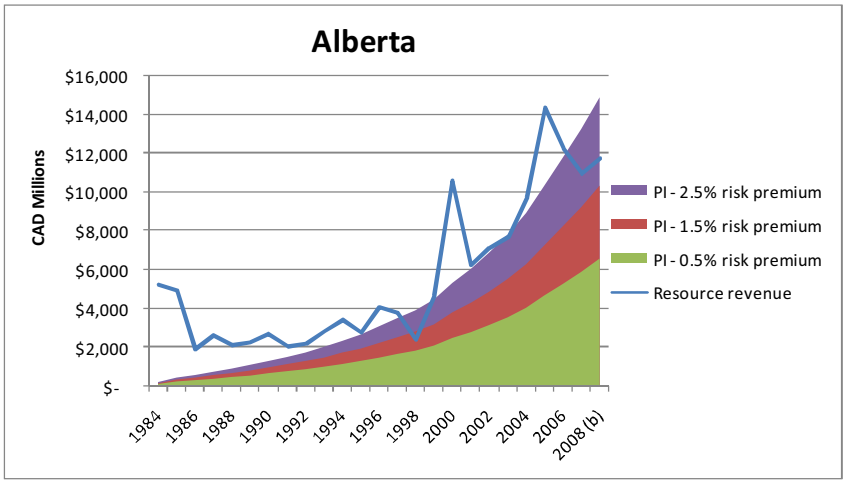


Figure 5.9 – Alberta's projected savings under Profile B



6. Conclusions

The fact that both resource rents and resource revenues are finite and are expected to follow a declining path, even if in the distant future, suggests that governments need to take special steps to manage them, particularly if concerned about sustainability and intergenerational equity.

Mixed ownership structures, increasing output paths (relating to shifts in demand driven by population and income growth) and the possibility of placing invested funds at risk are three conceptual additions that lead the paper away from the standard theoretical treatment of exhaustible resources. They more closely fit the observed reality of energy and minerals markets in Australia and Canada.

The use of additional fiscal indicators would appear desirable in the presence of significant resource revenue. While meeting the prevailing IMF criteria, Australia and Canada could be considered special cases in that most of the resource revenues accrue at the sub-national level. The sub-national jurisdictions of Alberta, Queensland and Western Australia, each of whom are running primary deficits, should be particularly encouraged to adopt these alternative measures.

Particularly at the sub-national level where resource revenues are more significant, there would appear to be a case for saving more resource revenue and potentially establishing resource funds.

The savings performance of the five jurisdictions ranges from broadly satisfactory to outstanding over the timeframe of the study. The case of Alberta suggests that over a longer horizon, performance may not have been as robust, and maintaining adequate performance becomes more difficult over time. This might serve as a warning to those jurisdictions that have yet to commence an explicit policy of saving resource revenue.

Given the prospect of resource revenues becoming even more significant, all jurisdictions could consider setting explicit policies dealing with how resource revenues will be transformed into a permanent stream of benefits. Some particular suggestions are in order.

Australia could consider adding a resource fund to its existing stable of funds. The objectives of such a fund would be to transform resource revenue into a permanent income stream. To this end, contributions to the fund could be determined by a transparent formula and the fund's principal should be protected. The fund might be more offshore oriented in its investment focus than existing funds, to serve as a hedge against a future terms-of-trade reversal.

Canada is the only jurisdiction within the study to be in a net debt position. Its pace of debt retirement over the past ten years has far outstripped what would have been expected merely as a result of saving its relatively insignificant resource revenue. With the prospect of Canada retiring net debt still some way into the future, there are not such compelling reasons for it to establish a resource fund.

Alberta is the only jurisdiction to have a resource fund in place. However, its policy choices over several decades have, according to the above analysis, not resulted in sufficient saving of resource wealth. Stricter expenditure restraint and greater investment of resource revenue will be the key to a sustainable future. The sustainable level of expenditure and optimal saving rates should be determined with reference to the expected profile of resource revenue.

Compared to the other jurisdictions, Queensland is on the dawn of its resource boom and appears better placed to make the fiscal adjustments necessary to achieve a sustainable footing. Its experience with investing in financial assets is also encouraging and may have achieved what a separate resource fund would have, although it is somewhat unclear what uses its financial

assets may have been earmarked for.[19] Queensland needs to consider ways to break the nexus between resource revenue and expenditure growth and should consider establishing a resource fund to ensure the benefits of the boom are transformed into a permanent income stream and shared with future generations.

Western Australia has enjoyed the fruits of the resources boom, and has managed to improve its fiscal position considerably. Like Queensland, it needs to consider ways to keep expenditure under control in the face of continued resource revenue growth. By establishing a resource fund that invests in offshore assets, Western Australia could diversify its net worth (given current weightings toward public infrastructure) and in the process obtain a natural hedge against future commodity price downturns.

[19] Further discussion of this point is contained in Appendix B.

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Data sources

Australia

Item	Source	Basis/Link (active 30 June 2008)
Revenue	Australian Government Budget Papers (Budget) – various years	http://www.budget.gov.au/2008-09/content/bp1/html/index.htm
Expenditure	Budget	
Operating balance	Budget	
Net worth	Budget	
Adjusted net saving	World Bank	World Development Indicators Online – adjusted saving and adjusted net saving series – subscription required
Resource revenue	N/A – see individual items below	NWS Royalties + 50% Corporate Income Tax from Energy and Mining + PRRT + Crude Oil Excise
Royalties	Australian Government Consolidated Financial Statements (CFS)	http://www.finance.gov.au/publications/CommCons_Financial_Statements.html
Corporate tax (energy and mining)	Australian Taxation Office Taxation Statistics (various years)	http://www.ato.gov.au/default.asp?menu=9791
PRRT	CFS	
Crude oil excise	CFS	
CPI - Australia	Australian Bureau of Statistics (ABS) – Table 6401.0	http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Mar%202008?OpenDocument
Population	ABS – Table 3101.0	http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Dec%202007?OpenDocument
Exports	Department of Foreign Affairs and Trade	http://www.dfat.gov.au/publications/stats-pubs/cot_cy2007.pdf

Canada

Item	Source	Basis/Link (active 30 June 2008)
Revenue	Public Accounts of Canada (Public Accounts) – various years	http://epe.lac-bac.gc.ca/100/201/301/public_accounts_can/index.html
Expenditure	Public Accounts	
Operating balance	Public Accounts	
Net worth	Public Accounts	
Adjusted net saving	World Bank	World Development Indicators Online – adjusted saving and adjusted net saving series – subscription required
Resource revenue		50% of Corporate Income Tax from Energy and Mining
Corporate tax (energy and mining)	Statistics Canada Financial and Taxation Statistics for Enterprises	http://www.statcan.ca/english/freepub/61-219-XIE/61-219-XIE2006000.pdf
CPI - Canada	Statistics Canada Table 3260021	CANSIM database – subscription required
Population	Statistics Canada Series V466668	CANSIM database – subscription required
Exports	Statistics Canada Table 2280003	http://www40.statcan.ca/l01/cst01/gblec04.htm

Alberta

Item	Source	Basis/Link (active 30 June 2008)
Revenue	Alberta Provincial Budget – Fiscal Plan Tables – Historical Fiscal Summary (Budget)	http://www.finance.gov.ab.ca/publications/budget/budget2008/pdf.html
Expenditure	Budget	
Operating balance	Budget	
Net worth	Budget	
Resource revenue	Budget	As stated in Budget. Does not include share of provincial Corporate Income Tax.
AHSTF	Alberta Finance – AHSTF Annual Reports	http://www.finance.gov.ab.ca/business/ahstf/publications.html#annual
CPI - Alberta	Statistics Canada Table 3260021	CANSIM database – subscription required
Population	Statistics Canada Series V466668	CANSIM database – subscription required
Exports	Alberta Finance – Alberta's International Merchandise Exports	http://www.albertacanada.com/documents/SP-ET_ABIntlMerchandiseExports_2007_qtr4.pdf

Queensland

Item	Source	Basis/Link (active 30 June 2008)
Revenue	Queensland Government Budget Papers (BP 2) (Budget)	http://www.budget.qld.gov.au/budget-papers/bp2.shtml
Expenditure	Budget	
Operating balance	Budget	
Net worth	Budget	
Resource revenue		Royalties + Leases (Rents)
Royalties and leases	Budget	
CPI - Brisbane	Australian Bureau of Statistics (ABS) – Table 6401.0	http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Mar%202008?OpenDocument
Population	ABS – Table 3101.0	http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Dec%202007?OpenDocument
Exports	Queensland Office of Economic and Statistical Research	http://www.oesr.qld.gov.au/queensland-by-theme/economic-performance/trade/tables/exports-commodity-country/exports-qld-aus-all-countries-commod/index.shtml

Western Australia

Item	Source	Basis/Link (active 30 June 2008)
Revenue	Western Australian Government Budget Papers (Budget)	http://www.dtf.wa.gov.au/cms/uploadedFiles/2008-09_bp_3.pdf
Expenditure	Budget	Historical series in Appendix 4.
Operating balance	Budget	
Net worth	Budget	
Resource revenue		Own Royalties + NWS Royalties from Federal Government + Leases
Own Royalties	Budget – mining revenue	
NWS Royalties	Budget – Commonwealth grants	
Leases	Budget – mining revenue	
CPI - Perth	Australian Bureau of Statistics (ABS) – Table 6401.0	http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Mar%202008?OpenDocument
Population	ABS – Table 3101.0	http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Dec%202007?OpenDocument
Exports	WA Department of Industry and Resource	http://www.doir.wa.gov.au/documents/exports07.xls

Appendix A – overview of the model

Variables

R_t Resource revenue[20]

g_t Time varying growth rate in resource revenue

E_t Expenditure (or use of resource revenue)[21]

B_t Borrowing requirement

D_t Outstanding debt

K_t Resource fund balance

N_t Net worth

PI_t Permanent income

Parameters

r interest rate

n annual population growth rate

π annual rate of inflation

σ perpetuity or permanent income factor

Policy variables

α resource revenue investment rate

γ fund earnings reinvestment rate

ρ risk premium[22]

[20] Actual resource revenue for the relevant jurisdiction is used in the policy simulations.

[21] Note that the term expenditure refers to the extent that resource revenue is used to fund recurrent expenditure. It does not refer to the total (ordinary) expenditure of the public sector. For modelling purposes, expenditure is held constant in real per capita terms. Actual initial expenditure for the relevant jurisdiction is used in the policy simulations, escalated at the actual rates of inflation and population growth.

[22] The risk premium can be considered a policy variable in the sense that different portfolio allocations will entail varying exposure to risk, with different expected returns.

Relations

$$R_t = R_{t-1}(1 + g_t)$$

$$E_t = E_0(1 + n)^t(1 + \pi)^t$$

$$B_t = E_t - (1 - \alpha)R_t - (1 - \gamma)(r + \rho)K_{t-1}$$

$$D_t = (1 + r)D_{t-1} + B_t$$

$$K_t = \alpha R_t + (1 + \gamma(r + \rho))\, K_{t-1}$$

$$N_t = K_t - D_t$$

$$PI_t = \sigma N_t$$

$$\sigma = r + \rho - n - \pi$$

Rules

If $B_t < 0$, the negative borrowing requirement (proceeds) is used to service debt ($r\, D_{t-1}$).

If $B_t < 0\ and\ B_t > r\, D_{t-1}$, the surplus proceeds are used to repay debt ($D_t < D_{t-1}$).

If $D_t = 0$, $K_t = \alpha(R_t - B_t) + \gamma(1 + r + \rho)K_{t-1}$, the proceeds are invested in the fund at the same rate as resource revenue.

Policy target

Allow α, γ and ρ to vary, such that

$$PI_t = E_t$$

Before

$$R_t = 0$$

Appendix B – additional data and results

AUSTRALIA

Significance of resource revenue

At Australia's federal level, resource revenue accrues from corporate income tax, the petroleum resource rent tax, an excise on production of crude oil and condensate and a share of royalties on offshore energy projects. My estimates of total nominal resource revenue are $4.8 billion in 2007-08 and $6.75 billion in 2008-09. This includes 50 per cent of the corporate income tax paid by the energy and mining sectors. As estimated, resource revenue in 2008-09 would comprise 2.1 per cent of total revenue, up from 1.3 per cent in 2003.

General policy approach

The previous Australian government (1996-2007) directed the general revenue surge (including resource revenues) towards various forms of saving. These included personal income tax cuts, inducements for private retirement saving (concessions for voluntary contributions and establishing tax free pensions) and funding its future pension liabilities for Commonwealth public servants (the Future Fund).

Over the period 2000- 2007 the nominal value of personal income tax cuts announced by the Government totalled at least $120 billion. This covered the period 2000-01 to 2010-11. Additional personal income tax cuts announced by the incoming government in the 2008-09 Budget total $49 billion over four years to 2011-12.

Inducements for private retirement saving are reported as a tax expenditure. This currently runs at around $26 billion per annum. Additional retirement saving concessions announced in the Budgets between 2005 and 2007 totalled approximately $7 billion.

Apart from the Future Fund, an additional fund, the Higher Education Endowment Fund (HEEF), was established as a perpetual fund in 2007 with a $5 billion injection to support capital expenditure and research facilities in Australian universities.

The current Australian government has committed to saving windfall resource revenue and announced it would establish a number of additional funds in the 2008-09 Budget. The Building Australia Fund will be available to finance national transport and communications infrastructure where state government or private investment is not occurring. It received an initial allocation of $20 billion.

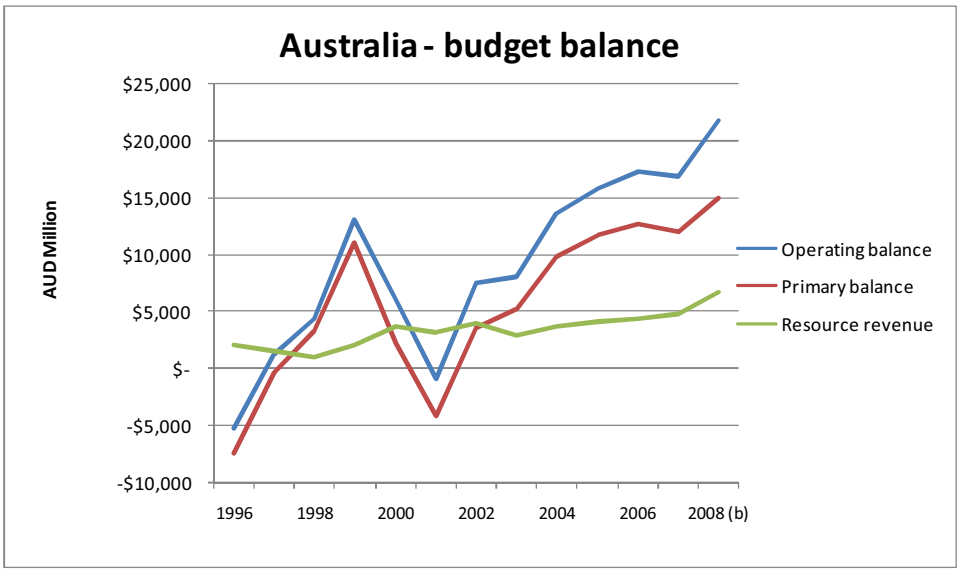
The Education Investment Fund subsumes the HEEF (which has grown to $6 billion) and adds an additional $5 billion which is available to finance capital spending in the higher education and vocational training sectors.

The Health and Hospitals Fund, with an initial allocation of $10 billion, is to finance investment in health infrastructure, particularly hospitals and medical technology.

With the exception of the HEEF, the principal of the various funds established in Australia is not protected, and may be drawn down over time. Accordingly, there is no existing institutional structure that would serve as a repository for public saving of resource revenue, should the policy of saving them be adopted.

Primary balance

In the period of the study 1997-98 is the only year in which the operating balance and primary balance have differed in qualitative terms. However, the increasing significance of resource revenue in the Budget has the potential to lead to such discrepancies in the future. The estimate of budgeted resource revenue comprises around one-third of the operating balance.



Real net worth

Real general government net worth per capita increased from approximately $-500 in 1999-00 to $2,900 in 2007-08. In 2007-08 dollars this equates to an improvement in real net worth from -$9 billion in 1999-00 to $61 billion in 2007-08.

What if resource revenue had been saved?

The actual change in nominal net worth of $67,831 million compares to the two benchmarks (recall Profiles A and B) of $47,746 million and $74,171 million.

Australia

($m) / FY	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (e)	2008 (b)
Budget position											
Total revenue	$ 146,496	$ 166,089	$182,804	$187,495	$204,552	$217,722	$235,943	$255,903	$272,584	$303,831	$319,494
Resource revenue	$ 1,039	$ 2,104	$ 3,782	$ 3,196	$ 3,983	$ 2,884	$ 3,798	$ 4,119	$ 4,500	$ 4,816	$ 6,751
%	0.7%	1.3%	2.1%	1.7%	1.9%	1.3%	1.6%	1.6%	1.7%	1.6%	2.1%
Operating balance	$ 4,337	$ 13,059	$ 5,970	-$ 983	$ 7,486	$ 8,036	$ 13,616	$ 15,792	$ 17,200	$ 16,800	$ 21,700
%	3.0%	7.9%	3.3%	-0.5%	3.7%	3.7%	5.8%	6.2%	6.3%	5.5%	6.8%
Primary balance	$ 3,298	$ 10,955	$ 2,188	-$ 4,179	$ 3,503	$ 5,152	$ 9,818	$ 11,673	$ 12,700	$ 11,984	$ 14,949
%	2.3%	6.6%	1.2%	-2.2%	1.7%	2.4%	4.2%	4.6%	4.7%	3.9%	4.7%
Net worth											
Nominal	$ -	-$ 7,004	-$ 6,445	-$ 11,348	-$ 15,011	-$ 839	$ 14,873	$ 24,992	$ 45,080	$ 60,827	$ 86,019
Real net worth	$ -	-$ 9,003	-$ 7,814	-$ 13,379	-$ 17,234	-$ 940	$ 16,259	$ 26,276	$ 46,432	$ 60,827	$ 83,514
Per capita ($)	$ -	-$ 470	-$ 403	-$ 681	-$ 867	-$ 47	$ 800	$ 1,277	$ 2,230	$ 2,887	$ 3,917
Savings fund											
Principal	$ 1,637	$ 4,840	$ 10,165	$ 15,889	$ 23,163	$ 29,096	$ 36,703	$ 45,280	$ 55,182	$ 66,287	$ 80,242
Impact on net worth	$ -	$ 1,445	$ 4,873	$ 8,674	$ 14,005	$ 18,027	$ 23,708	$ 30,362	$ 38,408	$ 47,746	$ 60,056
Permanent income	$ -	$ 51	$ 171	$ 304	$ 490	$ 631	$ 830	$ 1,063	$ 1,344	$ 1,671	$ 2,102
% of RR	0.0%	2.4%	4.5%	9.5%	12.3%	21.9%	21.8%	25.8%	29.9%	34.7%	31.1%
Other											
Population ('000)	18,926	19,153	19,413	19,641	19,873	20,092	20,329	20,573	20,819	*21,069*	*21,322*
CPI	122.3	126.2	133.8	137.6	141.3	144.8	148.4	154.3	157.5	*162.2*	*167.1*
Energy and mining exports (% of total)					30.0%					37.0%	

CANADA

Significance of resource revenue

Under the Canadian Constitution the provinces and territories enjoy constitutional ownership of natural resources, except those on federal lands. A number of side agreements concerning revenue from offshore oil revenue result in the diversion of that revenue to provincial governments.

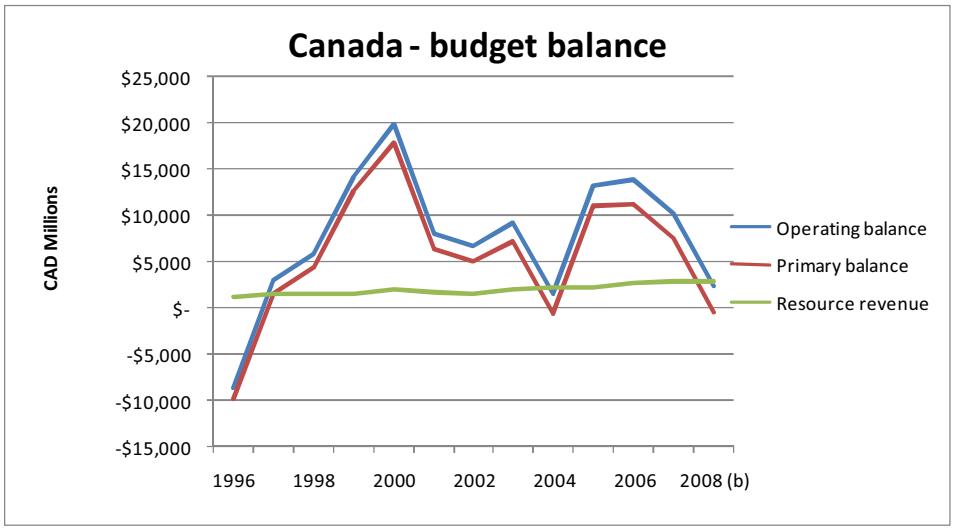
Corporate income tax is the primary source of resource rents accruing to the Canadian Government. For the purposes of the simulations, it is assumed that resource revenue equals 50 per cent of the corporate income tax paid by the energy and mining sector to the Federal Government. Where actual figures are not available, it is assumed that the share of corporate tax paid by the energy and mining sectors is 14 per cent, with half of this amount (7 per cent) counted as resource revenue. Estimates of resource revenue are $2.7 and $2.8 billion in 2007-08 and 2008-09 respectively. This equates to just over 1.1 per cent of total revenue, up from around 0.82 per cent in 2002-03.

General policy approach

The majority of the revenue growth in Canada has been directed towards reducing public debt, improving the financial position of the provinces and territories and improving Canada's tax competitiveness. The reduction in public debt has offered further dividends in the form of reduced financing costs, creating the necessary fiscal space for achieving the other two goals. More recently the Canadian Government has taken modest steps toward creating inducements for increased private saving.

Primary balance

Despite the relatively modest levels of resource revenue, in the context of rather slim operating surpluses in Canada, resource revenue is sufficiently large to cause a qualitative difference between the operating and primary balance. Primary deficits occurred in 1996-97 and 2003-04, with a further primary deficit in prospect for 2008-09.



Real net worth

The Canadian Government has managed to improve real net worth per capita by around $8,670 over the period between 1998-99 and 2007-08. The accumulated deficit, measured in 2007-08 terms, has improved from $22,393 to $13,724.

What if resource revenue had been saved?

The reduction in public debt has far outstripped what would have been achieved had Canada pursued a policy of saving resource revenue. The estimated change in net worth from the lower benchmark is just $11,000 million and for the upper benchmark is $26,000 million. Net debt has been reduced by almost $100,000 million over the corresponding period.

Canada

($m) / FY	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (e)	2008 (b)
Budget position											
Total revenue	$165,520	$176,408	$194,349	$183,930	$190,570	$198,590	$211,943	$222,203	$235,965	$244,500	$252,000
Resource revenue	$ 1,485	$ 1,548	$ 1,981	$ 1,697	$ 1,556	$ 1,920	$ 2,097	$ 2,221	$ 2,642	$ 2,738	$ 2,822
%	0.9%	0.9%	1.0%	0.9%	0.8%	1.0%	1.0%	1.0%	1.1%	1.1%	1.1%
Operating balance	$ 5,779	$ 14,258	$ 19,891	$ 8,048	$ 6,621	$ 9,145	$ 1,463	$ 13,218	$ 13,800	$ 10,200	$ 2,300
%	3.5%	8.1%	10.2%	4.4%	3.5%	4.6%	0.7%	5.9%	5.8%	4.2%	0.9%
Primary balance	$ 4,294	$ 12,710	$ 17,910	$ 6,351	$ 5,065	$ 7,225	-$ 634	$ 10,997	$ 11,158	$ 7,462	-$ 522
%	2.6%	7.2%	9.2%	3.5%	2.7%	3.6%	-0.3%	4.9%	4.7%	3.1%	-0.2%
Net worth											
Nominal	-$554,143	-$539,885	-$519,994	-$511,946	-$505,325	-$496,180	-$494,717	-$481,499	-$467,268	-$457,100	-$454,800
Real net worth	-$680,826	-$645,250	-$601,328	-$584,910	-$562,700	-$538,849	-$528,213	-$501,893	-$476,613	-$457,100	-$445,882
Per capita ($)	-$ 22,393	-$ 21,025	-$ 19,384	-$ 18,644	-$ 17,764	-$ 16,842	-$ 16,347	-$ 15,372	-$ 14,453	-$ 13,724	-$ 13,255
Savings fund											
Principal	$ 1,136	$ 2,736	$ 4,839	$ 6,754	$ 8,613	$ 10,921	$ 13,510	$ 16,338	$ 19,716	$ 23,341	$ 27,213
Impact on net worth	$ -	$ 386	$ 1,199	$ 1,779	$ 2,236	$ 3,067	$ 4,122	$ 5,354	$ 7,078	$ 9,006	$ 11,143
Permanent income	$ -	$ 14	$ 42	$ 62	$ 78	$ 107	$ 144	$ 187	$ 248	$ 315	$ 390
% of RR	0.0%	0.9%	2.1%	3.7%	5.0%	5.6%	6.9%	8.4%	9.4%	11.5%	13.8%
Other											
Population ('000)	30,403.9	30,689.0	31,021.3	31,372.6	31,676.1	31,995.2	32,312.1	32,649.5	32,976.0	*33,305.8*	*33,638.9*
CPI	92.9	95.5	98.7	99.9	102.5	105.1	106.9	109.5	111.9	*114.1*	*116.4*
Energy and mining exports (% of total)					16.7%				23.6%		

ALBERTA

Significance of resource revenue

Alberta collects resource revenue from a number of bases, with the main sources being production royalties and leases for energy projects. Alberta also collects corporate income tax. However, given a lack of information about the share of provincial corporate income tax paid by the energy sector, this source of revenue has been excluded from the statistics and related simulations presented in this paper. As such, the estimates of resource revenue for Alberta are significantly understated. The figures used reflect only that revenue nominated by the Albertan Government as resource revenue.

Compared to the other jurisdictions of interest, Alberta has a much greater dependence on resource revenue. In 2007-08, the ratio of resource revenue to own source revenue and total revenue is estimated to be 31.6 and 29.0 per cent respectively, increasing to 33.7 and 30.4 in 2008-09. This is relatively unchanged since the early 2000s. From a low of 15.3 per cent in 1998-99, the ratio to own source revenue reached a peak of 44.6 per cent in 2005-06.

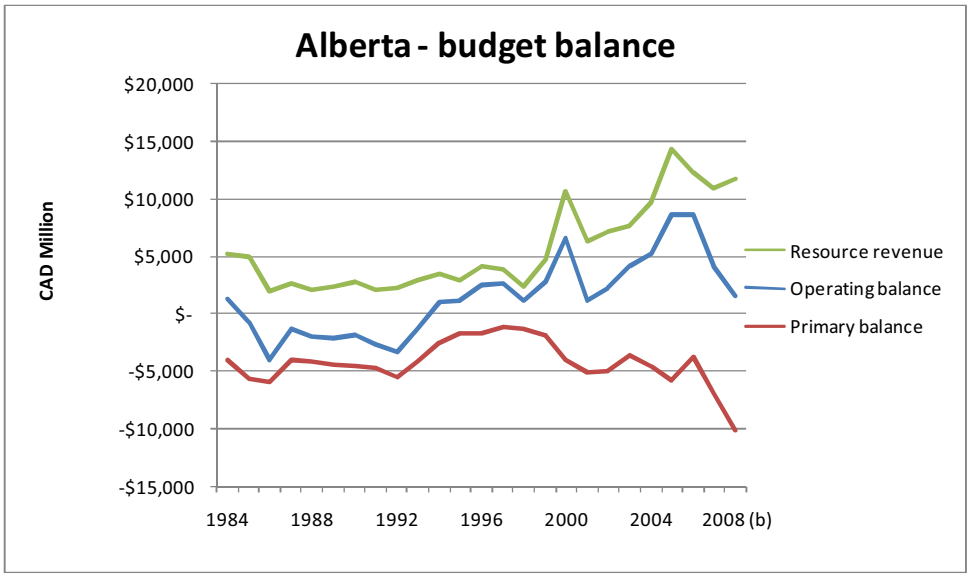
General policy approach

The Fiscal Responsibility Act prohibits the Government from running operating deficits and borrowing for non-capital purposes. Strong operating surpluses ($30 billion over 5 years) have been delivered on the back of resource revenue.[23] The Government has sought to maintain the 'Alberta advantage' by maintaining tax competitiveness, investing in education and infrastructure, debt retirement and ultimately public saving. In recent years there has been renewed interest in the Alberta Heritage Trust Fund. Contributions to the fund have resumed with additional arrangements to ensure its principal is protected against inflation.

[23] $21 billion of the revenue growth over this period was due to unanticipated increases in the price of oil. Alberta Government, Fiscal Plan 2008-11, p. 21.

Primary balance

Given its dependence on resource revenue, the Albertan Government has not recorded a primary surplus in any year since 1984-85. The primary deficit is projected to more than double to around $10 billion in 2008-09.



Real net worth

The change in net worth in Alberta between 1998 and 2007 of $49,325 million exceeds that of the lower target of $32,805 million.

What if resource revenue had been saved?

Data is included in the statistical appendix for the Alberta Heritage Savings Trust Fund. Alberta's policies for saving resource revenue have varied considerably over time.[24] The data indicates that the fund is far smaller than it would have been had the province followed stricter savings policies. That is, if the benchmark policy had commenced in 1998 (note, the fund commenced in 1976) it would already be more than twice its current size ($38,946 compared to $17,044).

[24] For a history of the fund see http://www.finance.gov.ab.ca/business/ahstf/annrep08/report.pdf.

Alberta

($m) / FY	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (e)	2008 (b)
Budget position											
Total revenue	$ 16,819	$ 20,103	$25,527	$21,926	$22,662	$25,887	$29,328	$35,542	$ 38,017	$ 37,757	$ 38,571
Resource revenue	$ 2,368	$ 4,650	$10,586	$ 6,227	$ 7,130	$ 7,676	$ 9,744	$14,347	$ 12,260	$ 10,956	$ 11,709
%	14.1%	23.1%	41.5%	28.4%	31.5%	29.7%	33.2%	40.4%	32.2%	29.0%	30.4%
Operating balance	$ 1,094	$ 2,791	$ 6,571	$ 1,081	$ 2,131	$ 4,136	$ 5,175	$ 8,551	$ 8,510	$ 4,031	$ 1,568
%	6.5%	13.9%	25.7%	4.9%	9.4%	16.0%	17.6%	24.1%	22.4%	10.7%	4.1%
Primary balance	-$ 1,274	-$ 1,859	-$ 4,015	-$ 5,146	-$ 4,999	-$ 3,540	-$ 4,569	-$ 5,796	-$ 3,750	-$ 6,925	-$ 10,141
%	-7.6%	-9.2%	-15.7%	-23.5%	-22.1%	-13.7%	-15.6%	-16.3%	-9.9%	-18.3%	-26.3%
Net worth											
Nominal	-$ 4,876	-$ 2,074	$ 4,300	$15,184	$17,161	$21,082	$26,081	$34,435	$ 42,883	$ 44,449	$ 45,830
Real net worth	-$ 6,574	-$ 2,704	$ 5,314	$18,689	$20,154	$24,204	$29,748	$37,872	$ 44,384	$ 44,449	$ 44,280
Per capita ($)	-$ 2,226	-$ 900	$ 1,738	$ 5,997	$ 6,375	$ 7,544	$ 9,068	$11,236	$ 12,776	$ 12,414	$ 11,999
Model savings fund											
Principal	$ 5,229	$ 10,114	$21,155	$28,334	$36,739	$46,069	$57,886	$74,838	$ 90,465	$105,492	$121,949
Impact on net worth	$ -	-$ 773	$ 4,014	$ 4,755	$ 6,169	$ 8,095	$12,150	$20,778	$ 27,395	$ 32,805	$ 38,946
Permanent income	$ -	-$ 27	$ 140	$ 166	$ 216	$ 283	$ 425	$ 727	$ 959	$ 1,148	$ 1,363
% of RR	0.0%	-0.6%	1.3%	2.7%	3.0%	3.7%	4.4%	5.1%	7.8%	10.5%	11.6%
Alberta Heritage Savings Trust Fund (commenced 1976)											
Starting principal				$12,100	$12,400	$11,075	$12,396	$12,222	$ 14,820	$ 16,581	$ 17,044
Earnings				$ 206	-$ 894	$ 1,133	$ 1,092	$ 1,397	$ 1,648	$ 824	
Withdrawals				$ 206	$ -	$ 1,133	$ 1,092	$ 1,015	$ 1,365	$ 358	
Capital injections								$ 1,750	$ 1,250	$ 918	
Change in value						$ 1,321	-$ 174	$ 466	$ 228	-$ 921	
Reinvestment						$ 1,321	-$ 174	$ 2,598	$ 1,761	$ 463	
Rate of return				4.2%	-11.0%	22.5%	7.7%	15.2%	12.4%	-0.7%	
Other											
Population ('000)	2,953.3	3,004.9	3,056.7	3,116.3	3,161.4	3,208.2	3,280.7	3,370.6	3,474.0	3,580.5	3,690.4
CPI	91.2	94.3	99.5	99.9	104.7	107.1	107.8	111.8	118.8	123.0	127.3
Energy and mining exports (% of total)									68.4%	67.1%	

Note: Resource revenue for Alberta does not include provincial corporate income tax from energy and mining due to a lack of reliable data.

QUEENSLAND

Significance of resource revenue

Queensland 's resource revenue surge has been a relatively recent phenomenon, but looks set to continue for some time. Strong growth in coal production and exports and anticipated major gas developments should see it continue to enjoy rapidly growing fiscal benefits associated with strong energy demand. Its primary sources of revenue are royalties on coal, onshore petroleum and gas projects and miscellaneous minerals. It also receives revenue (termed rents in that jurisdiction) from the lease of mining tenements.

The ratio of resource revenue to own source revenue and total revenue was relatively low and stable throughout the period to 2005. In 2008-09 these ratios are forecast to increase to 17.4 per cent and 10 per cent respectively on the back of an increase in the royalty rate for coal.

The Queensland economy is relatively diversified, and historically it has not been categorised as resource dependent. In fact, with a relatively large portfolio of financial assets held by the public sector, it is instructive to observe how one of the key fiscal risks in Queensland is the variability in financial market returns rather than resource prices. That said, the prospect of future growth in its resource sector suggests that it may quickly reach the point where supplementary fiscal arrangements are justified.

General policy approach

Like Western Australia, Queensland has been undertaking a significant public works program to build public infrastructure to support its rapidly growing economy. Similarly, a significant proportion of public investment is undertaken by government business enterprises.

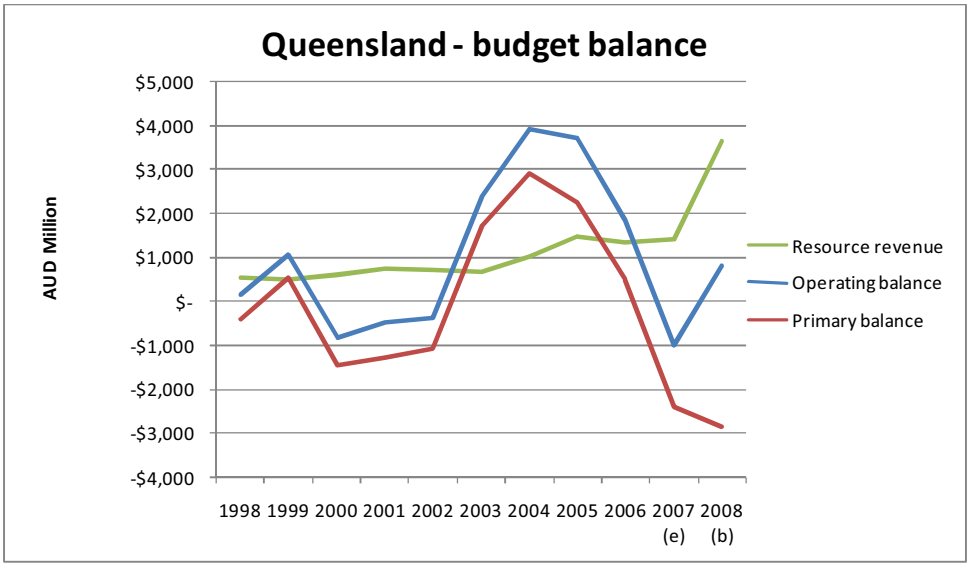
The financial assets of the Queensland public sector are earmarked for meeting future liabilities, especially with respect to public sector pensions. There appear to be no arrangements in place

that would facilitate the investment of resource revenue, and its conversion into a permanent income stream.

The state adheres to a number of principles in forming its fiscal strategy including: maintaining a competitive tax environment; maintaining an operating surplus; borrowing only for capital investments; covering future financial liabilities; and building the State's net worth.

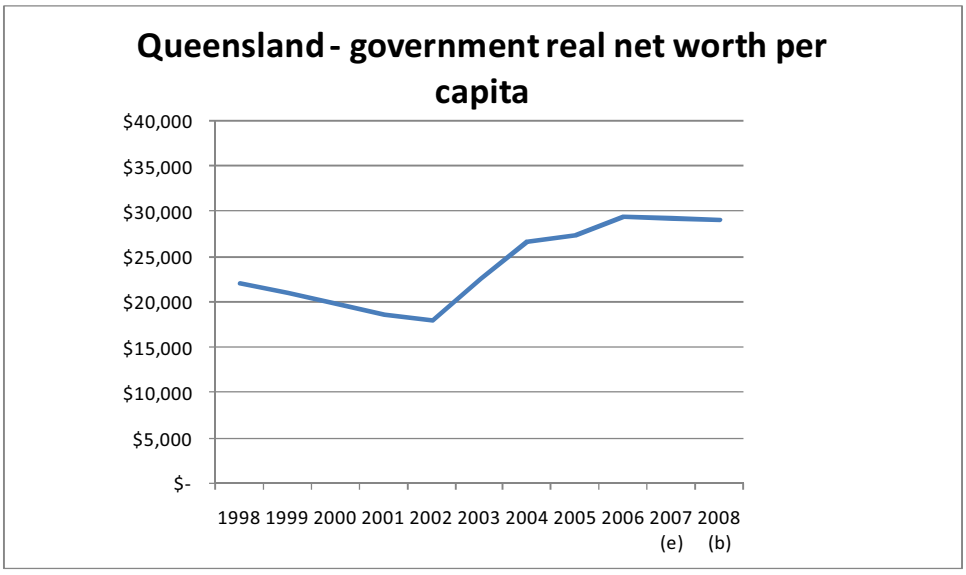
Primary balance

Resource revenue had not featured significantly in Queensland public finances during the period of review, at least until the current budget. The difference between the operating balance and primary balance is only qualitatively significant in 1998-99 and 2008-09. However, a near tripling of resource revenue in 2008-09 looks set to create the first significant divergence between the operating balance (surplus of nearly $1,000 million) and primary balance (deficit of nearly $3,000 million).



Real net worth

Measured in real per capita terms, government net worth has increased in Queensland over the review period. However, there was a sustained decline in the late 1990s to early 2000s. In addition, this measure is anticipated to decrease in 2007-08 and 2008-09, despite the surge in resource revenue. The government appears to have struggled to contain expenditure growth (10 per cent growth in the year to 2007-08) in the face of strong revenue growth.



What if resource revenue had been saved?

The actual change in nominal net worth far outstrips what would have been achieved under either benchmark savings policy. With the surge in resource revenue being mostly in prospect and significant existing financial assets Queensland would appear well-placed to adjust to stricter savings policies, maintaining greater discipline over its expenditure and ensuring the benefits are transformed into permanent annual benefits to be shared by future generations.

Queensland											
($m) / FY	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (e)	2008 (b)
Budget position											
Total revenue	$ 16,488	$ 17,407	$ 18,258	$ 19,342	$ 19,913	$ 25,214	$ 27,609	$ 30,084	$ 32,557	$ 32,276	$ 36,582
Resource revenue	$ 536	$ 511	$ 631	$ 769	$ 724	$ 674	$ 1,028	$ 1,492	$ 1,360	$ 1,401	$ 3,644
%	3.2%	2.9%	3.5%	4.0%	3.6%	2.7%	3.7%	5.0%	4.2%	4.3%	10.0%
Operating balance	$ 143	$ 1,062	-$ 820	-$ 486	-$ 350	$ 2,374	$ 3,926	$ 3,714	$ 1,856	-$ 995	$ 809
%	0.9%	6.1%	-4.5%	-2.5%	-1.8%	9.4%	14.2%	12.3%	5.7%	-3.1%	2.2%
Primary balance	-$ 393	$ 551	-$ 1,451	-$ 1,255	-$ 1,074	$ 1,700	$ 2,898	$ 2,222	$ 496	-$ 2,396	-$ 2,835
%	-2.4%	3.2%	-7.9%	-6.5%	-5.4%	6.7%	10.5%	7.4%	1.5%	-7.4%	-7.7%
Net worth											
Nominal	$ 57,689	$ 57,293	$ 58,473	$ 57,801	$ 58,692	$ 77,723	$ 96,433	$ 105,035	$ 117,831	$ 123,095	$ 128,563
Real net worth	$ 77,517	$ 74,792	$ 72,003	$ 69,062	$ 68,297	$ 87,661	$ 106,080	$ 110,956	$ 121,366	$ 123,095	$ 124,818
Per capita ($)	$ 22,139	$ 21,000	$ 19,841	$ 18,610	$ 17,968	$ 22,546	$ 26,761	$ 27,442	$ 29,428	$ 29,262	$ 29,090
Savings fund											
Principal	$ 536	$ 1,071	$ 1,750	$ 2,598	$ 3,439	$ 4,268	$ 5,488	$ 7,227	$ 8,912	$ 10,714	$ 14,841
Impact on net worth	$ -	-$ 42	-$ 3	$ 154	$ 254	$ 286	$ 654	$ 1,481	$ 2,215	$ 3,018	$ 6,095
Permanent income	$ -	-$ 1	-$ 0	$ 5	$ 9	$ 10	$ 23	$ 52	$ 78	$ 106	$ 213
% of RR	0.0%	-0.3%	0.0%	0.7%	1.2%	1.5%	2.2%	3.5%	5.7%	7.5%	5.9%
Other											
Population ('000)	3,501.4	3,561.5	3,628.9	3,711.0	3,801.0	3,888.1	3,964.0	4,043.2	4,124.1	*4,206.6*	*4,290.7*
CPI	122.8	126.4	134	138.1	141.8	146.3	150	156.2	160.2	*165.0*	*170.0*
Energy and mining exports (% of total)			40.6%	41.7%	38.1%	36.9%	43.3%	49.7%	49.4%		

WESTERN AUSTRALIA

Significance of resource revenue

Western Australia obtains resource revenue from a range of sources. The primary sources are royalties from onshore energy and mineral extraction, a share of royalties from offshore energy projects and revenue from leasing mining tenements. Resource revenue comprises approximately 15 per cent of own source revenue and approximately 13.5 per cent of total revenue (including Federal grants). These ratios are estimated to increase to 19 per cent and 17 per cent respectively in 2008-09. In 2003-04 the ratios were 10.5 and 8.3 per cent respectively. Total resource revenue is estimated to be $2.5 billion in 2007-08 and $3.4 billion in 2008-09.

General policy approach

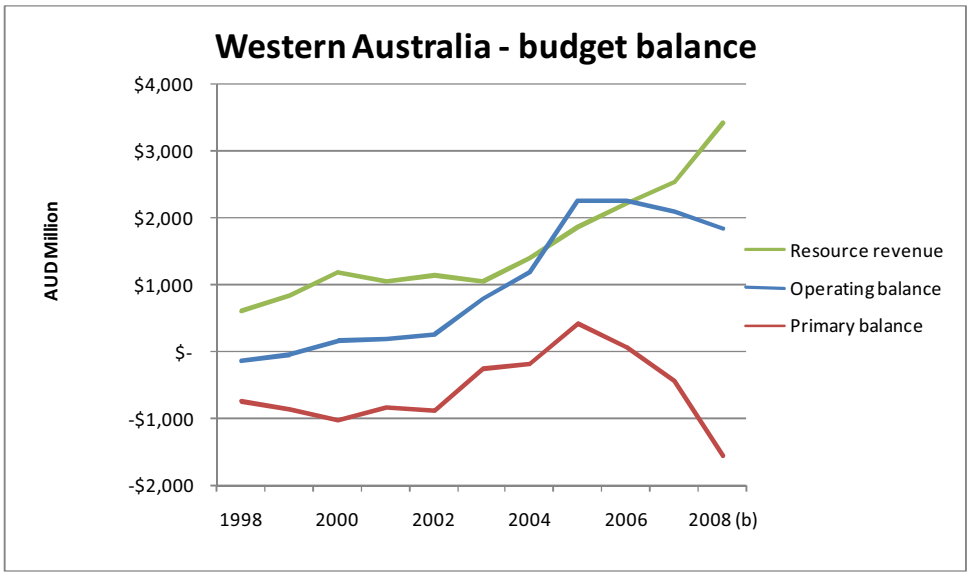
The current Western Australian Government (elected in 2001) has set its fiscal strategy with reference to a number of targets.[25] These include to increase the real net worth of the total public sector (Western Australia has significant equity in government business enterprises); to achieve an operating surplus in the general government sector; to retain the State's credit rating by constraining the net debt to revenue ratio and real per capita own source expenditures below specific targets; and to maintain a degree of tax competitiveness compared to other Australian jurisdictions.

In the period since 1998, the headline financial policies of the Western Australian government can be summarised as reigning in public debt, improving tax competitiveness and investing in public infrastructure. Compared to other jurisdictions (for example Alberta and Queensland), Western Australia maintains a relatively larger physical capital stock and smaller holdings of financial assets.

[25] Western Australia Budget Papers, 2008-09, Budget Paper 3, pp. 12-13.

Primary balance

Given the significance of resource revenue, in the period since 1998-99 Western Australia has achieved just two primary surpluses (in 2005-06 and 2006-07) whereas it has reported operating surpluses in all but two years (1998-99 and 1999-2000). For the most part, the primary deficit has been relatively contained (systematically less than $1 billion), but looks set to deteriorate in the 2008-09 Budget.



Real net worth

While improving the real net worth of the total public sector has been adopted as a fiscal target by the Western Australian Government, it is not presented on a per capita basis. Estimates of the real net worth of the general government sector measured on a per capita basis show a significant improvement in this metric over ten years. However, estimates for 2008-09 show that this is set for the first decrease since the late 1990s, despite record resource revenue.

What if resource revenue had been saved?

Western Australia far surpassed the target improvement in nominal net worth of $8,241 million despite lacking clear policies for resource revenue expenditure and financial asset accumulation.

Western Australia											
($m) / FY	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 (e)	2008 (b)
Budget position											
Total revenue	$ 8,984	$ 9,693	$ 10,597	$ 11,035	$ 11,771	$ 12,753	$ 14,222	$ 16,207	$ 17,573	$ 18,829	$ 19,872
Resource revenue	$ 610	$ 848	$ 1,195	$ 1,044	$ 1,156	$ 1,057	$ 1,397	$ 1,857	$ 2,204	$ 2,550	$ 3,424
%	6.8%	8.8%	11.3%	9.5%	9.8%	8.3%	9.8%	11.5%	12.5%	13.5%	17.2%
Operating balance	-$ 135	-$ 30	$ 167	$ 197	$ 254	$ 799	$ 1,192	$ 2,265	$ 2,254	$ 2,093	$ 1,855
%	-1.5%	-0.3%	1.6%	1.8%	2.2%	6.3%	8.4%	14.0%	12.8%	11.1%	9.3%
Primary balance	-$ 745	-$ 879	-$ 1,028	-$ 847	-$ 902	-$ 258	-$ 205	$ 408	$ 50	-$ 457	-$ 1,569
%	-8.3%	-9.1%	-9.7%	-7.7%	-7.7%	-2.0%	-1.4%	2.5%	0.3%	-2.4%	-7.9%
Net worth											
Nominal	$ 31,486	$ 31,691	$ 32,204	$ 36,006	$ 38,024	$ 43,754	$ 49,535	$ 58,156	$ 75,856	$ 80,262	$ 84,178
Real net worth	$ 42,417	$ 41,592	$ 39,885	$ 43,534	$ 45,037	$ 50,500	$ 55,101	$ 61,777	$ 78,132	$ 80,262	$ 81,726
Per capita ($)	$ 22,932	$ 22,189	$ 20,979	$ 22,620	$ 23,096	$ 25,530	$ 27,412	$ 30,101	$ 37,287	$ 37,516	$ 37,414
Savings fund											
Principal	$ 610	$ 1,486	$ 2,748	$ 3,915	$ 5,247	$ 6,541	$ 8,232	$ 10,459	$ 13,134	$ 16,275	$ 20,431
Impact on net worth	$ -	$ 223	$ 772	$ 1,195	$ 1,750	$ 2,230	$ 3,056	$ 4,361	$ 6,079	$ 8,241	$ 11,403
Permanent income	$ -	$ 8	$ 27	$ 42	$ 61	$ 78	$ 107	$ 153	$ 213	$ 288	$ 399
% of RR	0.0%	0.9%	2.3%	4.0%	5.3%	7.4%	7.7%	8.2%	9.7%	11.3%	11.7%
Other											
Population ('000)	1,849.7	1,874.5	1,901.2	1,924.6	1,949.9	1,978.1	2,010.1	2,052.3	2,095.4	*2,139.4*	*2,184.4*
CPI	120.8	124	131.4	134.6	137.4	141.0	146.3	153.2	158.0	*162.7*	*167.6*
Energy and mining exports (as % of total)										86.0%	