Non-renewable resource taxation in Australia

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Foreword

On 13 May 2008, the Treasurer announced a comprehensive review of Australia's tax-transfer system. The Australia's Future Tax System (AFTS) Review Panel delivered the final report to the Treasurer in December 2009. As part of this process, the AFTS Review Panel commissioned ABARE to examine Australia's non-renewable resource taxation arrangements.

From an economic perspective, non-renewable resource taxation is justified because of the presence and size of resource rent, the excess profits that represent a return to the resource. Traditionally, federal, state and territory governments in Australia allocate exploration and production rights to private investors and collect a return from the extraction of the community's mineral resources through a mix of arrangements.

There have been important policy reforms in recent decades including, most notably, the introduction by the Australian Government of the petroleum resource rent tax (PRRT) in 1987. However, output based royalties are still widely applied in Australia's mining sector. A key concern with output based royalties is the risk that governments collect an inadequate share of the resource rent during periods of relatively high industry profitability (for example, because of the relatively high commodity prices in recent years). Historical resource rent estimates presented in this report indicate there was a substantial potential revenue shortfall in recent years. This suggests that Australia's current resource charging arrangements are not sufficiently responsive to changes in industry profit. As a result, Australia is undercharging for its resource deposits.

Phillip Glyde
Executive Director
April 2010

Contents

Boxes

Tables

Figures

Summary

The objective in this report is to examine non-renewable resource taxation arrangements in Australia. The Australian Government is responsible for mineral resources in Australia's offshore areas beyond three nautical miles as well as for uranium in the Northern Territory. In all other cases, mineral resources located in coastal waters—areas within three nautical miles of the coast—or on land are the responsibility of the corresponding state or territory government.

Non-renewable resource taxation is considered in Australia's Future Tax System Review that was announced by the Treasurer on 13 May 2008.

Australia's non-renewable resources

Economic demonstrated resources (EDR) are a measure of Australia's mineral resources where there is reasonable certainty about the location, quantity and quality of ore deposits or fossil fuel fields, and their economic viability. Notably, in 2007, Australia ranked in the top four countries in terms of EDR for base metals (including copper, lead, zinc and nickel), bauxite, iron ore, mineral sands, gold, silver, uranium, industrial diamonds and brown coal.

In 2007-08, Australia's mining and mineral processing industries accounted for 11.5 per cent of total output (gross domestic product) and 4.1 per cent of total employment. In the same year, Australia's exports of mineral resources were 50 per cent of total export earnings or $116 billion—$19 billion for oil and gas, $24 billion for coal, $66 billion for metallic minerals and $7 billion for non-metallic minerals. Australia's mineral resources exports are estimated to have increased to around $160 billion in 2008-09.

Economic framework

Mining is the process of converting the community's mineral resource assets in the ground to an alternative form of wealth. In Australia, private companies invest in mineral resource projects based on the geological, economic and policy setting. There are four key stages in the mining process: exploration and evaluation, development, production and basic processing, and project closure (field or mine site rehabilitation). The process of the discovery and (economic) depletion of resource deposits requires ongoing exploration activity, often in remote areas of Australia, to maintain the mining sector.

From an economic perspective, for non-renewable resource industries, the government has an important role in addressing market failures, collecting resource rent (the return to the resource) and investing the resource rent. More broadly, there is also a role for the government to assess the efficiency implications of current policies and administrative processes. For example, excessive administrative burdens (or red tape) increase industry costs, reduce resource rents and hence reduce the potential return to the community through non-renewable resource taxation.

Investing resource taxation revenue allows future generations to benefit from the extraction of the community's non-renewable resources—this is equivalent to converting the natural resource asset to an alternative form of asset that benefits the community. Sovereign wealth funds based on revenue collected from mining activities have been established in several countries. Existing investments are funded predominantly from petroleum earnings; only four sovereign wealth funds have origins in minerals. Most of these funds are aimed at stabilising government revenues and expenditure related to earnings from commodities, and not simply at maintaining long-term returns on assets.

Non-renewable resource taxation issues

The objective of non-renewable resource taxation policy is to enable the government to collect a reasonable payment from private investors who are assigned exploration and production rights to the community's mineral resources, while minimising negative impacts on private investment and production decisions.

The economic rationale for resource taxation is based on the presence and size of resource rents. In practice, resource rent is difficult to estimate and is often approximated by the economic rent which is the excess profit or supernormal profit earned in the market (equal to revenue less costs where costs include normal profit or a 'normal' rate of return to capital). A resource tax is justified if the resource rents are sufficiently large to outweigh associated administrative and compliance costs.

Non-renewable resource taxation options may be categorised broadly as rent based taxes (these target resource rent or supernormal profit), profit or income based taxes or royalties (these target accounting profit including both normal and supernormal profit; these are referred to as income based options in this report) and output based royalties (including an ad valorem royalty levied on the value of production and a specific royalty levied on the volume of production). Important rent based taxation options are:

- Brown tax—levied as a constant percentage of the annual net cash flow of a resource project with cash payments made to private investors in years of negative net cash flow. The Brown tax is generally considered to be a useful benchmark against which to assess other policy options (the government essentially acts as a silent partner in the resource project).
- Resource rent tax—this avoids the need for cash rebates by allowing negative net cash flows to be accumulated at a threshold rate and offset against future profit. The government collects a percentage of a project's adjusted net cash flow.
- Allowance for corporate capital (ACC)—the government taxes corporate net cash flow equivalent (excluding financial transactions) rather than corporate income. Instead of the standard deduction for interest on debt, companies are allowed to deduct an imputed return on their entire asset base.
- Allowance for corporate equity (ACE)—the government taxes corporate net cash flow equivalent (including financial transactions) rather than corporate income. In addition to the standard deduction for interest on debt, companies are allowed to deduct an imputed return on the cost of equity finance.

Globally, ad valorem and specific royalties have been the traditional mechanisms applied by governments to collect resource revenue from mining projects. However, output based royalties are inefficient and regressive—these options tend to collect a higher share of resource rent for less profitable projects resulting in negative distortions to private investment and production decisions. While the government may collect royalty revenue throughout the production phase of a resource project, there may be significant lost revenue opportunities under an output based royalty, particularly during periods of relatively high industry profitability.

By contrast, rent and income based taxes and royalties are relatively efficient policy options that allow the government to increase resource revenue during periods of high industry profitability—by design, these options ensure government revenue varies with changes in economic conditions. Compared with the outcome under output based royalties, rent and income based options reduce investor risk and increase resource rent potential. Rent and income based options increase the administrative burden and variability of resource revenue.

In recent years, there has been increasing recognition by governments in both developed and developing economies about the economic rationale for resource taxation. For example, Chile, Peru and South Africa have only recently introduced, or announced the introduction of, resource taxation arrangements and Western Australia only introduced an ad valorem royalty for gold just prior to 2000. Non-renewable resource taxation arrangements in many international jurisdictions have also been changed in recent years to incorporate some capacity to collect additional resource revenue during periods of relatively high industry prices or profitability. Notably, there has been a trend toward rent or income based options in developed economies.

Non-renewable resource taxation in Australia

In Australia, non-renewable resource taxation arrangements vary widely across jurisdictions. Within a given jurisdiction, arrangements may also differ according to mineral resource or location (for example, separate arrangements apply to some specific resource projects). Output based royalties are important options in all jurisdictions; rent or income based options mainly include the Australian Government's company income tax and petroleum resource rent tax, and arrangements in the Northern Territory.

Company and resource taxation revenue from Australia's mining sector was $14 billion in 2006-07, the latest year for which there are comprehensive data. Company taxation revenue was $6.8 billion of which 95 per cent was sourced from the 3 per cent of mining companies that have income of $100 million or more. Resource taxation revenue from the mining sector was around $7.1 billion in 2006-07, comprising $3.5 billion (50 per cent) from the oil and gas industry, $1.7 billion (24 per cent) from the coal industry, $1.8 billion (25 per cent) from the metal ore mining industry and $0.1 billion (1 per cent) from the non-metallic mineral mining and quarrying industry.

Resource taxation and economic rent in Australia's mining sector are examined using two different sources of industry performance data: PricewaterhouseCoopers (PwC) for the minerals industry (available for 1978-79 to 2006-07) and the Australian Bureau of Statistics (ABS) for the mining sector (available for 1992-93 to 2006-07 for the oil and gas, coal and metal ore mining industries, and 2000-01 to 2006-07 for the mining sector). This information is used to derive industry net cash flow before taxes. Actual resource taxation revenue is compared with outcomes under two hypothetical rent based taxes: the Brown tax and a resource rent tax. Estimates of economic rent based on a range of assumptions for the risk premium in the industry's minimum rate of return are also presented for each of these time periods, based on data availability.

The main results based on ABS data for the period 2000-01 to 2006-07 are:

- Resource tax payments appear to have been somewhat more responsive to changes in industry profitability (as measured by net cash flow before taxes) in the oil and gas industry compared with the coal and metal ore mining industries where output based royalties dominate.
- The present value of net cash flow before taxes is estimated as $167 billion in Australia's mining sector, of which $39 billion was collected in resource taxes.
- The present value of resource tax payments under a hypothetical Brown tax in Australia's mining sector is $67 billion. The Brown tax is levied at a rate of 40 per cent, the same rate that applies in the petroleum resource rent tax; this rent based tax is applied to industry net cash flow before taxes and it is assumed that there is no industry supply response to the implementation of the more efficient rent based tax.
- The shortfall in potential resource tax revenue for the period is around $28 billion in present value terms (or $4 billion a year on average). However, company tax revenue would be reduced under any resource taxation arrangement that resulted in lower net cash flow after resource tax (this aspect is not considered here).
- In present value terms, the estimated economic rent for Australia's mining sector ranges from $161 billion ($23 billion a year) for risk neutral investors to $139 billion ($20 billion a year) for risk averse investors with a minimum rate of return equal to the long-term bond rate plus 20 percentage points.

Conclusion

The AFTS Review provides Australian policymakers, on behalf of the Australian community, with an important opportunity to consider the effectiveness of current resource taxation arrangements in the mining sector compared with alternative arrangements, particularly rent based taxes. The estimates presented in this report indicate a likely substantial shortfall in actual resource taxation revenue compared with potential revenue, particularly in the recent period 2000-01 to 2006-07. Given Australia's considerable economic demonstrated resources and continuing strong demand from China, future resource rents and hence resource taxation potential are likely to be substantial.

1 Introduction

On 13 May 2008, the Treasurer announced a comprehensive review of Australia's tax-transfer system to examine current arrangements and design a structure that positions Australia to deal with the demographic, social, economic and environmental challenges of the 21st century (Swan 2008). Australia's Future Tax System (AFTS) Review was conducted in several stages. The first discussion paper from the AFTS Review was released in August 2008 (see Australian Treasury 2008a). In the same month, the Review Panel released framing questions and called for public submissions (see box 1.1). In December 2008, the Review Panel released consultation papers to outline emerging issues from the public submissions process and provide the basis for further submissions, public meetings and direct consultation. The Review Panel delivered its final report to the Treasurer in December 2009 (see www.taxreview.treasury.gov.au for further information on the Review).

To complement the consultations process, the Review Panel decided to commission research in a number of areas, including natural resource taxation (see Australian Treasury 2008b). In the main consultation paper, the Review Panel indicated that research in the area of natural resources "aims to develop an economic framework for the taxation of natural resources; current tax and royalty settings; alternative approaches proposed in the literature or used overseas; implications for federal fiscal relations; and the role of taxation as a mechanism to ensure optimal use of the resources" (Australian Government 2008b, p. 273). A summary of key messages from submissions on non-renewable resources is provided in box 1.1.

The objective in this report is to examine non-renewable resource taxation arrangements in Australia. Non-renewable resources include oil, gas and minerals and may also be referred to as mineral resources. The Australian Government is responsible for mineral resources in Australia's offshore areas beyond three nautical miles as well as for uranium in the Northern Territory. In all other cases, mineral resources located in coastal waters—areas within three nautical miles of the coast—or on land are the responsibility of the corresponding state or territory government.

As noted in Australian Treasury (2008a), Australian governments assign exploration and production rights to the mining sector and apply a complex array of tax and non-tax revenue raising instruments—including company income tax, royalties, excises and licenses—to provide a return from the use of the community's mineral resources. Since 1989 when the Australian Government was considering extending the petroleum resource rent tax to the Bass Strait fields, ABARE has examined resource taxation issues in Australia in several reports (see, for example, Hinchy, Fisher and Wallace 1989, Hogan and Thorpe 1990, Thorpe, Anthony and Croft 1990, Hogan and Donaldson 2000, Hogan 2003a and Hogan 2007).

The structure of this report is as follows. Recent information on key geological and economic indicators for Australia's mining sector is briefly presented in chapter 2. An economic framework for the mining sector, including stages in the mining process and the role of government, is outlined in chapter 3. The economic implications of resource taxation options in the mining sector are examined in chapter 4—this discussion draws on papers presented at an IMF conference on natural resource taxation, held in Washington D.C. in September 2008 (to be published in Daniel, Keen and McPherson 2010). Empirical evidence on resource rents and resource taxation payments in Australia's mining sector is presented in chapter 5. Some concluding comments are presented in chapter 6.

box 1.1 **Australia's Future Tax System (AFTS) Review—summary of questions and key messages from submissions on non-renewable resources**

In August 2008, the Panel invited submissions to the Australia's Future Tax System Review, guided by four broad consultation questions (Australian Treasury 2008b):

- What major challenges facing Australia need to be addressed through the tax-transfer system?
- What features should the system have in order to respond to these challenges?
- What are the problems with the current system?
- What reforms do we need to address these problems?

Three specific consultation questions related to natural resource charging:

- When considering the appropriate return to the Australian community for the use of its non-renewable resources, what relative weight should be given to the determinants of that return?
- What is the most appropriate method of charging for Australia's non-renewable resources, given they are immobile but that Australia needs to compete globally for mining investment?
- What is the role of the tax system in ensuring that renewable resources are used both sustainably and efficiently?

The key messages from submissions relating to non-renewable resources was summarised in Australian Treasury (2008b, p. 255):

"Some submissions argue that there is potential to increase revenue from natural resources in the context of the overall tax mix.

Submissions from the mining sector argue that the sector's large capital expenditures and the long life of investments require stability in revenue arrangements. Consequently, any changes to mining sector revenue arrangements should only apply on a prospective basis. These submissions also state that consultation with industry prior to the introduction of any changes to existing resource pricing arrangements is critical.

One mining industry submission favours profit based arrangements over *ad valorem* arrangements.

Submissions from the mining sector also propose more generous tax depreciation arrangements."

2 Australia's non-renewable resources

By international standards, Australia is relatively abundant in mineral resources and is a major producer and exporter of a diverse range of mineral and energy commodities (see ABARE 2008 and 2009). In this chapter, background information is presented on Australia's mining sector.

Economic demonstrated resources

Economic demonstrated resources (EDR) are a measure of Australia's mineral resources where there is reasonable certainty about the location, quantity and quality of ore deposits or fossil fuel fields, and their economic viability (further information on resource definitions is provided in Geoscience Australia 2008 and BP 2009). EDR for selected mineral resources is provided in table 2.1.

Notably, in 2007, Australia ranked in the top four countries in terms of EDR for base metals (including nickel), bauxite, iron ore, mineral sands, gold, silver, uranium, industrial diamonds and brown coal. Australia's share of world EDR is at least 30 per cent for zircon, rutile, nickel, uranium and lead, and over 10 per cent for other major minerals except black coal.

By contrast, at the end of 2008, Australia accounted for around 0.3 and 1.4 per cent of world proved reserves for oil and gas, respectively. Australia ranked 26th and 14th for oil and gas reserves, respectively.

Geoscience Australia (2008) provides information on Australia's accessible EDR to production ratio for minerals. The EDR to production ratio is relatively low for industrial diamonds, oil, gold, silver,

2.1 Australia's economic demonstrated resources (EDR) December 2007

	world ranking	share of world	years of accessible EDR a
	no.	%	no.
Oil and gas b			
Oil	27	0.3	20
Gas	14	1.4	65
Coal			
Black coal	6	6	90
Brown coal	1	25	490
Selected metallic minerals			
Base metals (including nickel)			
Copper	2	12	70
Lead	1	30	35
Zinc	1	24	30
Nickel	1	38	140
Bauxite	2	24	85
Iron ore	4	13	65
Mineral sands			
Ilmenite	2	19	80
Rutile	1	40	55
Zircon	1	43	50
Precious metals			
Gold	2	12	25
Silver	2	17	25
Uranium	1	34	95
Selected non-metallic minerals			
Industrial diamonds	3	17	10

a Years of accessible EDR based on 2007 production (rounded to nearest 5 years). **b** Proved reserves in 2008. Data from BP (2009).
Sources: Geoscience Australia (2008) and BP (2009).

zinc and lead (see table 2.1). Increases in production would reduce resource life unless new resource deposits are discovered or there are technological breakthroughs (for example, the adoption of cost effective technologies that would reduce development and production costs and allow currently uneconomic deposits to be reclassified as economic). In general, there is some tendency for exploration activity to focus on the major resources that have a lower EDR to production ratio (see, for example, Hogan et al. 2002).

Output and employment

In 2007-08, the mining sector accounted for 7.7 per cent of Australia's gross domestic product (GDP) with mineral processing industries accounting for a further 3.8 per cent (see table 2.2). In the same year, 4.1 per cent of Australia's labour force were employed in the mining and mineral processing industries.

2.2 Output and employment in Australia's mining and mineral processing industries 2007-08

	output a		employment b	
	level	share of total	level	share of total
	$b	%	'000	%
Mining				
Oil and gas extraction	–	–	11	0.1
Coal mining	–	–	26	0.2
Metal ore mining	–	–	46	0.4
Other mining (including services)	–	–	62	0.6
Total	83.4	7.7	145	1.4
Mineral processing				
Petroleum, coal and chemical products	15.1	1.4	98	0.9
Non–metallic mineral products	5.5	0.5	42	0.4
Metal products	20.4	1.9	158	1.5
Total	40.9	3.8	298	2.8
Mining and mineral processing	124.3	11.5	442	4.2
Australia	1 084.5	100.0	10 621	100.0

a Industry gross value added. Chain volume measures; reference year is 2006-07. **b** Average employment over four quarters.
Source: ABARE (2009).

Energy consumption

Energy is an essential input into most economic activities and, as a consequence, there tends to be a strong relationship between growth in output and energy consumption. Between 1989-90 and 2006-07, the Australian economy has become less energy intensive mainly because of energy efficiency gains and structural change (see Sandu and Petchey 2009). In 2007-08, 95 per cent of Australia's primary energy requirements were met from oil, gas and coal resources—55 per cent from oil and gas and 40 per cent from coal (see table 2.3). Abundant coal resources and the proximity of these resources to areas of high energy demand along the east coast have historically made coal a relatively cheap source of energy, particularly for electricity. The remaining five per cent of Australia's primary energy consumption is met by renewable energy sources.

2.3 Australia's primary energy consumption, by fuel type 2007-08

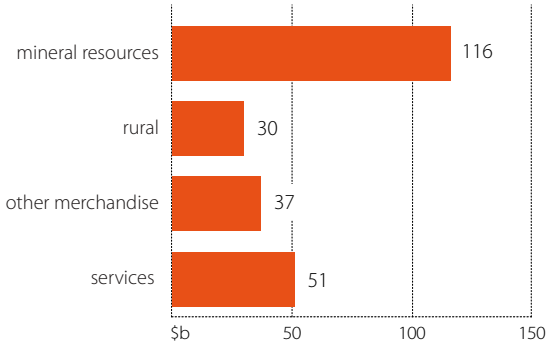
	energy units PJ	share of total %
Oil	1 942	33.6
Gas	1 249	21.6
Coal		
Black coal	1 681	29.1
Brown coal	611	10.6
Total coal	2 292	39.7
Renewables		
Hydro	43	0.8
Wind	14	0.2
Solar	7	0.1
Bioenergy	226	3.9
Total renewables	290	5.0
Total	5 773	100.0

Source: Schultz (2009).

Exports

Australia's exports of mineral resources accounted for $116 billion or 50 per cent of total export earnings of $234 billion in 2007-08 (ABARE 2009; see figure a). This is substantially higher than the export shares for the rural sector (13 per cent), other merchandise goods (16 per cent) and the services sector (22 per cent).

a Australia's exports of goods and services
by sector, 2007-08 (excludes bunker fuel)



The principal markets for Australia's mineral resources exports are located in Asia with Japan, China and the Republic of Korea being the three largest destinations. Since 1970-71, mineral resources have accounted for an average of 37 per cent of Australia's export earnings. This share has increased from an average of 32 per cent in the 1970s to an average of 42 per cent since 2000-01.

Australia's mineral resources exports are estimated to have increased to around $160 billion in 2008-09 (see table 2.4). Oil and gas exports were $21 billion (or 13 per cent of the total), coal exports were $55 billion (34 per cent) and exports of metallic minerals (including mineral products) were $79 billion (49 per cent) in 2008-09.

2.4 Australia's mineral resources exports

2007-08 and 2008-09

	2007-08		2008-09	
	exports $b	share of total %	exports $b	share of total %
Oil and gas [a]				
Oil	13.0	11.2	10.6	6.6
LNG	5.9	5.0	10.1	6.3
Total oil and gas	18.8	16.2	20.7	12.9
Coal	24.4	21.0	54.7	34.2
Metallic minerals [b]				
Metalliferous minerals and metals	65.0	55.9	78.1	48.8
Uranium	0.9	0.8	1.0	0.6
Total metallic minerals	65.9	56.7	79.1	49.4
Non-metallic minerals [b]	7.1	6.1	5.6	3.5
Total	116.2	100.0	160.0	100.0

a Excludes bunker fuels. **b** Includes mineral products.
Source: ABARE (2009).

3 Economic framework

Mining is the process of converting the community's mineral resource assets in the ground to an alternative form of wealth. In this chapter, the role of resource taxation is considered within a broader economic framework for the mining sector. Key stages in the mining process are briefly discussed, including the role of government. Given the potential for windfall tax revenue during mining booms, information on mineral resource investment funds (or sovereign wealth funds) established in other countries is also provided.

Key stages in the mining process

In Australia, private companies invest in mineral resource projects based on the geological, economic and policy setting. The four key stages in the mining process are exploration and evaluation, development, production and basic processing, and closure (see figure b):

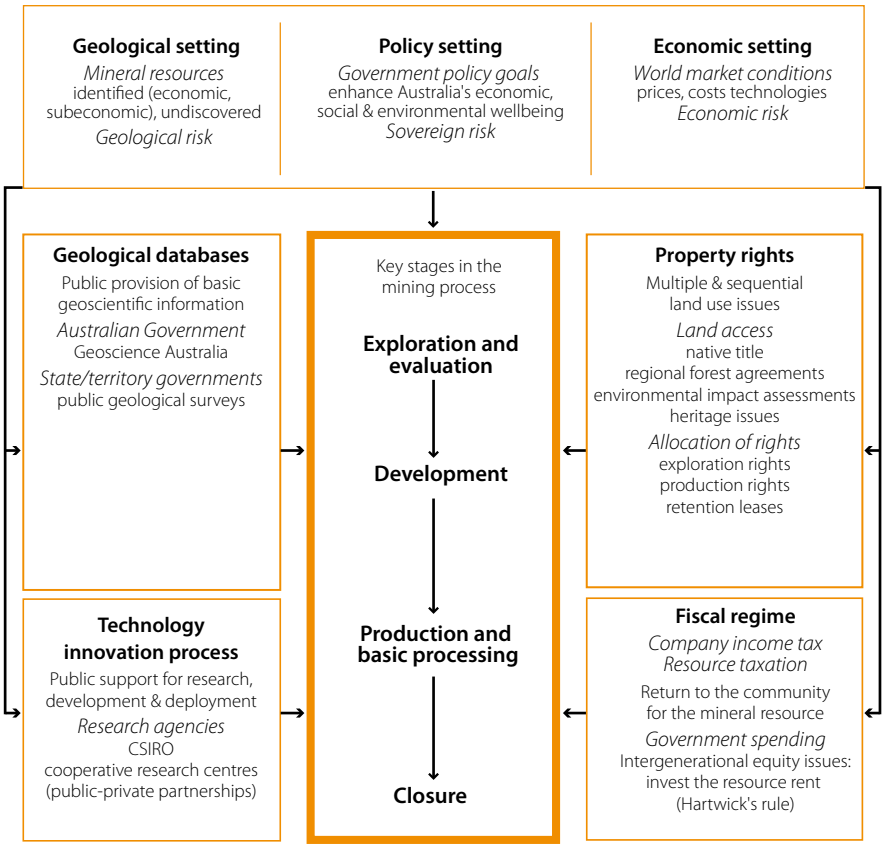
- **Exploration and evaluation**—Exploration is an investment in knowledge about the size, location and quality of resource deposits (ore deposits or fossil fuel fields). The process of the discovery and (economic) depletion of resource deposits requires ongoing exploration activity, often in remote areas of Australia, to maintain the mining sector. Private exploration activity, broadly defined, includes *the generative stage* (prospective areas are identified based on public geological databases and supplementary private reconnaissance work), *the primary exploration stage* (detailed exploration occurs within lease areas); and *the evaluation stage* (assessment of the economic viability of any resource deposit that has been discovered).
- **Development**—For resource projects that are assessed to be economic, the development stage involves the construction and development of the mine site or field and related facilities. The availability and cost of infrastructure such as power, water, transport and personnel accommodation can influence requirements at this stage.
- **Production and basic processing**—Following project development, private companies undertake resource extraction, processing and marketing activities. The extent of processing depends on a range of factors including the mineral resource type, location and end use market. For example, gas produced in Australia for the export market must be converted first to liquefied natural gas (LNG). By contrast, crude oil and black coal typically require little if any processing before transportation to the user (mainly petroleum refineries, the iron and steel industry, and power plants). For metallic minerals, basic mineral processing occurs at most mine sites to reduce transport costs.
- **Closure**—Project closure occurs with the economic depletion of the resource deposit from that location. Declining reserves may encourage further exploration around the existing deposit to extend the life of the resource project. Following closure, companies rehabilitate the mine site or field according to a strategy approved by government—this may require environmental restoration during the production stage as well as at the end of the resource project depending mainly on the nature of the operation.

Each stage in the mining process involves risk, and the decision by private investors to begin the process, or continue to the next stage, requires that the assessed benefits of the decision exceed the assessed costs (including the cost of risks borne by the private investor).

A range of geological, economic and policy factors influences the decisions of private investors. Most importantly, in the exploration and development stages, project profitability assessments are influenced by expectations and risks relating to, for example, resource prospectivity, resource prices, technologies, input costs more generally, land access and government policies. Government policies that are relevant to industry range from sector specific policies such as resource taxation and approval processes, to broader policy processes such as microeconomic reform and macroeconomic policy settings.

Further information on the mining process is available in, for example, Hogan et al. (2002) and AusIMM (2006).

b Economic framework for the mining sector



Role of government

From an economic perspective, government has an important role in:

- **Addressing market failures**—a fundamental role for government is to identify market failures and to analyse policy options to correct these market failures at least cost to society.
- **Collecting resource rent**—Resource taxation ensures the government, on behalf of the community, collects a return from the extraction of the community's mineral resources.
- **Investing resource rent**—Government decisions on how to spend resource taxation revenue may have significant implications for future generations.

The key criteria used to evaluate policy options in Australia's AFTS Review are broadly categorised as equity, efficiency, simplicity, sustainability (including revenue adequacy) and policy consistency (Australian Treasury 2008b). A number of government policies that address market failures in the mining sector are identified in figure b, including assigning property rights (exploration and production rights) to private investors, public provision of geological databases and public support for research, development and deployment (see, for example, Hogan 2003b and 2004 for further information).

Mechanisms to collect resource rent are discussed in some detail in chapter 4. Investing the resource taxation revenue allows future generations to benefit from the extraction of the community's non-renewable resources—this is equivalent to converting the natural resource asset to an alternative form of asset that benefits the community. The idea that resource rents should be invested rather than used for consumption purposes to sustain the benefits from resource extraction, and enhance intergenerational equity, is often referred to as Hartwick's rule after Hartwick (1977). Information on the international experience in resource rent investment funds, or sovereign wealth funds, is presented below.

Consistent with the above, there is a role for government to assess the efficiency implications of current policies and administrative processes. For example, excessive administrative burdens (red tape), and difficult or complex environmental regulations (green tape) increase industry costs and reduce resource rents (and hence reduce the potential return to the community through resource taxation). Some jurisdictions in Australia have aimed to reduce red tape to reduce industry costs and facilitate investment in resource exploration and development. For example, the South Australian Government's PACE initiative through Primary Industries and Resources SA aims to encourage minerals industry investment by bringing "exploration, education, research and environmental considerations together in a strategic and coordinated way" (PIRSA 2009). Fraser Institute survey results presented in chapter 5 suggest the South Australian and Northern Territory governments have been successful in achieving substantial efficiency gains in administrative processes, reducing regulatory duplication and inconsistencies as well as reducing regulatory uncertainty (see table 5.5).

Sovereign wealth funds

Sovereign wealth funds based on revenue collected from mining activities have been established in several countries (see table 3.1). Existing investments are funded predominantly from petroleum earnings. Only four sovereign wealth funds have origins in minerals, the

3.1 Sovereign wealth funds from mineral resource revenue

April 2009

country	fund name	assets, US$b	inception	origin
Mauritania	National Fund for Hydrocarbon Reserves	0.3	2006	Oil & gas
Kiribati	Revenue Equalization Reserve Fund	0.4	1956	Phosphates
Venezuela	FIEM	0.8	1998	Oil
UAE – Ras Al Khaimah	RAK Investment Authority	1.2	2005	Oil
Malaysia	Terengganu Investment Authority	2.8	2008	Oil
Trinidad & Tobago	Heritage and Stabilization Fund	2.9	2000	Oil
US – Alabama	Alabama Trust Fund	3.1	1986	Gas
US – Wyoming	Permanent Wyoming Mineral Trust Fund	3.6	1974	Minerals
East Timor	Timor-Leste Petroleum Fund	4.2	2005	Oil & gas
Saudi Arabia	Public Investment Fund	5.3	2008	Oil
Botswana	Pula Fund	6.9	1966	Diamonds & minerals
Oman	State General Reserve Fund	8.2	1980	Oil & gas
Nigeria	Excess Crude Account	9.4	2004	Oil
Azerbaijan	State Oil Fund	11	1999	Oil
Canada	Alberta's Heritage Fund	12	1976	Oil
Iran	Oil Stabilisation Fund	13	1999	Oil
UAE – Abu Dhabi	International Petroleum Investment Company	14	1984	Oil
Bahrain	Mumtalakat Holding Company	14	2006	Oil
UAE – Abu Dhabi	Mubadala Development Company	15	2002	Oil
Chile	Social and Economic Stabilization Fund	22	1985	Copper
US – Alaska	Alaska Permanent Fund	27	1976	Oil
Brunei	Brunei Investment Agency	30	1983	Oil
Kazakhstan	Kazakhstan National Fund	38	2000	Oil
Algeria	Revenue Regulation Fund	47	2000	Oil
Qatar	Qatar Investment Authority	62	2003	Oil
Libya	Libyan Investment Authority	65	2006	Oil
UAE – Dubai	Investment Corporation of Dubai	82	2006	Oil
Kuwait	Kuwait Investment Authority	203	1953	Oil
Russia	National Welfare Fund	220	2008	Oil
Norway	Government Pension Fund – Global	326	1990	Oil
Saudi Arabia	SAMA Foreign Holdings	431	na	Oil
UAE – Abu Dhabi	Abu Dhabi Investment Authority	627	1976	Oil
Oman	Oman Investment Fund	na	2006	Oil
UAE – Dubai	Dubai World	na	2006	Oil
UAE – Federal	Emirates Investment Authority	na	2007	Oil
		A$b		
Australia **a**	Future Fund	61	2004	Non-commodity

a Australia's Future Fund is not classified as a sovereign wealth fund from mineral resources. Assets are as at 30 June 2009.
Sources: Sovereign Wealth Fund Institute (2009); www.futurefund.gov.au.

largest of which is Chile's Social and Economic Stabilisation Fund, with around US$22 billion in assets originating from copper mining. Other funds with earnings from minerals are Botswana's Pula Fund (US$7 billion, diamonds), Wyoming's Permanent Wyoming Mineral Trust Fund (US$3.6 billion, minerals), and Kiribati's Revenue Equalisation Reserve Fund (US$400

million, phosphates). Most of these funds are aimed at stabilising government revenues and expenditure related to earnings from commodities, and not simply at maintaining long-term returns on assets.

The sovereign wealth funds established in Norway and Alaska are discussed briefly below.

Norway: The Government Pension Fund – Global

In Norway, The Government Pension Fund is used to invest revenue from mining with two main stated aims:

- **To ensure petroleum revenues are available for use by future generations as well as current generations**—to provide the government with savings on which to draw in periods where public disbursements are too large to be financed by tax.
- **To act as a buffer between current petroleum revenues and the use of these revenues in the economy**—to shield the economy from fluctuations in prices and extraction rates in the petroleum sector.

The fund has a long term investment strategy approved by the Norwegian parliament and the use of the fund is "limited to 4 per cent, or the expected annual real return on the Petroleum Fund over time" (Gjedrem 2004, p. 1). This rule is to ensure use of the revenues can be sustained over time. The government sees that the fund is not savings but represents the conversion of petroleum wealth to financial investments. Given the long term outlook of the fund and the fund's objective of improving intergenerational equity, an Advisory Council on Ethics was established in 2004 to advise whether or not companies should be excluded from the investment fund as a result of activities that breach the fund's ethical guidelines. Businesses involved in arms production, tobacco, or that are found to have caused or be causing significant environmental damage are examples of excluded companies.

Alaska Permanent Fund

The Alaska Permanent Fund was created in 1976 based on returns from the oil industry. An important objective in establishing the fund was to provide a means of conserving a portion of the state's revenue from mineral resources to benefit all generations of Alaskans (APFC 2009). The fund was set up according to the following rule:

- at least 25 per cent of all mineral lease rentals, royalties, royalty sales proceeds, federal mineral revenue-sharing payments and bonuses received by the state be placed in a permanent fund, the principal of which may only be used for income-producing investments.

Earnings realised from the fund may be spent by the state legislature and the fund is managed by a state owned corporation. Typically, the earnings from the fund are paid as dividends to eligible Alaskan citizens.

Hanneson (2001) presents a useful discussion of issues in establishing investment funds, drawing in particular on the experience in the Norwegian Petroleum Fund (since renamed the Government Pension Fund – Global), the Alaska Permanent Fund and the Alberta Heritage Fund.

4 Non-renewable resource taxation issues

Australia is endowed with a finite but unknown quantity of mineral resources located in fossil fuel fields and ore deposits—estimates of economic demonstrated resources (EDR) provide an indication of identified resources that are economically recoverable over a specified time frame (see chapter 2). The community owns these mineral resources in the ground and the role of the industry is to convert these natural assets to alternative forms of wealth above ground (see chapter 3). Mineral resource industries are characterised by a dynamic process of project exploration, development, production and closure. The resource rent is the return to the mineral resource and there is an important role for government in ensuring the community obtains a return to its mineral resources based on the generation of this resource rent.

The objective of non-renewable resource taxation policy is to enable the government to collect a reasonable payment from private investors who are assigned exploration and production rights to the community's mineral resources, while minimising negative impacts on private investment and production decisions. In recent years, there has been renewed international interest in the challenge of designing and implementing resource taxation in the mining sector (Daniel et al. 2008; Land 2008). With the sharp rise in world energy and mineral commodity prices between 2002 and 2008, many governments have been assessing the extent to which resource taxation arrangements have been adequate in collecting a reasonable return on the use of the community's mineral resources. Reflecting the importance and complexity of resource taxation, the IMF held a conference in September 2008 on *Taxing Natural Resources: New Challenges, New Perspectives*.

As part of the consultation process in the AFTS Review, Australian Treasury (2008b, p.256) note that the "overarching design issue with resource revenue arrangements is how to balance the competing objectives of enabling exploration and extraction, while ensuring the community receives the appropriate return on Australia's assets". This chapter provides a discussion of resource taxation issues relevant to Australia's mining sector, drawing on papers relating to the IMF conference and the tax review process.

Resource rent—the economic rationale for resource taxation

Resource rent is the return to the mineral resource and is the economic rationale for resource taxation policy. In practice, the resource rent is difficult to estimate and is often approximated by the economic rent. Economic rent is the payment that exceeds the minimum return required to hold capital in the activity. That is, economic rent is the excess profit or supernormal profit earned in the market, and is equal to revenue less costs where costs include

normal profit or a 'normal' rate of return to capital (including a risk free component and a risk premium that compensates risk averse private investors for the risks incurred in the activity). In the mining sector, economic rent is a long term concept that takes into account the costs of exploration, development, production and closure.

Resource rent exists because of the quality and scarcity of non-renewable resources. Project profitability increases with the quality of the mineral resource deposit (or fossil fuel field), all else constant; that is, relatively high grade deposits have a lower extraction cost and earn economic rent. Scarcity rent occurs when a resource is in short supply relative to its demand; economic rent because of resource scarcity may be a short run phenomenon, but may persist in the long run depending on the extent to which supply may be increased or rising prices encourage switching to substitute products. Economic rent may also occur from other factors such as other location specific rents or superior managerial skills and innovation, particularly for technology leaders.

Boadway and Keen (2008, p. 4) argue that it is the "sheer scale and potential persistence of such rents that marks out the resource sector". They further argue that the resource sector has a number of other features that make resource taxation both important and challenging for many countries. These features include: high sunk costs and long production periods; tax revenue that may be substantial and a primary benefit to the host country; considerable uncertainty at all stages of the mining process; interactions between tax systems in different jurisdictions; the possibility of project based taxation due to immobility of deposits; and the exhaustibility of resources.

Resource taxation options

Key resource taxation options are defined in box 4.1. Boadway and Keen (2008, p. 1) note that "to a large extent, the literatures on resource taxation and on business and commodity taxation more generally have evolved largely distinct from one another, and indeed the same is true in terms of policy formation too". In the resource taxation literature, resource taxation options are categorised broadly as:

- **Rent based taxes**—these options target the resource rent in resource projects and include, most importantly, the Brown tax and the resource rent tax. These taxes are applied to the net cash flow of a resource project and the Brown tax, proposed by Brown (1948), is generally regarded as the benchmark against which to assess other resource taxation options.
- **Income based taxes or royalties**—these options target some measure of accounting profit (normal as well as supernormal profit) and include the standard company income tax and profit based royalties.
- **Output based royalties**—these options target either the value of production (ad valorem royalty) or volume of production (specific royalty). The excise is a variant of an ad valorem royalty whereby higher rates apply to higher annual rates of production.

These systems may be referred to as source based taxation options whereby the tax base is income earned in the country where productive activity takes place (for a discussion of residence and destination based options, see, for example, Auerbach, Devereaux and Simpson 2008).

The Meade Committee (1978) identified two flow-of funds or cash flow taxes that are designed to address distortions in the standard corporate tax system (see Auerbach, Devereux and Simpson 2008):

- R-based cash flow tax (real)— for goods producing firms, this tax is levied on the net cash flow from the firm's 'real' transactions (that is, sales of products, services and fixed assets less purchases of materials, wages and fixed assets; no deduction is given for interest or other financial costs).
- R+F based cash flow tax (real and financial)—this tax is levied on the net cash flow from the firm's real and financial transactions (that is, net cash flow also accounts for net changes in debt and interest payments).

Cash flow equivalent versions of these taxation options that target economic rent (supernormal profit) include the allowance for corporate capital (ACC) and the allowance for corporate equity (ACE), respectively (Auerbach, Devereux and Simpson 2008).

Resource revenue payments may also be collected through licence fees (or lump sum payments). Auction systems for allocating exploration and production rights may be designed to be a rent collection mechanism, although cash bonus bidding is not currently used in Australia (and is not widely used overseas). Rent collection through state participation was examined at the IMF conference, but these options are not relevant to the Australian case and therefore are not covered in this report (see, for example, McPherson 2008 for further information).

Criteria for evaluating resource taxation options

An economic assessment of the advantages and disadvantages of resource taxation options, or fiscal instruments, is typically based on several criteria. Three broad criteria that may be used to evaluate resource taxation options are economic efficiency, government resource revenue and risk, and administrative simplicity. Baunsgaard (2001) discusses fiscal instruments with reference to seven criteria including neutrality, project risk, stability, flexibility, fiscal risk, revenue delay and administrative simplicity (Hogan and Goldsworthy 2010 discuss resource taxation options based on this approach).

The economic efficiency of resource taxation options encompasses the neutrality and investor risk criteria:

- Neutrality—a fiscal instrument is neutral if investment and production decisions in a resource project are not distorted by the tax. Typically, the neutrality criterion is used to evaluate the extent to which some projects that are viable before tax may become unprofitable after a fiscal instrument is applied, resulting in efficiency losses.
- Project risk—this is the investor's assessment of the technical and commercial risks associated with a resource project. The higher the assessed risks associated with a project, the lower the assessed profitability of the project (all else constant). The tax option may have a significant impact on the project risk and profitability assessment.

box 4.1 **Key resource taxation options**

Rent based taxes

- **Brown tax**—the Brown tax is levied as a constant percentage of the annual net cash flow of a resource project with cash payments made to private investors in years of negative net cash flow. Net cash flow is the difference between project revenue and costs. A Brown tax is an R-based cash flow tax. The Brown tax, named after a tax proposed by Brown (1948), is a useful benchmark against which to assess other policy options, but is not considered to be a feasible policy option for implementation since it involves cash rebates to private investors (the government essentially acts as a silent partner in the resource project).
- **Resource rent tax (RRT)**—a version of the Brown tax that avoids the need for cash rebates by allowing negative net cash flows to be accumulated at a threshold rate and offset against future profit. The government collects a percentage of a project's adjusted net cash flow. The resource rent tax was first proposed by Garnaut and Clunies Ross (1975) for natural resource projects in developing countries to enable more of the net economic benefits of these projects to accrue to the domestic economy. A resource rent tax is also an R-based cash flow tax.
- **Allowance for corporate capital (ACC)**—a version of an R-based tax whereby the government taxes corporate cash flow equivalent (excluding financial transactions) rather than corporate income. Instead of the standard deduction for interest on debt, companies are allowed to deduct an imputed return on their entire asset base (see, for example, Auerbach, Devereaux and Simpson 2008).
- **Allowance for corporate equity (ACE)**—a version of an R+F based tax whereby the government taxes corporate cash flow equivalent (including financial transactions) rather than corporate income. In addition to the standard deduction for interest on debt, companies are allowed to deduct an imputed return on the cost of equity finance (see, for example, Auerbach, Devereaux and Simpson 2008).

Income based taxes and royalties

- **Company income tax**—typically an important part of the fiscal regime for all companies; a higher tax rate may be applied to mining companies within the standard company income tax system.
- **Profit based royalty**—the government collects a percentage of a project's profit; typically based on some measure of accounting profit. This differs from the standard income tax in that it is levied on a given project rather than the corporation.

Output based royalties

- **Ad valorem royalty**—the government collects a percentage of a project's value of production. Traditionally levied at a constant rate, but variants of this system have been introduced including, for example, exemptions for small projects, and sliding scales based on price, production, cost category or profit.
- **Specific royalty**—the government collects a charge per physical unit of production. Typically levied at a constant rate and applied to low value, high production non-metallic minerals.
- **Excise**—this is a variant of an ad valorem royalty whereby higher rates apply to higher annual rates of production.

- **Sovereign risk (or stability)**—this is the investor's assessment of country risks associated with a resource project (including political or policy risks). For example, changes in the fiscal settings over the life of a project may have a significant impact on the future profitability of the project.

Government resource revenue and risk encompasses flexibility, fiscal loss and revenue delay criteria:

- **Flexibility**—the responsiveness of fiscal instruments to changes in future market conditions; that is, the capacity of fiscal instruments to collect a reasonable share of the resource rent under a range of future market outcomes.
- **Fiscal loss (risk that the government does not collect some minimum return to the resource)**—the situation where the government obtains a lower than expected or zero return to the resource, particularly under adverse market outcomes. A fiscal instrument where tax revenue is not responsive to changes in future market conditions results in greater stability in tax revenue flows, reducing the risk of fiscal loss (but not managing the possibility of fiscal gain).
- **Revenue delay (risk that the government does not collect a return to the resource for a significant time period after project commencement)**—the situation where the government does not start to collect tax revenue until some time after the project's production commencement date. Under a resource rent tax, for example, revenue collection is delayed until investors have received a specified threshold rate of return on their capital outlays.

The administrative simplicity of resource tax options includes:

- **Administration and compliance costs**—the costs incurred by government in designing, implementing and monitoring compliance with a fiscal instrument as well as the costs incurred by investors in complying with the fiscal instrument.

The criteria used in papers presented at the IMF conference are similar, but are often expressed in different ways. For example, the criteria used in Daniel et al. (2008) include neutrality, revenue raising potential, risk to government (including stability and timing of resource revenue), effects on investor perceptions of risk, and adaptability and progressivity. The criteria used in Land (2008) are revenue potential, fiscal risk and administrative costs associated with its use. These papers also note that there are important interactions and trade offs between these criteria.

Evaluating resource taxation options

Key messages from the 2008 IMF conference on resource taxation

The IMF conference papers provided a relatively consistent evaluation of resource taxation options. Based on the above criteria, these evaluations may be summarised as follows:

- **Rent and profit based taxes and royalties**—these options tend to rank more highly for economic efficiency and flexibility since: government tax revenue tends to vary with project profitability; investors and government share in the risks of adverse market outcomes; and the government is less likely to adjust fiscal settings in response to major changes in market conditions.
- **Output based taxes**—these options tend to rank more highly for revenue stability (encompassing the fiscal loss and revenue delay criteria), and administrative simplicity since: the government receives royalty payments in all years in which production from the resource project is positive, including any years in which losses may unexpectedly occur; and the information requirements tend to be lower than for rent or profit based options.

box 4.2 **Some key issues in the design of rent based taxes**

Full loss offset

Under a resource rent tax, a private investor only pays tax when the threshold rate of return on the investment in the resource project is achieved. The two key fiscal settings in the resource rent tax are the threshold rate (also referred to as the uplift rate) and the tax rate. A resource rent tax with full loss offset approximates the Brown tax where the uplift rate compensates investors for the delay of the refund of the tax value of expenditure and the risk that the government will never make this contribution. To achieve full loss offset in a resource rent tax while avoiding cash rebates, the main options are to allow losses from failed exploration or development projects to be transferred to successful projects—these may be transfers within the same company, including the potential to carry forward losses, or transfers to another company. The transferability of losses allowed in a resource rent tax system applies only to resource operations within the same jurisdiction.

Fane and Smith (1986) argued that the uplift rate should be set equal to the risk free interest rate since, with full loss offset, the accumulated expenditures represent a certain reduction in future resource rent tax liabilities (see also Boadway and Keen 2008). Fane and Smith (1986) also argued that the difficulties in making any actual tax proposal approximate the theoretical concept of a pure rent tax (or neutral tax) provide a justification for choosing a rent tax rate less than 100 per cent.

Full loss offset is also important for achieving efficient outcomes under other rent based taxes such as the allowance for corporate equity (see, for example, Boadway and Keen 2008 for further information).

Less than full loss offset

Lack of full loss offset in the resource rent tax is an important issue. For example, a resource rent tax that is levied only on successful resource projects fails to fully account for all revenues and costs in the resource industry. With less than full loss offset where not all relevant expenditures are deductible for resource rent tax assessment purposes, risk averse private investors may be compensated by introducing an additional risk premium in the fiscal settings and/or reducing the tax rate.

In the original approach suggested by Garnaut and Clunies Ross (1975), the resource rent tax applied to individual resource projects where, importantly, exploration activity in a failed lease area would be treated as a distinct resource project. They argued that a higher risk premium and/or lower tax rate than would otherwise apply would compensate industry for the lack of full loss offset. In resource rent taxes adopted in developed economies, failed development projects are the main source of lack of full loss offset—that is, investors may incur development risk, but exploration costs are usually fully deductible for resource rent tax purposes. Similar issues arise under other rent based taxes.

The IMF conference papers evaluated different aspects of resource taxation. For example, papers that examined theory, experience and issues include Boadway and Keen (2008), Hogan (2008), Osmundsen (2008), Daniel et al. (2008) and Land (2008). Cramton (2008) discusses recent theoretical developments in the design of auctions. Tax administration and compliance issues are examined in Calder and McPherson (2008), Mullins (2008) and Kellas (2008)—issues include, for example, the administrative complexity of different fiscal instruments, the tax administration capability of governments, taxation of LNG projects, transfer pricing and other international tax aspects. State participation issues are discussed in McPherson (2008) and, related to sovereign risk issues in developing economies, contractual assurances of fiscal stability are discussed in Daniel and Sunley (2008).

Ad valorem and specific royalties have been the traditional mechanisms applied by governments to collect resource revenue from mining projects. The historical use of output based royalties reflects the apparent provincial or state/territory government preference for administratively simple mechanisms that provide a relatively predictable revenue stream from the commencement of production at each mining project (see, for example, Productivity Commission 1998 and Hogan and Donaldson 2000).

Key messages from the IMF conference on natural resource taxation include:

- **Output based royalties are inefficient and regressive**—under an output based royalty, government revenue varies with the volume of production (specific royalty) or the value of production (ad valorem royalty) but does not vary with project profitability. Under these options, a higher share of resource rent is collected for less profitable projects resulting in negative distortions to private investment and production decisions. For example, Hogan (2008) notes that an ad valorem royalty, levied at a constant rate, overtaxes low profit projects and undertaxes high profit projects. Notably, some projects that were assessed to be economic before tax will become uneconomic or unprofitable under an output based royalty. While the government may collect royalty revenue throughout the production phase of a resource project, there may be significant lost revenue opportunities under an output based royalty, particularly during periods of relatively high industry profitability.
- **Rent and income based taxes and royalties are efficient policy options that allow the government to increase resource revenue during periods of high industry profitability**—rent or income based taxes ensure government revenue varies with changes in economic conditions. Compared with the outcome under output based royalties, rent and income based taxes and royalties reduce investor risk and increase resource rent potential. For example, Land (2008, p. 7) notes that "fiscal flexibility using progressive taxation removes the need to re-negotiate periodically or override existing fiscal arrangements"—under a progressive tax, a higher share of resource rent is collected for more profitable projects. Daniel et al. (2008, p. 13) also note that "a system that responds flexibly to changes in circumstances may be perceived as more stable". However, it is widely acknowledged that there are important challenges in designing a rent based tax (discussed further in box 4.2).

- **The importance of time consistency to reduce sovereign risk**—sovereign risk is a significant issue when taxation of resource projects is not consistent over time where changes to the tax system would discourage longer term investment in resource projects. An example of time inconsistent taxation given in Osmundsen (2008) is where the government responds asymmetrically to price rises and falls under output based royalties. Osmundsen (2008, p. 24) provides an interesting discussion of this issue in the context of petroleum taxation changes in Norway and concludes that "petroleum tax should be shaped in a long-term perspective with the emphasis on credibility and predictability" (see also box 4.3).
- **Resource deposits are immobile and governments should not reduce royalty rates to compete for investment in domestic resource projects**—collecting a reasonable return on the use of the community's mineral resources is a sound fiscal objective. Boadway and Keen (2008, p.10) note that foreign tax rules matter but there "is another aspect of the international nature of the resource business that is more puzzling" and this relates to the level of tax competition in the resources sector since the "potential rents to be earned from the deposit are specific to a particular location". This was particularly an issue during the 1980s and 1990s when many governments were focused on reducing royalty and company income tax rates to encourage mining investment during a period of declining prices (see, for example, Land 2008 and Hogan and Goldsworthy 2010).

box 4.3 **Norway's petroleum tax system**

Norway has moved toward a petroleum tax system that is based on the corporation tax and that has been designed to be neutral (Osmundsen 2008). From OECD (2007) and Osmundsen (2008), key features of Norway's petroleum tax system are:

- profits from the petroleum industry are taxed at the ordinary corporate income tax rate of 28 per cent
- a special tax of 50 per cent applies to petroleum companies
- immediate deductibility is allowed for a range of costs including, for example, exploration, research and development, and operating expenses
- investment costs can be deducted from the corporate tax base on a linear basis over six years from the date the investments were made
- interest expenses are deductible, but only for debt up to 50 per cent of the company's depreciable assets in the petroleum industry
- to avoid taxation of the normal return on investment, an additional deduction of 30 per cent reduces the tax base of the 50 per cent special tax. This equates to an additional 7.5 per cent allowance on the investment cost for the first four years only (and nothing thereafter).
- consolidation between fields is permitted
- tax losses can be carried forward with interest
- companies that are not in a tax position may apply for a cash refund of the fiscal value of exploration costs in the company's tax return.

The Norwegian Government received 31 per cent of its total income from the petroleum industry in 2007 (Osmundsen 2008).

- **Rent and profit based taxes and royalties increase the administrative burden and variability of resource revenue**—Osmundsen (2008) suggests the issue of optimal risk sharing between government and investors is an important topic for further research. Norway's petroleum tax system has become more neutral (or efficient) over time, but Osmundsen (2008, p. 24) argues "this makes very heavy demands on the expertise and integrity of the government administration. If such expertise and integrity are not fully present, simpler and more transparent administrative models would be preferable". Land (2008, p. 15) argues that "a tax administration that is capable of imposing income tax on resource businesses consistently and effectively, should, with a relatively modest augmentation of skills and personnel be able to administer RRT."

Previous ABARE research has focused on the efficiency implications of resource taxation options using the certainty equivalent approach to assess the impact of policy options for private risk assessments. This is a useful economic framework that highlights the negative impact of output based royalties on private risk assessments and private investment decisions (see, for example, Hogan 2003a and 2007). In these assessments, rent based tax options are preferred to output based royalties since the former reduces negative distortions to private investment and production decisions in the mining sector, while allowing the government to collect a reasonable share of the resource rent over time. The rent based tax mainly considered in these assessments is the resource rent tax. The AFTS Review process provides Australian governments with the opportunity to consider rent based tax options whereby resource rent from the mining sector is collected through the company tax system.

Recent developments

In recent years, there has been increasing recognition by governments about the economic rationale for resource taxation. For example, Chile, Peru and South Africa have only recently introduced, or announced the introduction of, resource taxation arrangements and Western Australia only introduced an ad valorem royalty for gold just prior to 2000 (see Otto et al. 2006 and Hogan 2008). However, some jurisdictions still do not apply any resource tax system including, for example, Mexico and most provinces in Argentina (Victoria does not apply a resource tax to gold).

Resource taxation arrangements in many jurisdictions have also been changed in recent years to incorporate some capacity to collect additional resource revenue during periods of relatively high industry prices or profitability. For example, an ad valorem royalty, levied at a rate that is a sliding scale based on price has been introduced in a number of jurisdictions (see Land 2008 and Hogan and Goldsworthy 2010).

There has been a shift toward rent or income based royalties in developed economies. Nearly all provinces in Canada, the Northern Territory in Australia and Nevada in the United States have adopted rent or income based royalties (Otto et al. 2006). Some jurisdictions in Canada have introduced a rent or income based tax in addition to the ad valorem royalty. The hybrid system adopted in some Canadian provinces appears to be an attempt to balance the objectives that investors, as owners of capital, receive some minimum return to capital and the community, as owners of the mineral resource, receive some minimum return to the mineral resource. Under this hybrid system, the government collects a minimum return to

the mineral resource by introducing an output based royalty (that is, a royalty that is linked to production to reflect the reduction in the community's mineral resource assets). To reduce negative distortions to private investment and production decisions, the ad valorem royalty is deductible under a complementary rent or income based tax or royalty (this is the case in Canada).

Rent based taxes under the corporate tax system have been introduced in the UK North Sea fiscal regime and the petroleum tax system in Norway (OECD 2007). In Norway's petroleum tax system, for example, companies which are not in a tax position may carry forward their losses and apply for a cash refund of the fiscal value of exploration costs in the company's tax return (see box 4.3 for further information on Norway's petroleum tax system).

5 Resource taxation and economic rent in Australia's mining sector

As outlined in the previous chapter, the economic rationale for resource taxation in Australia's mining sector is based on the presence and size of resource rents. A resource tax is justified if these rents are sufficiently large to outweigh associated administrative and compliance costs. In Australia, the fiscal instruments mainly used to collect resource rents include the Australian Government's company income tax, and resource taxation systems that vary widely across jurisdictions. Within a given jurisdiction, arrangements may differ according to mineral resource or location (for example, separate arrangements apply to some specific resource projects).

In this chapter, information is presented on Australia's resource taxation arrangements, taxation revenue and economic rent. Global petroleum and minerals survey results published by the Fraser Institute are briefly presented to provide an indication of the extent to which Australia's fiscal or taxation regime is considered by industry to be an impediment to mining investment in individual jurisdictions. Given data constraints, there are significant difficulties in estimating resource rent in Australia's mining sector over time. However, information is presented to provide an indication of the size of economic rent in the mining sector and the extent to which current arrangements collect this rent.

Current resource taxation arrangements

An overview of resource taxation arrangements in Australia's mining sector is provided in table 5.1. More detailed information is available in MCMPR (Ministerial Council for Mineral and Petroleum Resources, 2006), Hogan (2007) or the web sites from relevant government departments (an overview of arrangements and links to state/territory government departments are provided in www.ret.gov.au; see also CGC 2008).

Australian Government

Company income tax and oil and gas resources

Australia has a 200 nautical mile Exclusive Economic Zone (EEZ) around continental Australia and its territories in accordance with the United Nations Convention on the Law of the Sea (UNCLOS). Mineral resources located in Australia's offshore areas beyond three nautical miles are the responsibility of the Australian Government. Only oil and gas are produced offshore in Australia.

The Australian Government's company income tax and crude oil excise tax applies to all jurisdictions in Australia:

- **Company income tax**—levied at a rate of 30 per cent, the treatment of business expenditure for companies in the mining sector is generally the same as in other industries. Special treatment is given to certain capital expenditures (for example, immediate deductions are allowable for exploration and mine site rehabilitation costs) and resource taxation payments are deductible. Companies also receive tax concessions for research and development expenditures and must comply with other general taxation arrangements such as payroll tax, capital gains tax and the fringe benefits tax.
- **Crude oil excise tax**—an output based royalty levied at a rate that increases with crude oil and condensate production; the first 30 million barrels of production is exempt from the excise. Offshore, the excise applies to the North West Shelf (NWS) permit area. Onshore, the excise is waived if a resource rent royalty is introduced by the state/territory government (with a revenue sharing agreement negotiated with the Australian Government).

Oil and gas resource taxation in areas under the jurisdiction of the Australian Government includes:

- **Ad valorem royalty**—also referred to as the offshore petroleum royalty, the ad valorem royalty applies to the NWS permit area and state/territory waters at rates of 10.0 to 12.5 per cent. For the NWS permit area, the Western Australian Government receives 60 to 68 per cent of the royalty revenue and the Australian Government receives the remainder.
- **Production sharing contract**—applies to the Joint Petroleum Development Area (JPDA) in the Timor Sea. A treaty was originally signed with Indonesia in 1989 to enable petroleum exploration and development in this area. A new treaty with East Timor entered into force in April 2003. Australia receives 10 per cent of the royalties from the JPDA.
- **Resource rent royalty**—applies to Barrow Island with revenue sharing between the Western Australian Government (75 per cent) and the Australian Government (25 per cent). Introduced in 1985.
- **Petroleum resource rent tax**—applies to other offshore areas under the jurisdiction of the Australian government at a rate of 40 per cent of net project income. General project expenditure is accumulated at the long term government bond rate plus 5 percentage points, and exploration expenditure is transferable between projects within the same company and is immediately deductible (at 150 per cent in designated offshore frontier areas from 2004 to 2009). For new companies, exploration expenditure is accumulated at the long term bond rate plus 15 percentage points (only if the expenditure is incurred within five years of the production licence date) or the GDP inflation factor otherwise. Introduced in 1987 to replace the petroleum royalty and crude oil excise, and extended in 1990 to cover the Bass Strait project.

Uranium resources in the Northern Territory

Uranium resources located in the Northern Territory are also the responsibility of the Australian Government. The Ranger uranium mine in the Northern Territory is subject to a 5.5 per cent ad valorem royalty comprising a 4.25 per cent payment to the Aboriginal Benefit Account and a 1.25 per cent payment to the Northern Territory government in lieu of royalties.

State and territory governments

Mineral resources located on land or in coastal waters within three nautical miles of the coast are the responsibility of the corresponding state or territory government. Oil and gas projects in the states and territories are generally subject to an ad valorem royalty levied at a rate of 10 per cent. In New South Wales, production in the first five years is exempt from the royalty and the rate increases by one percentage point a year from 6 per cent in the sixth year to 10 per cent in the tenth year.

5.1 Overview of resource taxation arrangements in Australia [a]

Jurisdiction	Oil and gas	Coal	Metallic minerals
Australian Government	30% company tax Rent based and output based	30% company tax	30% company tax Ranger uranium mine in NT: ad valorem
Western Australia	Ad valorem	Ad valorem (exported) Specific (not exported)	Ad valorem
Queensland	Ad valorem	Ad valorem	Ad valorem
New South Wales	Ad valorem	Ad valorem	Ad valorem Broken Hill: income based
Victoria	Ad valorem	Specific	Ad valorem
Northern Territory	Ad valorem	Income based	Income based
South Australia	Ad valorem	Ad valorem	Ad valorem Olympic Dam: a surplus royalty may also apply
Tasmania	Ad valorem and income based component	Ad valorem and income based component	Ad valorem and income based component

a State/territory jurisdictions are ranked by value of mineral resource production in 2006-07.

Coal is mainly produced in Queensland and New South Wales (black coal) and Victoria (brown coal). An ad valorem royalty applies for all coal mines in Queensland at a rate of 7 per cent below $100 per tonne and 10 per cent above $100 per tonne. In New South Wales, an ad valorem royalty applies at a rate of 7 per cent for opencut coal mines and a lower rate applies to higher cost underground coal mines (5 per cent for underground mines deeper than 400 metres and 6 per cent otherwise). In Victoria, a specific royalty applies to brown coal with the rate adjusted annually for inflation (as measured by the consumer price index).

The resource taxation systems in the Northern Territory, South Australia and Tasmania apply consistently to coal and metallic minerals, although there are some exceptions. In the Northern Territory, an income based royalty is levied at a rate of 18 per cent (exemption for the first $50 000). In South Australia, an ad valorem royalty applies at a rate of 2.5 per cent—the rate is 3.5 per cent for Olympic Dam (a surplus royalty may also apply). In Tasmania, an ad valorem royalty applies at

5.2 Company and resource taxation revenue from Australia's mining sector, by industry 2006-07

	company tax		resource taxation [a]	
	number of companies [b]	net tax	value	share of total
	no.	$m	$m	%
Petroleum				
Oil and gas extraction	230	–	3 525	49.6
Minerals				
Coal mining	180	–	1 696	23.9
Metal ore mining				
Iron ore mining	–	–	849	11.9
Base metals				
Copper ore mining	–	–	190	2.7
Silver-lead-zinc ore mining	–	–	197	2.8
Total	–	–	387	5.4
Gold ore mining	–	–	194	2.7
Mineral sand mining	–	–	34	0.5
Bauxite mining, nickel ore mining and other	–	–	332	4.7
Total	515	–	1 796	25.3
Non-metallic mineral mining and quarrying	1 025	–	79	1.1
Total minerals	1 950	–	3 571	50.2
Exploration and other mining support services				
Exploration	1 230	–	–	–
Other mining support services	935	–	–	–
Total	2 165	–	12	0.2
Total	4 105	6 801	7 108	100.0

a ABS data include payments under mineral lease arrangements, and resource rent taxes and royalties. Oil and gas extraction also includes crude oil excise payments based on Australian Taxation Office data. **b** There is a minor discrepancy between the total and sum of components.
Sources: ABS (2008), Australian Taxation Office (2009).

5.3 Company tax in Australia's mining sector, by income category 2006-07

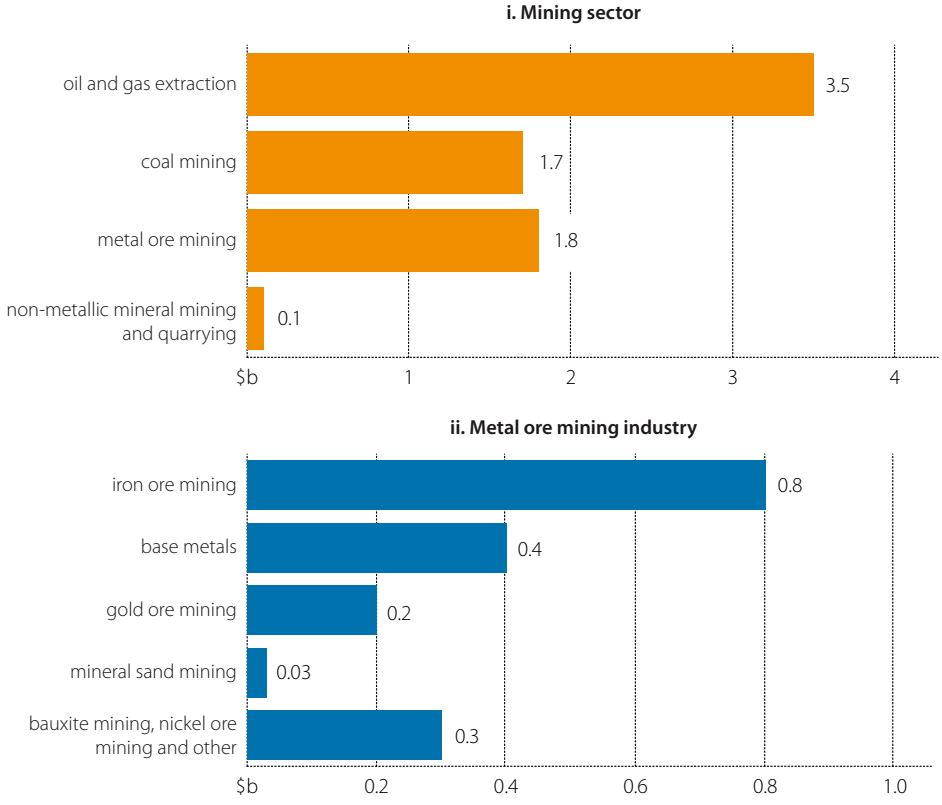
	number of companies		net tax	
income group	number	share of total	value	share of total
	no.	%	$b	%
Loss/nil	725	17.7	0.7	0.0
$1 – $499,999	2 090	50.9	11.8	0.2
$500,000 – $999,999	280	6.8	13.0	0.2
$1,000,000 – $4,999,999	520	12.7	36.8	0.5
$5,000,000 – $9,999,999	130	3.2	31.5	0.5
$10,000,000 – $49,999,999	190	4.6	140.1	2.1
$50,000,000 – $99,999,999	50	1.2	102.9	1.5
$100,000,000 or more	120	2.9	6 464.6	95.0
Total	4 105	100.0	6 801.3	100.0

Source: Australian Taxation Office (2009).

a rate of 1.6 per cent with an additional component based on profit (cap of 5 per cent of net sales and 20 per cent rebate if local processing).

Ad valorem royalties apply to metallic minerals in other jurisdictions. In Western Australia, the ad valorem royalty rate generally varies according to the extent of processing—7.5 per cent for bulk material, 5 per cent for concentrate material and 2.5 per cent for metal (although 1.25 per cent applies to all gold production if the market price falls below A$450 an ounce). In Queensland, an ad valorem royalty applies to base metals and gold at a fixed rate of 2.7 per cent, although producers have the option of choosing a variable rate (1.5 to 4.5 per cent) after mining has commenced, effective for a five year period (in each case, exemption for the first $30 000, and 20 to 35 per cent royalty reduction if local processing). Ad valorem royalties generally apply in New South Wales (4 per cent) and Victoria (2.75 per cent).

C Resource taxation payments in Australia's mining sector
by industry, 2006-07 (includes crude oil excise)



Resource taxation revenue

Information on company and resource taxation revenue from Australia's mining sector in 2006-07 is presented in table 5.2 (2006-07 is the latest year for which there is comprehensive data for resource taxation revenue). In aggregate, company and resource taxation revenue was $14 billion in 2006-07.

Company taxation revenue from mining companies was $6.8 billion in 2006-07. There were 4105 companies that were classified as mining companies by the Australian Taxation Office (see table 5.3). There are a relatively large number of small explorers and producers in the mining sector—75 per cent of mining companies have income less than $1 million in 2006-07. However, 95 per cent of company taxation revenue was sourced from the three per cent of mining companies that have income of $100 million or more. Company taxation revenue from the mining sector may be higher than reported in table 5.3 given industry classification difficulties for some companies.

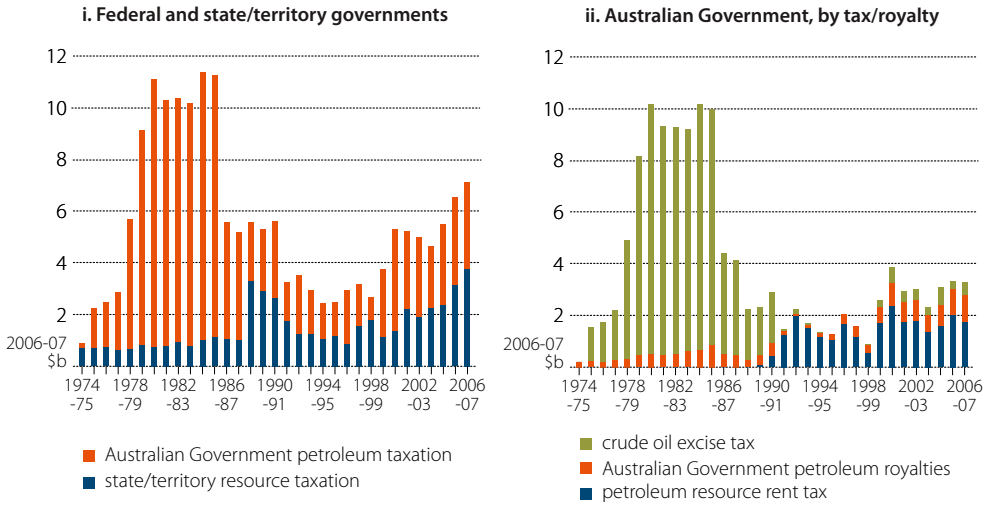
Resource taxation revenue from the mining sector was around $7.1 billion in 2006-07. This estimate is based on Australian Taxation Office information on crude oil excise payments and ABS information on other mineral royalty payments. The industry breakdown is also illustrated in figure c. In 2006-07, around half of resource taxation revenue was sourced from the oil and gas industry, and coal mining and metal ore mining each accounted for around one quarter (see figure c.i). Non-metal ore mining (including quarrying) accounted for only one per cent of total resource taxation revenue.

Within the metal ore mining industry, the major sources of resource taxation revenue in 2006-07 were iron ore (12 per cent of total resource taxation payments), base metals (5 per cent) and gold (3 per cent) (see figure c.ii).

Information on resource taxation revenue in Australia since 1974-75 is presented in figure d (this figure is based on information from the ABS and Australian Taxation Office as well as www.ret.gov.au). Resource taxation revenue in real terms peaked following the second oil shock in the late 1970s, averaging $11 billion a year between 1979-80 and 1985-86 (see figure d.i). During this period, 92 per cent of resource taxation revenue was sourced from Australian Government petroleum taxation, mainly crude oil excise payments (see figure d.ii).

Resource taxation revenue has increased strongly again from the recent low of $3.2 billion in 1998-99 (in 2006-07 prices), largely as a result of strong growth in world commodity prices during this period. Unlike the earlier peak, both Australian Government petroleum taxation and state/territory resource taxation were important contributors to the resource revenue growth. Between 1998-99 and 2006-07, resource taxation revenue increased at an average annual rate of 13.1 per cent—9.7 per cent for Australian government petroleum taxation and 18.1 per cent for state/territory resource taxation. During this period, 56 per cent of resource taxation revenue was sourced on average from Australian Government petroleum taxation, mainly petroleum resource rent taxation payments (see figure d.ii).

d Resource taxation revenue from Australia's mining sector
in 2006-07 prices



In 2007-08, petroleum resource rent tax and crude oil excise revenue were $1.9 billion and $386 million, respectively (current prices; Australian Taxation Office 2009). CGC (2008) estimates that the importance of mining revenue in state budgets rose from 5.4 per cent of state own-source revenue in 2002-03 to 7.7 per cent in 2007-08.

Fraser Institute global petroleum and mineral surveys

Petroleum industry

In 2009, the Fraser Institute released the results of its third annual international survey on barriers to investment in oil and gas exploration and production in jurisdictions around the world (Fraser Institute 2009a). In the report, 143 jurisdictions are ranked according to the scores assigned by managers and executives in the petroleum industry to 16 factors that affect investment decisions (see appendix A for a listing of these factors). The report also provides information on four composite indices (all-inclusive composite index, commercial environment index, regulatory climate index and geopolitical risk index).

The ranking of seven state/territory jurisdictions in Australia for the all-inclusive composite index and four individual factors most relevant to Australia's company and resource taxation arrangements is provided in table 5.4. Since no single jurisdiction applies only the petroleum resource rent tax, it is not possible to distinguish between the results for petroleum resource rent tax and ad valorem royalties (it is assumed that offshore oil and gas is considered within the jurisdiction of the adjacent state or territory). In each case, a higher ranking (that is, a ranking closer to one) indicates the jurisdiction is more attractive for investment in petroleum exploration and development (that is, has a lower level of investment barriers). Aggregate survey results for Australia are not provided in the report.

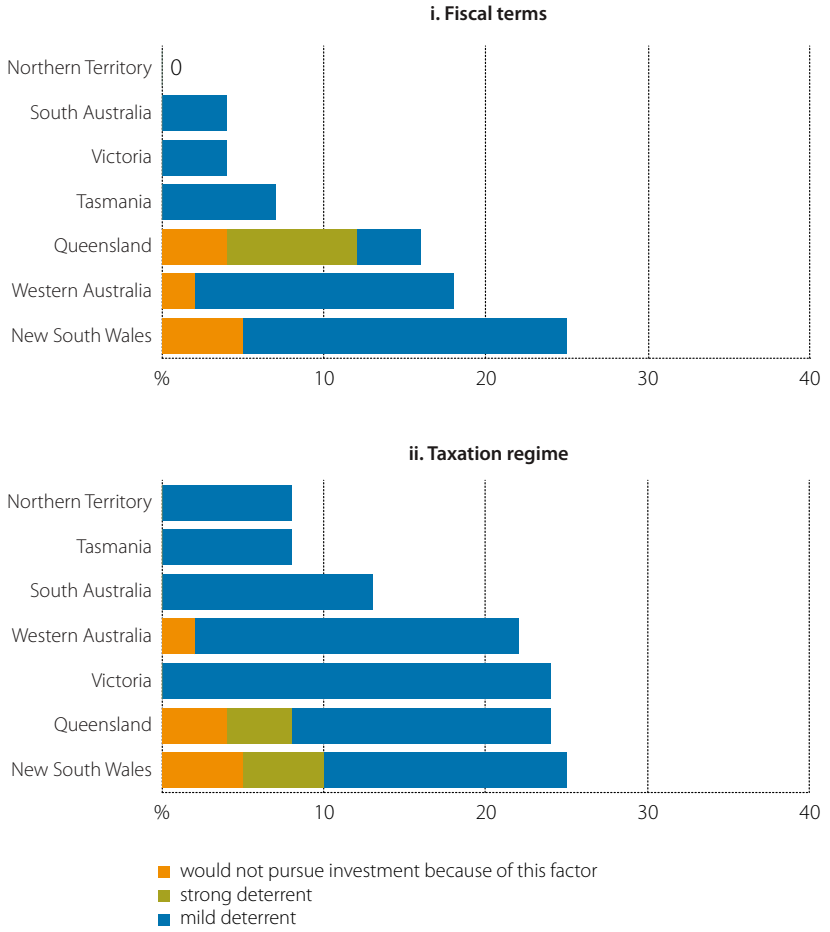
5.4 Fraser Institute global petroleum survey: ranking for Australian jurisdictions [a] 2009 (ranking out of 143 jurisdictions)

	All-inclusive composite index no.	Fiscal terms no.	Taxation regime no.	Cost of regulatory compliance no.	Regulatory uncertainty no.
Western Australia	56	40	40	78	52
Queensland	49	34	48	63	61
New South Wales	62	65	51	70	57
Victoria	57	12	41	71	47
Northern Territory	32	10	10	57	22
South Australia	17	11	21	46	35
Tasmania	44	16	9	34	34

a A higher ranking (that is, a ranking closer to 1) indicates the jurisdiction is more attractive for investment in petroleum exploration and development. Jurisdictions are ranked by value of mineral resource production in 2006-07.
Source: Fraser Institute (2009a).

e Fraser Institute global petroleum survey results: fiscal terms and taxation regime in Australian jurisdictions, 2009

share of respondents who indicated factor is an impediment to investment



- **All-inclusive composite index**—based on the survey results for all 16 factors, this index is the most comprehensive indicator of investment barriers in each jurisdiction. South Australia ranked 17 out of the 143 jurisdictions, scoring in the top quintile (20 per cent) considered most attractive for investment. Other states/territories scored in the second quintile with the Northern Territory (32) ranked highest in this group followed by Tasmania (44), Queensland (49), Western Australia (56), Victoria (57) and New South Wales (62).
- **Fiscal terms**—refers to government requirements pertaining to royalty payments, production shares and licensing fees. The top three ranking jurisdictions in Australia are the Northern Territory (10), South Australia (11) and Victoria (12), followed by Tasmania (16), Queensland (34), Western Australia (40) and New South Wales (65).
- **Taxation regime**—refers to the tax burden (other than for oil production, which is reflected under fiscal terms), including personal, corporate, payroll and capital taxes. The top three ranking jurisdictions are Tasmania (9), the Northern Territory (10) and South Australia (21), followed by Western Australia (40), Victoria (41), Queensland (48) and New South Wales (51).
- **Cost of regulatory compliance**—refers to the costs of processing permit applications, participating in hearings etc. The ranking for each jurisdiction is consistently lower than for either fiscal terms or taxation regime. The highest ranking jurisdiction is Tasmania (34) and the lowest ranking jurisdiction is Western Australia (78).
- **Regulatory uncertainty**—refers to the extent to which the regulatory environment is unstable; that is, whether there are frequent, unexpected or unjustified changes in rules and requirements. The ranking for each jurisdiction tends to be lower than for either fiscal terms or taxation regime. The highest ranking jurisdiction is the Northern Territory (22) and the lowest ranking jurisdiction is Queensland (61).

In the Fraser Institute survey, respondents are asked to select one of five responses that best describe each factor in the jurisdiction: encourages investment; is not a deterrent to investment; is a mild deterrent to investment; is a strong deterrent to investment; and would not invest due this criterion.

The share of respondents who indicated fiscal terms and taxation regime are impediments to investment in petroleum exploration and development in Australian jurisdictions is indicated in figure e (in parts i and ii, respectively). The Northern Territory has the lowest share (performs best) for each of these factors. For fiscal terms, New South Wales, Western Australia and Queensland perform poorly relative to other jurisdictions in Australia. For taxation regime, New South Wales, Queensland, Victoria and Western Australia perform poorly relative to other jurisdictions.

In the 2008 Fraser Institute survey of the global oil and gas industry, Australia was included as a single jurisdiction (Fraser Institute 2008). The main factors that were identified by respondents as an impediment to investment in Australia were: Aboriginal lands claims (50 per cent of respondents indicated this factor was an impediment to investment), environmental regulations (43 per cent), labour regulations (36 per cent), local natural gas price (35 per cent), taxation regime (31 per cent), local public infrastructure (31 per cent), labour availability (31 per cent), cost of regulatory compliance (29 per cent) and fiscal terms (18 per cent). The results for other factors suggest these are areas in which Australia has a strong competitive advantage including: trade regulations (only 9 per cent of respondents indicated this factor was an impediment to investment), business infrastructure (8 per cent), regulatory uncertainty (7 per

cent), geological database (7 per cent), local processing requirements (0 per cent), political stability (0 per cent) and security (0 per cent).

In 2009, Norway (North Sea) ranked 52 for fiscal terms (Fraser Institute 2009).

Minerals industry

Since 1997, the Fraser Institute has conducted an annual survey of metal mining and exploration companies to assess barriers to investment in exploration (Fraser Institute 2009b). In the 2008-2009 report, 71 jurisdictions are ranked according to the scores assigned by managers and executives in mining and mining consulting companies to 15 factors that affect exploration investment decisions (see appendix A for a listing of these factors). The report also provides information on two composite indices (policy potential index and composite policy and mineral index).

5.5 Fraser Institute global minerals survey results: ranking for Australian jurisdictions [a] 2008-09 (ranking out of 71 jurisdictions)

	policy potential index no.	taxation regime no.	regulatory duplication & inconsistencies no.	regulatory uncertainty no.
Western Australia	21	23	32	22
Queensland	25	37	17	21
New South Wales	23	39	26	18
Victoria	29	28	29	24
Northern Territory	20	33	9	4
South Australia	16	19	7	2
Tasmania	31	36	14	5

a A higher ranking (that is, a ranking closer to 1) indicates the jurisdiction is more attractive to investment in exploration. Jurisdictions are ranked by value of mineral resource production in 2006-07.
Source: Fraser Institute (2009b).

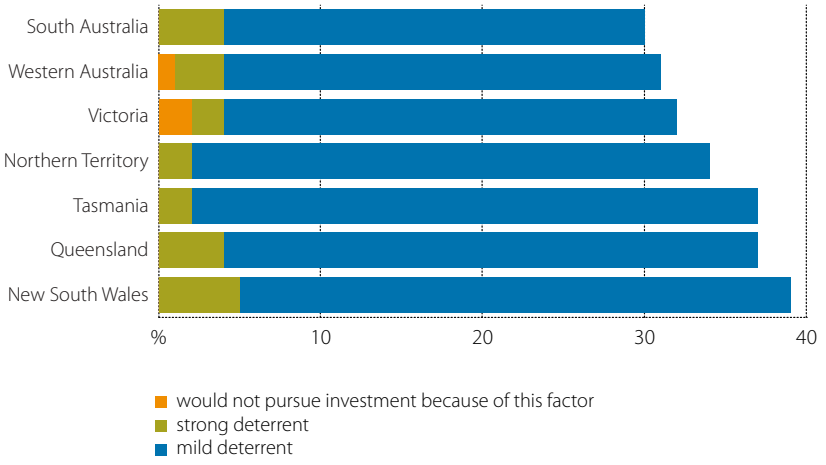
The ranking of seven state/territory jurisdictions in Australia for the policy potential index and three individual factors most relevant to Australia's company and resource taxation arrangements is provided in table 5.5. In each case, a higher ranking (that is, a ranking closer to one) indicates the jurisdiction is more attractive for investment in exploration (that is, has a lower level of investment barriers). Aggregate survey results for Australia are not provided in the report.

- **Policy potential index**—a composite index that indicates the effects of government policies on exploration. South Australia (ranked 16 out of the 71 jurisdictions) is the Australian jurisdiction considered most attractive for investment, followed by the Northern Territory (20), Western Australia (21), New South Wales (23), Queensland (25), Victoria (29) and Tasmania (31).
- **Taxation regime**—including personal, corporate, payroll, capital taxes and the complexity associated with tax compliance. The two leading jurisdictions are South Australia (19) and Western Australia (23), followed by Victoria (28), the Northern Territory (33), Tasmania (36), Queensland (37) and New South Wales (39).

- **Regulatory duplication and inconsistencies**—including federal/provincial or federal/state and interdepartmental overlap. South Australia (7) and the Northern Territory (9) rank highly on this factor. The lowest ranking jurisdiction is Western Australia (32).
- **Regulatory uncertainty**—refers to uncertainty concerning the administration, interpretation and enforcement of existing regulations. The ranking for each jurisdiction is consistently higher than for taxation regime. The highest ranking jurisdiction is South Australia (2) and the lowest ranking jurisdiction is Victoria (24).

The survey results for taxation regime may need to be interpreted with some caution. A relatively high ranking may imply a jurisdiction has adopted a relatively efficient regime or a relatively inefficient regime that collects a smaller share of the resource rent. The share of respondents who indicated taxation regime is an impediment to investment in exploration in Australian jurisdictions is indicated in figure f.

f Fraser Institute global minerals survey results: taxation regime in Australian jurisdictions, 2008-09
share of respondents who indicated this factor as an impediment to investment



Estimates of economic rent

Resource rent is likely to be the major source of economic rent in the mining sector, but other sources of economic rent may also be present (see chapter 4). In practice, it is difficult to distinguish between resource rent and economic rent. It is also difficult to estimate economic rent, partly because of data constraints. Some previous studies relevant to estimating economic rent in Australia's mining sector are discussed briefly in box 5.1.

box 5.1 Selected previous studies on economic rent in Australia's mining sector

Kemp (1987)

Kemp (1987) examined economic rents from petroleum exploitation and the effects of fiscal systems in a wide range of countries using a suite of model fields and oil prices in 1985 and 1986-87. Simulations of oil fields enabled key features of different fiscal systems to be examined while avoiding the difficulties in measuring economic rents in practice—this approach was adopted in the study by Hogan and Thorpe (1990) in the context of rent collection in Australia's oil industry (although risk assessments were explicitly included in the latter analysis using the certainty equivalent approach, drawing on the analysis in Hinchy, Fisher and Wallace 1989). Of interest in the current study, Kemp (1987, p. 318) noted that corporate income taxes "are not normally directly geared to economic rents, and whether they are proportional or regressive in their relationship to economic rents depends critically on the speed with which investments can be recovered. The slower the permitted pace the more likely that the income-tax yield will be regressive in its relationship with economic rents. How close the link is also depends on whether allowed depreciation starts with the expenditure or when the asset is placed in service. A cash-flow type of corporation tax with full loss offsetting would be proportionally linked to economic rents."

A main conclusion of his study was that most fiscal systems do not perform very efficiently as collectors of economic rent. He found that Australia's petroleum resource rent tax scheme performs better than many others. This is in contrast to the other main fiscal system in Australia where Kemp (1987, p. xxxix) notes the "performance of the scheme incorporating the conventional royalty and production levy is such that it is highly regressive in its relation to economic rents".

Thampapillai and Kolednik (1990)

Thampapillai and Kolednik (1990) reported estimates of economic rent in Australia's oil industry over the period 1981-82 to 1986-87. In the paper, the marginal extraction cost is assumed to be constant during a given year which enables the marginal extraction cost to be equated to the average cost of extraction for that year (the average cost of extraction was derived by dividing the total cost of extraction, including exploration costs, by the volume of crude oil output in the same year). In these calculations, investment expenditure over the period 1971-72 to 1984-85 was converted into 1984-85 prices using an implicit price deflator and then annualised using the annuity factor for a 12 per cent discount rate over a twelve year period (the government bond rate was around 12 per cent on average over the period). Investment is assumed to have a lagged impact on industry production which is incorporated into the annualisation of investment costs (two years for investment in buildings and three years for investment in exploration and mine development).

Economic rent in the oil industry was estimated to have increased from $3.5 billion in 1981-82 to a high of $4.2 billion in 1984-85 before falling to $2.3 billion in 1986-87—the decline was due to a fall in world oil prices (see figure g.i).

Hogan and Donaldson (2000)

Hogan and Donaldson (2000) provided some preliminary estimates of resources rents in Australia's mining sector based on ABS financial performance data in 1997-98. Assuming the minimum rate of return on capital is equal to the long term Treasury bond yield of six per cent, the resource rent (or economic rent) was estimated to be $6.3 billion in the mining sector, comprising $4.1 billion for the oil and gas industry, $0.8 billion for the coal industry and $1.3 billion for the metal ore mining industry. These estimates were reduced when a risk premium was included in the minimum rate of return.

In this section, an overview of developments in the mining sector since 1969-70 is provided to indicate there has been a significant return to exploration and development in the mining sector and the nature of cyclical fluctuations over time. Resource taxation and economic rent in Australia's mining sector are then examined using two different sources of industry performance data:

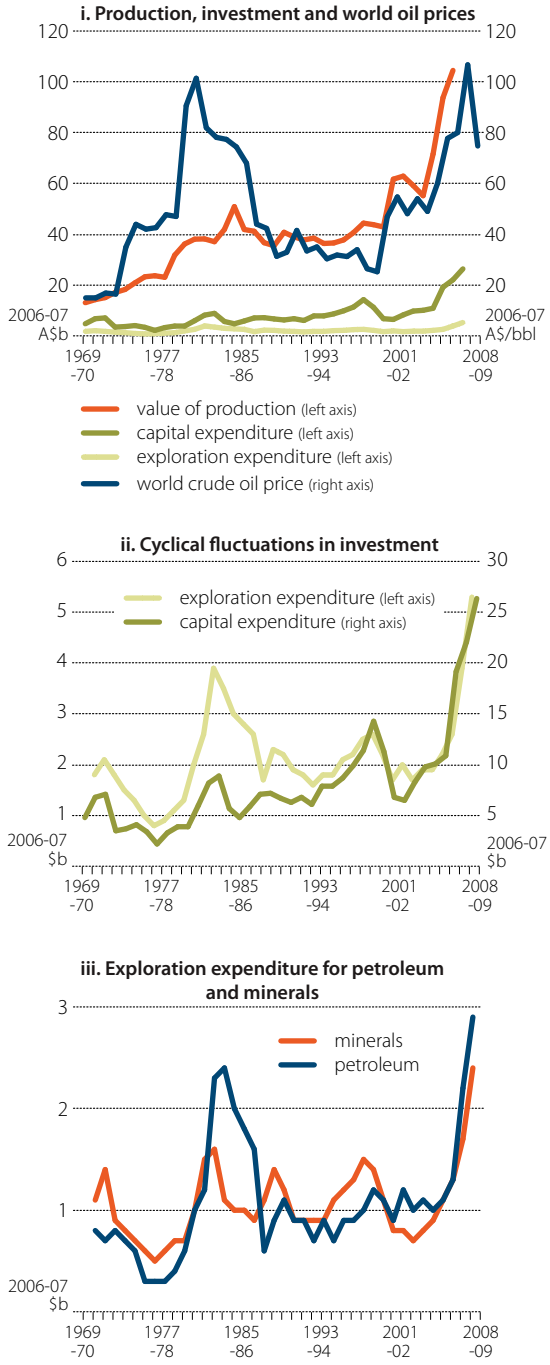
- PricewaterhouseCoopers (PwC) data for the minerals industry are available for the period 1978-79 to 2006-07
- Australian Bureau of Statistics (ABS) data for the oil and gas, coal and metal ore mining industries are available for the period 1992-93 to 2006-07, and data for the mining sector are available for the period 2000-01 to 2006-07.

This information is used to derive industry net cash flow before tax. Actual resource taxation revenue is compared with outcomes under two hypothetical rent based taxes, the Brown tax and a resource rent tax. Estimates of economic rent based on a range of assumptions for the risk premium in the industry's minimum rate of return are also presented for each of these time periods, based on data availability.

Overview

ABS data on the value of mineral resource production, exploration expenditure and capital expenditure in Australia since 1969-70 is presented in figure g. The value of mineral resource production includes the oil and gas, coal, metal ore and non-metal mineral mining industries, and exploration and capital expenditure include all mining activities. Aggregate data on operating costs is not available.

g Real value of production and investment in Australia's mining sector and world oil prices
in 2006-07 prices



In broad terms, the value of mineral resource production less exploration and capital expenditure has three key components: operating costs; a minimum return to investment; and economic rent. It appears likely that the size of economic rent in Australia's mining sector has been significant during this period (see figure g.i).

5.6 Value of mineral production in Australia, by state/territory [a]

2006-07

	ranking	value	share of total
	no.	$b	%
Western Australia	1	49.7	47.6
Queensland	2	27.2	26.0
New South Wales	3	12.3	11.7
Victoria	4	5.5	5.2
Northern Territory	5	5.2	5.0
South Australia	6	3.4	3.3
Tasmania	7	1.2	1.1
Australia	–	104.5	100.0

a Offshore oil and gas production is assigned to the adjacent state or territory.
Source: ABARE (2008).

There are at least three important characteristics of mining activities that need to be taken into account when considering mineral resource taxation options: there may be several failed exploration projects before a successful exploration project; resource development projects involve large upfront capital costs and it may be several years before the private investor achieves a positive return on the project; and global petroleum and minerals industries are subject to substantial cyclical fluctuations.

The large historical swings in world crude oil prices are illustrated in figure g.i (based on the world trade weighted average price). In Australia, the importance of cyclical fluctuations in investment in exploration and development activities is apparent in figure g.ii. The most striking observation from this figure is that the recent mining boom has been large by historical standards and widely based, including both petroleum and minerals industries (see also figure g.iii).

Market fluctuations that persist over a number of years may be caused by supply side and demand side factors (see, for example, Hogan et al. 2002). Supply side shocks include, for example, the discovery of a newly prospective mineral province (underpins Australia's nickel boom that peaked in 1970-71), restricted OPEC oil production (underpins the two oil price shocks in the 1970s), the adoption of new technologies (underpins the gold boom that peaked in 1987-88; a new gold ore processing technology substantially lowered economic cutoff grades) or a combination of these factors (underpins the resources boom that peaked in 1996-97; also influenced by the release of new government aeromagnetic data in prospective areas). Strong demand growth in China has underpinned the recent increase in world energy and mineral commodity prices.

The value of mineral resource production in Australia was $104 billion in 2006-07—$50 billion for petroleum and coal (or 48 per cent of the total), $49 billion for metallic minerals (47 per cent) and $6 billion for non-metallic minerals (6 per cent). Information on the distribution of the value of mineral resource production across states/territories is presented in table 5.6 (offshore oil and gas production is assigned to the adjacent state or territory).

Economic rent estimates for the minerals industry based on PricewaterhouseCoopers (PwC) data

Net cash flow estimates and direct taxes

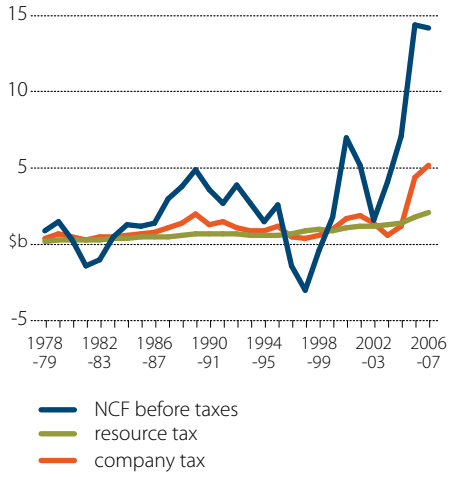
Financial data for Australia's minerals industry are available from PwC (2007 and earlier issues) for the period 1978-79 to 2006-07 (the survey was not conducted in 2008 or 2009). The minerals industry is defined by PwC to include exploration for, and extraction and primary processing of, minerals in Australia. This includes refining and smelting activities, but excludes the oil and gas and iron and steel industries.

For simplicity, net cash flow before taxes in the minerals industry is estimated by net profit before taxes plus depreciation less net capital expenditure (each of these components is available from the PwC survey; before tax refers to before resource and company taxes). These estimates should be interpreted as being broadly indicative of net cash flow before taxes (more detailed estimates are beyond the scope of this study). Net cash flow before taxes, resource tax payments and company tax payments in the minerals industry are illustrated in figure h. Information on the net cash flow estimates and direct taxes in the minerals industry, in current prices, is also provided in table 5.7.

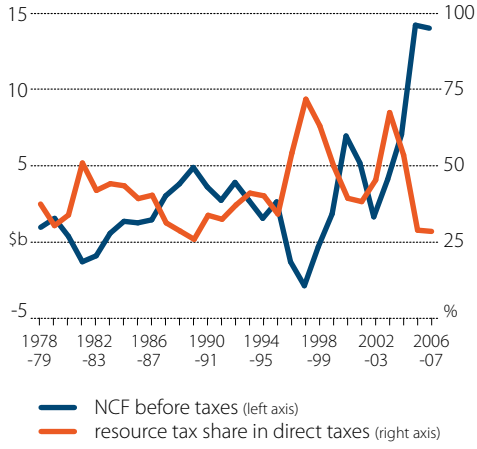
Net cash flow before taxes was negative in two periods, 1981-82 to 1982-83 and 1996-97 to 1998-99. These periods correspond to two of the cyclical upturns in exploration expenditure evident in figure g.iii. The most striking feature in the data is the strength of the recent upturn in net cash flow before taxes.

h Net cash flow (NCF) before taxes and direct taxes in Australia's mineralsindustry, based on PwC data in current prices

i. Industry profitability and direct taxes



ii. Industry profitability and the resource tax share



Resource tax payments in the minerals industry have increased relatively steadily from $0.2 billion in 1978-79 to $2.1 billion in 2006-07 while company tax payments have tended to vary with net cash flow before taxes, increasing over the period from $0.4 billion to $5.2 billion (see figure h.i). This highlights two important points:

- **Resource tax**—the relative lack of responsiveness of output based royalties (that dominate Australia's minerals industry) to changes in economic conditions.
- **Company tax**—by contrast, the company income tax system has been relatively responsive to changes in industry profitability in Australia's minerals industry.

5.7 Net cash flow estimates and direct taxes in Australia's minerals industry based on PwC data (in current prices)

	net profit before taxes a $b	depreciation b $b	net capital expenditure c $b	net cash flow before taxes $b	net cash flow after taxes d $b	direct taxes resource tax e $b	direct taxes company tax $b	direct taxes total $b
1978-79	1.2	0.6	0.9	0.9	0.2	0.2	0.4	0.6
1979-80	1.9	0.6	1.1	1.5	0.4	0.3	0.7	1.0
1980-81	1.5	0.8	2.1	0.3	-0.5	0.3	0.5	0.8
1981-82	0.8	1.1	3.3	-1.4	-2.0	0.3	0.3	0.6
1982-83	1.2	1.1	3.3	-1.0	-1.8	0.3	0.5	0.8
1983-84	1.3	1.2	2.0	0.5	-0.3	0.4	0.5	0.8
1984-85	1.6	1.4	1.8	1.3	0.3	0.4	0.6	1.0
1985-86	1.8	1.6	2.2	1.2	-0.1	0.5	0.7	1.2
1986-87	2.0	1.7	2.3	1.4	0.1	0.5	0.8	1.3
1987-88	3.4	1.9	2.2	3.0	1.4	0.5	1.1	1.6
1988-89	4.9	2.0	3.1	3.8	1.8	0.6	1.4	2.0
1989-90	7.0	2.1	4.2	4.9	2.2	0.7	2.0	2.7
1990-91	4.6	2.4	3.4	3.6	1.6	0.7	1.3	2.0
1991-92	3.9	2.4	3.6	2.7	0.6	0.7	1.5	2.2
1992-93	4.1	2.5	2.7	3.9	2.1	0.7	1.1	1.8
1993-94	4.1	2.6	4.0	2.7	1.2	0.6	0.9	1.5
1994-95	3.1	2.9	4.5	1.5	-0.1	0.6	0.9	1.6
1995-96	4.6	2.9	5.0	2.6	0.7	0.6	1.2	1.9
1996-97	2.1	3.2	6.7	-1.4	-2.6	0.7	0.5	1.2
1997-98	1.8	3.5	8.4	-3.0	-4.3	0.9	0.4	1.3
1998-99	2.6	3.7	6.7	-0.4	-2.0	1.0	0.6	1.5
1999-00	3.0	3.7	4.9	1.8	-0.1	0.9	1.0	1.9
2000-01	6.8	3.9	3.6	7.0	4.3	1.1	1.7	2.8
2001-02	6.9	3.9	5.6	5.2	2.1	1.2	1.9	3.1
2002-03	5.3	4.1	7.9	1.6	-1.1	1.2	1.4	2.6
2003-04	4.7	4.5	5.1	4.1	2.2	1.3	0.6	1.9
2004-05	9.5	4.2	6.5	7.1	4.5	1.4	1.2	2.7
2005-06	18.5	4.2	8.4	14.4	8.2	1.8	4.4	6.2
2006-07	22.3	4.8	12.9	14.2	6.9	2.1	5.2	7.3
Present value (in 2006-07 prices) f								
1978-79 to 2006-07	–	–	–	178.0	19.5	60.2	98.4	158.5
Annual average	–	–	–	6.1	0.7	2.1	3.4	5.5
1992-93 to 2006-07	–	–	–	79.0	24.4	22.9	31.7	54.6
Annual average	–	–	–	5.3	1.6	1.5	2.1	3.6
2000-01 to 2006-07	–	–	–	60.6	30.5	11.6	18.6	30.2
Annual average	–	–	–	8.7	4.4	1.7	2.7	2.0

a Net profit before resource and company taxes. **b** Depreciation and amortisation. **c** Net capital expenditure on mining, smelting and refining assets. **d** Net cash flow after resource and company taxes. **e** Mineral royalties, licence fees etc. **f** Values brought forward at the LTBR.

Source: PwC (2007 and earlier issues).

These issues are highlighted in figure h.ii. The share of the resource tax in total direct tax revenue tends to be low during periods of relatively high industry profitability; for example, resource tax accounted for 26 per cent of direct taxes in 1989-90 and 29 per cent in 2005-06 and 2006-07. By contrast, resource tax tends to account for a higher share of direct taxes during periods of relatively low net cash flow; for example, resource tax accounted for 72 per cent of direct taxes in 1997-98. On average, resource taxes represented 42 per cent of direct taxes in the minerals industry over the full period.

In present value terms, over the period 1978-79 to 2006-07, net cash flow before taxes was valued at $178 billion while net cash flow after taxes was valued at $19 billion (in 2006-07 prices with values transferred between years at the long term bond rate, LTBR). The present value of direct taxes over the period was $159 billion, comprising $60 billion and $98 billion for resource and company tax payments, respectively. By contrast, over the recent period 2000-01 to 2006-07, around half of net cash flow before taxes was collected by the government through direct taxes (in present value terms).

Net cash flow after resource tax (before company tax)

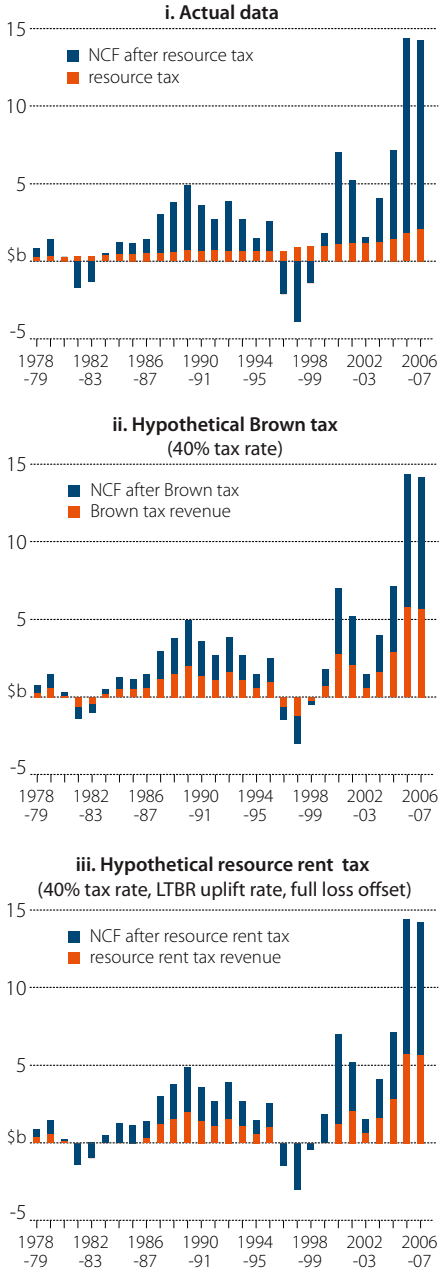
In table 5.8, actual data for net cash flow after resource tax (but before company tax is levied) and resource tax payments are compared with outcomes under two hypothetical rent based taxes, the Brown tax and a resource rent tax (see box 4.1 for definitions of these rent based taxes). The Brown tax is assumed to be levied at a rate of 40 per cent (the same tax rate that applies in Australia's petroleum resource rent tax). Assuming full loss offset, the resource rent tax is levied at the same rate and the uplift rate for negative net cash flow is assumed to be the long term bond rate. A relatively simple industry approach is taken whereby the rent based taxes are applied to industry net cash flow before taxes and there is no industry supply response to the implementation of the more efficient rent based taxes.

The distribution of net cash flow before taxes to the government (through the resource tax) and investors (as net cash flow after resource tax) is illustrated in figure i for the period 1978-79 to 2006-07:

- **Actual data** in figure i.i—resource tax payments are relative stable, increasing steadily over the period (as indicated above).
- **Hypothetical Brown tax** in figure i.ii—resource tax payments vary with net cash flow; the government provides investors with a cash payment during periods of negative net cash flow (equal to 40 per cent of net cash flow before tax).
- **Hypothetical resource rent tax** in figure i.iii—the government avoids cash payments by allowing negative net cash flow to accumulate at the uplift rate to be offset against future resource tax obligations. Resource tax revenue is zero during the periods 1981-82 to 1985-86 and 1996-97 to 1999-00.

In present value terms, the government collects $71 billion under both the Brown tax and resource rent tax over the full period compared with actual resource tax revenue of $60 billion (see table 5.8). The shortfall in potential resource tax revenue over the period 1978-79 to 2006-07 is around $11 billion in present value terms. Notably, the shortfall in potential resource tax revenue is around $10 billion in present value terms for the recent period 2000-01 to 2006-07 (or $1.5 billion a year on average).

i Net cash flow (NCF) before company tax in Australia's minerals industry: impact of selected resource taxation options, based on PwC data
in current prices



Company tax revenue would be reduced under any resource taxation arrangement that resulted in lower net cash flow after resource tax (this aspect is not considered here).

Estimated economic rent

Economic rent is the excess of net cash flow after a deduction is made to enable market participants to earn a minimum return to investment over time. Estimates of economic rent in present value terms, based on four assumptions for the minimum rate of return to net capital expenditure in the minerals industry, are provided in table 5.9. As a benchmark, investors are assumed to be risk neutral in which case the appropriate minimum rate of return to capital assumption is the risk free interest rate or LTBR. Under the realistic assumption that investors are risk averse, the minimum rate of return includes a risk premium which is assumed to be 5, 10 or 20 percentage points. That said, even if investors are risk averse, the appropriate uplift rate is the long-term bond rate if there is full loss offset because the tax credit is certain and therefore risk free (see box 4.2 for further discussion of this issue).

The distribution of net cash flow before taxes to investors (minimum return to capital) and the residual (estimated economic rent) is illustrated in figure j. For simplicity, the minimum return to net capital expenditure is assumed to be achieved in the same year the expenditure is incurred. In present value terms, the estimated economic rent for the period 1978-79 to 2006-07 ranges from $141 billion for risk neutral investors to $71 billion for risk averse investors with a minimum rate of return equal to the LTBR plus 20 percentage points. For the period 2000-01 to 2006-07, the corresponding estimates of industry economic rent range from $57 billion to $46 billion, substantially higher than the actual resource tax payments of $12 billion.

5.8 Net cash flow before company tax in Australia's minerals industry: impact of selected resource taxation options based on PwC data (in current prices)

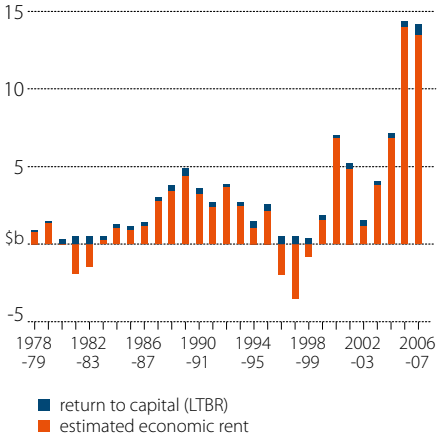
		actual data		hypothetical rent based taxes (40% tax rate)				
		NCF after		Brown tax		resource rent tax (RRT) b		
	LTBR a	resource tax	resource tax	NCF after Brown tax	Brown tax	NCF after RRT	RRT	accumulated losses
	%	$b	$b	$b	$b	$b	$b	$b
1978-79	9.2	0.6	0.2	0.5	0.3	0.5	0.3	0.0
1979-80	10.7	1.1	0.3	0.9	0.6	0.9	0.6	0.0
1980-81	12.6	0.0	0.3	0.2	0.1	0.2	0.1	0.0
1981-82	15.1	-1.7	0.3	-0.8	-0.6	-1.4	0.0	-1.4
1982-83	14.6	-1.3	0.3	-0.6	-0.4	-1.0	0.0	-2.6
1983-84	13.8	0.1	0.4	0.3	0.2	0.5	0.0	-2.5
1984-85	13.4	0.8	0.4	0.8	0.5	1.3	0.0	-1.6
1985-86	13.7	0.7	0.5	0.7	0.5	1.2	0.0	-0.6
1986-87	13.5	0.9	0.5	0.9	0.6	1.1	0.3	0.0
1987-88	12.5	2.5	0.5	1.8	1.2	1.8	1.2	0.0
1988-89	12.8	3.2	0.6	2.3	1.5	2.3	1.5	0.0
1989-90	13.3	4.2	0.7	3.0	2.0	3.0	2.0	0.0
1990-91	12.2	2.9	0.7	2.2	1.4	2.2	1.4	0.0
1991-92	10.0	2.0	0.7	1.6	1.1	1.6	1.1	0.0
1992-93	8.3	3.2	0.7	2.3	1.6	2.3	1.6	0.0
1993-94	7.4	2.1	0.6	1.6	1.1	1.6	1.1	0.0
1994-95	9.9	0.9	0.6	0.9	0.6	0.9	0.6	0.0
1995-96	8.7	1.9	0.6	1.5	1.0	1.5	1.0	0.0
1996-97	7.6	-2.1	0.7	-0.9	-0.6	-1.4	0.0	-1.4
1997-98	6.0	-3.9	0.9	-1.8	-1.2	-3.0	0.0	-4.6
1998-99	5.5	-1.4	1.0	-0.3	-0.2	-0.4	0.0	-5.3
1999-00	6.5	0.9	0.9	1.1	0.7	1.8	0.0	-3.7
2000-01	5.8	5.9	1.1	4.2	2.8	5.8	1.2	0.0
2001-02	5.9	4.0	1.2	3.1	2.1	3.1	2.1	0.0
2002-03	5.4	0.4	1.2	0.9	0.6	0.9	0.6	0.0
2003-04	5.7	2.8	1.3	2.4	1.6	2.4	1.6	0.0
2004-05	5.4	5.7	1.4	4.3	2.9	4.3	2.9	0.0
2005-06	5.4	12.6	1.8	8.6	5.8	8.6	5.8	0.0
2006-07	5.8	12.1	2.1	8.5	5.7	8.5	5.7	0.0
Present value (in 2006-07 prices) c								
1978-79 to 2006-07	–	117.9	60.2	106.8	71.2	106.8	71.2	–
Annual average	–	4.1	2.1	3.7	2.5	3.7	2.5	–
1992-93 to 2006-07	–	56.1	22.9	47.4	31.6	47.4	31.6	–
Annual average	–	3.7	1.5	3.2	2.1	3.2	2.1	–
2000-01 to 2006-07	–	49.0	11.6	36.4	24.3	38.6	22.1	–
Annual average	–	7.0	1.7	5.2	3.5	5.5	3.2	–

a Long-term bond rate. **b** Uplift rate is equal to the LTBR; assumes full loss offset. **c** Values brought forward at the LTBR.
Sources: Based on ABARE (2008) and PwC (2007 and earlier issues).

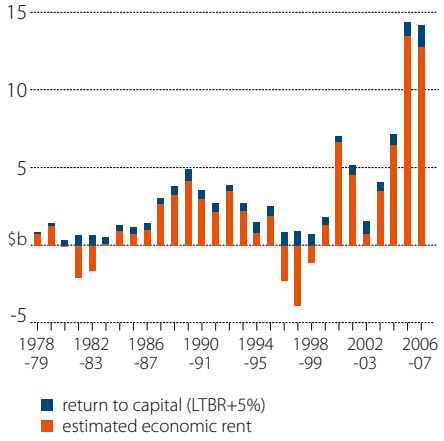
j Indicators of economic rent in Australia's minerals industry, based on PwC data

in current prices

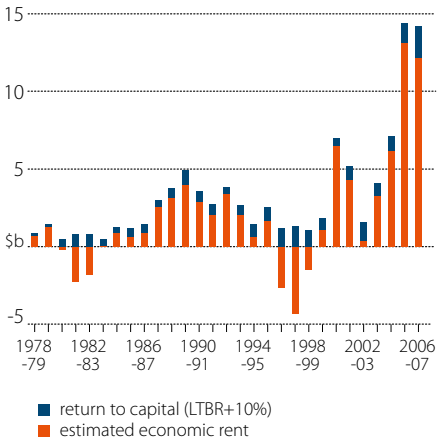
i. Risk neutral investors: minimum rate of return to capital = LTBR



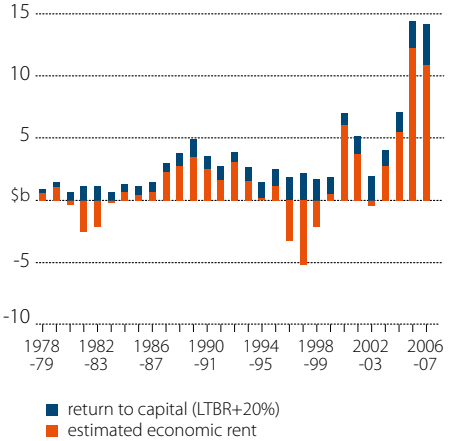
ii. Risk averse investors: minimum rate of return to capital = LTBR+5%



iii. Risk averse investors: minimum rate of return to capital = LTBR+10%



iv. Risk averse investors: minimum rate of return to capital = LTBR+20%



5.9 Present value of estimated economic rent in Australia's minerals industry, based on PwC data (in 2006-07 prices)

	minimum rate of return to capital assumption [a]			
	risk neutral investors	risk averse investors		
	LTBR	LTBR+5%	LTBR+10%	LTBR+20%
	$b	$b	$b	$b
1978-79 to 2006-07	141.1	123.6	106.2	71.3
Annual average	4.9	4.3	3.7	2.5
1992-93 to 2006-07	70.0	63.2	56.5	42.9
Annual average	4.7	4.2	3.8	2.9
2000-01 to 2006-07	57.4	54.6	51.7	46.0
Annual average	8.2	7.8	7.4	6.6

a Minimum rate of return assumption to discount cash flows to investors.
Sources: Based on ABARE (2008) and PwC (2007 and earlier issues).

Economic rent estimates for the mining sector based on ABS data

Net cash flow estimates and resource taxes

Financial data are available from ABS (2008 and earlier issues) for Australia's oil and gas, coal and metal ore mining industries in the period 1992-93 to 2006-07 and for the mining sector since 2000-01. More limited financial information for the mining sector is collected and reported for 2007-08 in ABS (2009); for example, natural resource royalties expenses are not published for 2007-08.

Net cash flow before taxes in the mining sector is estimated by earnings before interest, tax, depreciation and amortisation (EBITDA) plus natural resource royalties expenses less net capital expenditure. Resource taxation revenue is given by the ABS estimates of natural resource royalties expenses (these estimates exclude the crude oil excise tax). Information on the net cash flow estimates and resource tax payments in the mining sector, in current prices, is provided in table 5.10 and figure k.

In the metal ore mining industry, net cash flow before tax was negative in 1997-98 and, although this is a shorter duration, the timing is similar to the losses recorded by the minerals industry based on PwC data (see table 5.7). Resource tax payments appear to have been somewhat more responsive to changes in industry profitability (as measured by net cash flow before taxes) in the oil and gas industry compared with the coal and metal ore mining industries where output based royalties dominate.

Most notably, in the recent period 2000-01 to 2006-07, the present value of net cash flow before taxes is estimated to have been $167 billion in Australia's mining sector of which $39 billion was collected in resource taxes.

5.10 Net cash flow estimates and resource tax in Australia's mining sector, based on ABS data (in current prices)

		minerals [a]				
	oil and gas extraction	coal mining	metal ore mining	total	oil and gas, and minerals [a]	total mining
	$b	$b	$b	$b	$b	$b
EBITDA plus natural resource royalties expenses [b]						
1992-93	6.1	1.9	3.8	5.7	11.7	-
1993-94	5.7	2.0	4.2	6.2	11.8	-
1994-95	5.9	1.8	4.7	6.4	12.3	-
1995-96	6.2	2.5	5.8	8.3	14.5	-
1996-97	8.0	2.8	5.2	8.0	16.0	-
1997-98	8.0	2.8	5.3	8.1	16.1	-
1998-99	6.3	3.8	6.1	9.9	16.2	-
1999-00	8.6	3.3	5.5	8.7	17.4	-
2000-01	16.7	4.0	8.1	12.1	28.7	28.9
2001-02	13.7	5.5	6.4	11.8	25.6	26.8
2002-03	14.1	5.7	6.6	12.3	26.4	27.8
2003-04	12.1	3.8	6.9	10.7	22.8	24.7
2004-05	13.4	7.7	8.1	15.8	29.2	30.6
2005-06	17.3	13.6	14.4	28.0	45.3	47.0
2006-07	20.1	12.6	22.8	35.5	55.6	56.5
Net capital expenditure						
1992-93	1.7	0.9	1.4	2.4	4.1	-
1993-94	1.5	0.8	1.8	2.6	4.1	-
1994-95	1.3	1.0	2.7	3.7	5.0	-
1995-96	1.5	1.1	2.9	4.0	5.5	-
1996-97	1.3	1.2	2.6	3.8	5.2	-
1997-98	2.0	1.1	5.3	6.4	8.4	-
1998-99	2.8	1.0	4.1	5.1	7.9	-
1999-00	2.3	0.5	3.2	3.7	6.0	-
2000-01	1.4	0.8	1.7	2.5	3.9	4.2
2001-02	4.6	1.2	1.9	3.0	7.7	8.5
2002-03	4.1	1.9	4.2	6.0	10.1	12.2
2003-04	3.6	1.5	5.0	6.5	10.1	11.4
2004-05	4.7	3.0	5.3	8.3	12.9	14.4
2005-06	6.4	5.6	6.9	12.5	18.9	20.9
2006-07	7.8	6.1	10.1	16.2	24.0	27.6
Net cash flow before taxes						
1992-93	4.3	0.9	2.4	3.3	7.6	-
1993-94	4.2	1.2	2.3	3.5	7.8	-
1994-95	4.6	0.8	1.9	2.7	7.3	-
1995-96	4.6	1.4	3.0	4.3	9.0	-
1996-97	6.6	1.6	2.6	4.2	10.8	-
1997-98	6.1	1.7	-0.03	1.6	7.7	-
1998-99	3.5	2.7	2.1	4.8	8.3	-
1999-00	6.3	2.7	2.3	5.0	11.4	-
2000-01	15.3	3.2	6.3	9.5	24.8	-
2001-02	9.1	4.3	4.5	8.8	17.9	18.3
2002-03	10.0	3.8	2.5	6.3	16.3	15.5
2003-04	8.5	2.3	1.9	4.2	12.7	13.3

continued...

5.10 Net cash flow estimates and resource tax in Australia's mining sector, based on ABS data (in current prices) continued

		minerals [a]				
	oil and gas extraction $b	coal mining $b	metal ore mining $b	total $b	oil and gas, and minerals [a] $b	total mining $b
Net cash flow before taxes (continued)						
2004-05	8.7	4.7	2.8	7.6	16.2	16.2
2005-06	10.9	7.9	7.6	15.5	26.4	26.2
2006-07	12.3	6.5	12.8	19.3	31.6	28.9
Present value (in 2006-07 prices) [c]						
1992-93 to 2006-07	164.4	60.9	75.9	136.8	301.2	-
Annual average	11.0	4.1	5.1	9.1	20.1	-
2000-01 to 2006-07	88.8	37.6	43.9	81.5	170.4	167.4
Annual average	12.7	5.4	6.3	11.6	24.3	23.9
Net cash flow after resource tax (before other taxes)						
1992-93	2.5	0.7	2.0	2.7	5.3	-
1993-94	2.7	1.0	2.0	3.0	5.7	-
1994-95	3.3	0.5	1.5	2.0	5.4	-
1995-96	3.4	1.1	2.5	3.6	7.0	-
1996-97	5.1	1.3	2.2	3.4	8.5	-
1997-98	4.6	1.2	-0.5	0.7	5.3	-
1998-99	2.4	2.2	1.6	3.8	6.2	-
1999-00	4.6	2.2	1.8	4.0	8.6	-
2000-01	12.5	2.6	5.7	8.3	20.9	20.7
2001-02	6.6	3.5	3.8	7.3	13.9	14.1
2002-03	7.3	2.8	1.8	4.6	11.9	11.0
2003-04	6.3	1.5	1.1	2.7	9.0	9.4
2004-05	6.2	3.7	1.9	5.6	11.8	11.7
2005-06	8.0	6.3	6.2	12.5	20.5	20.1
2006-07	9.3	4.8	11.0	15.8	25.1	22.3
Present value (in 2006-07 prices) [c]						
1992-93 to 2006-07	120.3	47.0	61.9	108.9	229.2	-
Annual average	8.0	3.1	4.1	7.3	15.3	-
2000-01 to 2006-07	67.2	29.1	35.9	65.0	132.2	128.2
Annual average	9.6	4.2	5.1	9.3	18.9	18.3
Resource tax [d]						
1992-93	1.8	0.2	0.3	0.6	2.4	-
1993-94	1.5	0.2	0.3	0.5	2.0	-
1994-95	1.3	0.3	0.4	0.7	2.0	-
1995-96	1.3	0.3	0.4	0.7	2.0	-
1996-97	1.5	0.4	0.4	0.8	2.3	-
1997-98	1.5	0.5	0.5	0.9	2.4	-
1998-99	1.0	0.5	0.5	1.0	2.1	-
1999-00	1.8	0.5	0.5	1.0	2.8	-
2000-01	2.8	0.6	0.7	1.2	4.0	4.1
2001-02	2.4	0.8	0.7	1.6	4.0	4.1

continued...

5.10 Net cash flow estimates and resource tax in Australia's mining sector, based on ABS data (in current prices) continued

		minerals [a]				
	oil and gas extraction $b	coal mining $b	metal ore mining $b	total $b	oil and gas, and minerals [a] $b	total mining $b
Resource tax [d] (continued)						
2002-03	2.7	1.0	0.7	1.7	4.4	4.5
2003-04	2.2	0.8	0.7	1.5	3.7	3.9
2004-05	2.4	1.0	1.0	2.0	4.4	4.5
2005-06	2.9	1.6	1.4	3.0	5.9	6.0
2006-07	3.0	1.7	1.8	3.5	6.5	6.6
Present value (in 2006-07 prices) [c]						
1992-93 to 2006-07	44.0	13.9	14.1	27.9	72.0	-
Annual average	2.9	0.9	0.9	1.9	4.8	-
2000-01 to 2006-07	21.6	8.5	8.0	16.5	38.1	39.2
Annual average	3.1	1.2	1.1	2.4	5.4	5.6

a Excludes non-metallic mineral mining and quarrying. **b** EBIDTA refers to earnings before interest, tax, depreciation and amortisation. **c** Values brought forward at the LTBR. **d** Natural resource royalties expenses. Excludes excise.
Sources: ABS (2008 and earlier issues).

The distribution of net cash flow before taxes to the government (through the resource tax) and investors (as net cash flow after resource tax) is illustrated in figure l for the period of 1992-93 to 2006-07. Notably, the resource tax as a percentage of net cash flow before taxes tends to fall during periods of relatively high net cash flow before taxes and, conversely, tends to rise during periods of relatively low net cash flow before taxes (see figure l).

Net cash flow after resource tax (before company tax)

In table 5.11, information is presented on net cash flow after resource tax (but before company tax is levied) and resource tax payments under a hypothetical Brown tax levied at a rate of 40 per cent (see box 4.1). As before, this rent based tax is applied to industry net cash flow before taxes and there is no industry supply response to the implementation of the more efficient rent based tax.

The distribution of net cash flow before taxes to the government (through the Brown tax) and investors (as net cash flow after resource tax) is illustrated in figure m for the period 1992-93 to 2006-07. In each industry, resource tax payments under this hypothetical Brown tax are higher than the actual outcomes.

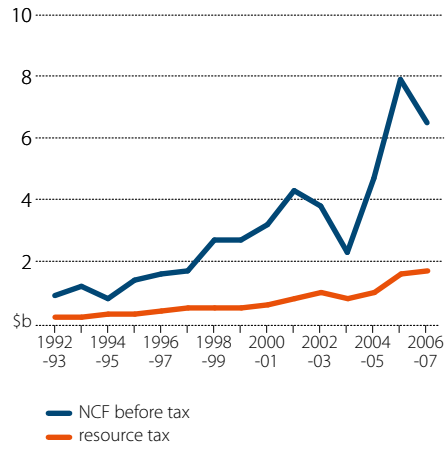
Most notably, in the recent period 2000-01 to 2006-07, the present value of resource tax payments under the hypothetical Brown tax in Australia's mining sector is $67 billion, considerably higher than the actual resource tax payments. This indicates the shortfall in potential resource tax revenue for the period 2000-01 to 2006-07 is around $28 billion in present value terms (or $4 billion a year on average). However, company tax revenue would be reduced under any resource taxation arrangement that resulted in lower net cash flow after resource tax (as before, this aspect is not considered here).

k Net cash flow (NCF) before taxes and resource tax payments in Australia's mining sector, based on ABS data

in current prices

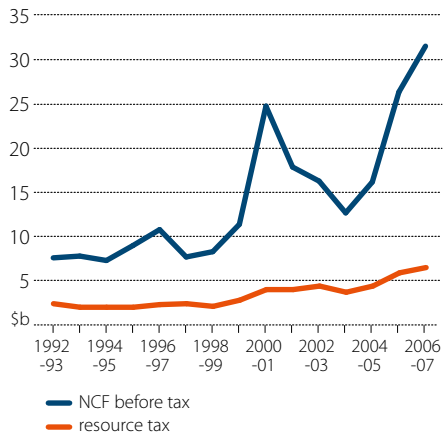
i. Oil and gas extraction

ii. Coal mining



iii. Metal ore mining

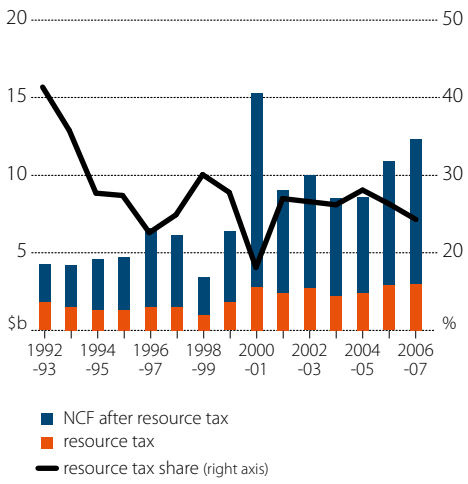
iv. Oil and gas extraction, coal mining and metal ore mining



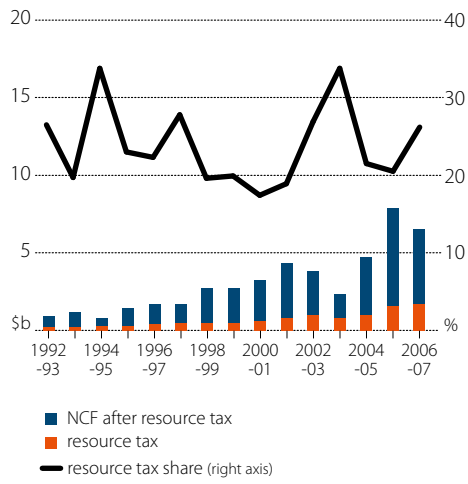
Net cash flow (NCF) and resource tax payments in Australia's mining sector, based on ABS data

in current prices

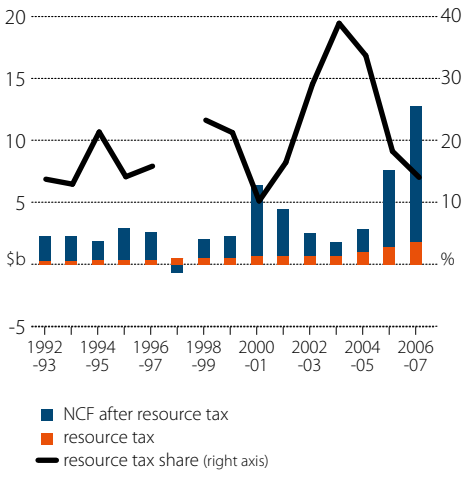
i. Oil and gas extraction



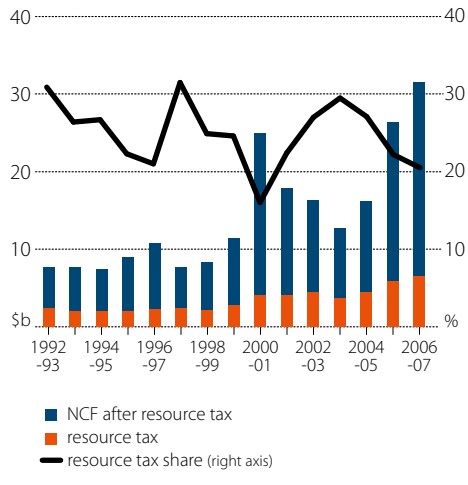
ii. Coal mining



iii. Metal ore mining



iv. Total oil and gas, coal and metal ore mining



5.11 Net cash flow in Australia's mining sector under a hypothetical Brown tax, based on ABS data (in current prices)

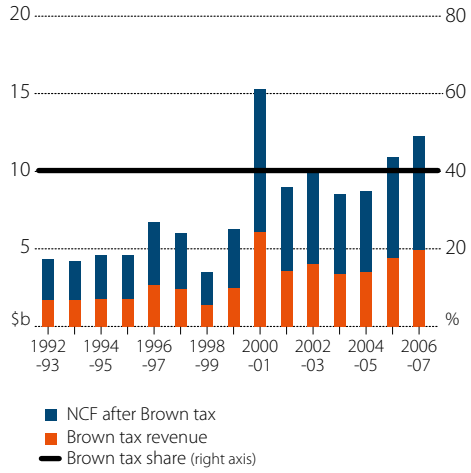
		minerals [a]				
	oil and gas extraction $b	coal mining $b	metal ore mining $b	total $b	oil and gas, and minerals [a] $b	total mining $b
Net cash flow after Brown tax [b]						
1992-93	2.6	0.6	1.4	2.0	4.6	-
1993-94	2.5	0.7	1.4	2.1	4.7	-
1994-95	2.8	0.5	1.2	1.6	4.4	-
1995-96	2.8	0.8	1.8	2.6	5.4	-
1996-97	4.0	1.0	1.5	2.5	6.5	-
1997-98	3.6	1.0	-0.02	1.0	4.6	-
1998-99	2.1	1.6	1.2	2.9	5.0	-
1999-00	3.8	1.6	1.4	3.0	6.8	-
2000-01	9.2	1.9	3.8	5.7	14.9	14.8
2001-02	5.4	2.6	2.7	5.3	10.7	11.0
2002-03	6.0	2.3	1.5	3.8	9.8	9.3
2003-04	5.1	1.4	1.1	2.5	7.6	8.0
2004-05	5.2	2.8	1.7	4.5	9.7	9.7
2005-06	6.5	4.8	4.5	9.3	15.8	15.7
2006-07	7.4	3.9	7.7	11.6	18.9	17.3
Present value (in 2006-07 prices) [c]						
1992-93 to 2006-07	98.6	36.5	45.6	82.1	180.7	-
Annual average	6.6	2.4	3.0	5.5	12.0	-
2000-01 to 2006-07	53.3	22.6	26.3	48.9	102.2	100.5
Annual average	7.6	3.2	3.8	7.0	14.6	14.4
Brown tax revenue (40% tax rate)						
1992-93	1.7	0.4	0.9	1.3	3.1	-
1993-94	1.7	0.5	0.9	1.4	3.1	-
1994-95	1.8	0.3	0.8	1.1	2.9	-
1995-96	1.8	0.5	1.2	1.7	3.6	-
1996-97	2.7	0.6	1.0	1.7	4.3	-
1997-98	2.4	0.7	-0.01	0.7	3.1	-
1998-99	1.4	1.1	0.8	1.9	3.3	-
1999-00	2.5	1.1	0.9	2.0	4.5	-
2000-01	6.1	1.3	2.5	3.8	9.9	9.9
2001-02	3.6	1.7	1.8	3.5	7.2	7.3
2002-03	4.0	1.5	1.0	2.5	6.5	6.2
2003-04	3.4	0.9	0.8	1.7	5.1	5.3
2004-05	3.5	1.9	1.1	3.0	6.5	6.5
2005-06	4.4	3.2	3.0	6.2	10.6	10.5
2006-07	4.9	2.6	5.1	7.7	12.6	11.5
Present value (in 2006-07 prices) [c]						
1992-93 to 2006-07	65.8	24.4	30.4	54.7	120.5	-
Annual average	4.4	1.6	2.0	3.6	8.0	-
2000-01 to 2006-07	35.5	15.1	17.6	32.6	68.1	67.0
Annual average	5.1	2.2	2.5	4.7	9.7	9.6

a Excludes non-metallic mineral mining and quarrying. **b** Net cash flow before company tax. **c** Values brought forward at the LTBR.
Sources: Based on ABS (2008 and earlier issues).

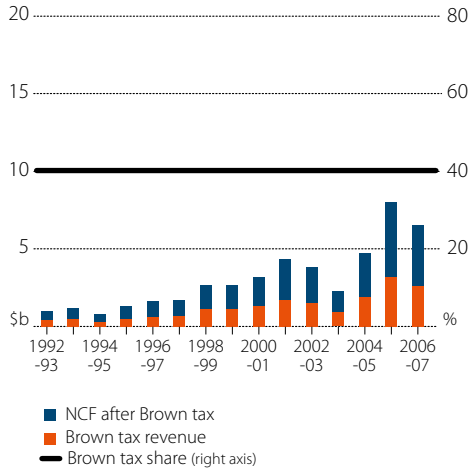
Net cash flow (NCF) in Australia's mining sector under a hypothetical Brown tax, based on ABS data

in current prices; 40% tax rate

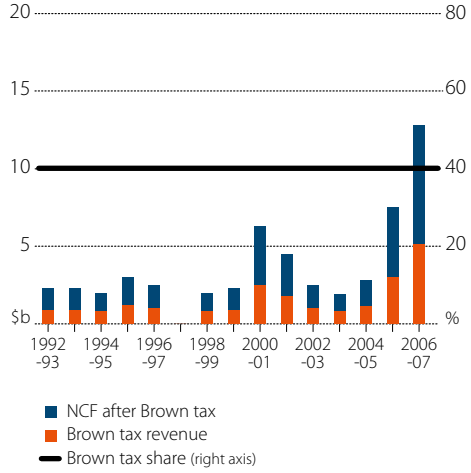
i. Oil and gas extraction



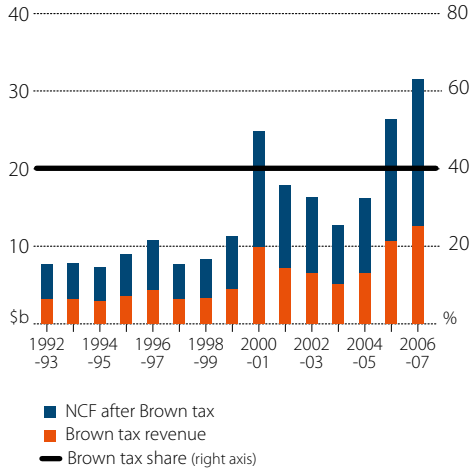
ii. Coal mining



iii. Metal ore mining



iv. Oil and gas extraction, coal mining and metal ore mining



Economic rent estimates

Estimates of economic rent in present value terms are calculated based on the four assumptions used previously for the minimum rate of return to net capital expenditure (see table 5.12). In present value terms, the estimated economic rent for Australia's mining sector in the period 2000-01 to 2006-07 ranges from $161 billion ($23 billion a year) for risk neutral investors to $139 billion ($20 billion a year) for risk averse investors with a minimum rate of return to discount cash flows equal to the LTBR plus 20 percentage points. As noted previously, the appropriate discount rate for risk averse investors is the long-term bond rate if there is full loss offset because the tax credit is certain and therefore risk free (see box 4.2 for further discussion).

5.12 Present value of estimated economic rent in Australia's mining sector, based on ABS data (in current prices)

	minimum rate of return to capital assumption [a]			
	risk neutral investors	risk averse investors		
	LTBR	LTBR+5%	LTBR+10%	LTBR+20%
	$b	$b	$b	$b
Oil and gas extraction				
1992-93 to 2006-07	160.3	157.1	154.0	147.6
Annual average	10.7	10.5	10.3	9.8
2000-01 to 2006-07	86.7	84.9	83.0	79.3
Annual average	12.4	12.1	11.9	11.3
Coal mining				
1992-93 to 2006-07	58.5	56.7	54.8	51.2
Annual average	3.9	3.8	3.7	3.4
2000-01 to 2006-07	36.4	35.3	34.2	32.0
Annual average	5.2	5.0	4.9	4.6
Metal ore mining				
1992-93 to 2006-07	70.6	66.4	62.3	54.1
Annual average	4.7	4.4	4.2	3.6
2000-01 to 2006-07	41.7	39.8	37.8	33.9
Annual average	6.0	5.7	5.4	4.8
Minerals [b]				
1992-93 to 2006-07	129.1	123.1	117.1	105.2
Annual average	8.6	8.2	7.8	7.0
2000-01 to 2006-07	78.1	75.1	72.0	65.9
Annual average	11.2	10.7	10.3	9.4
Oil and gas, and minerals [b]				
1992-93 to 2006-07	289.4	280.3	271.1	252.8
Annual average	19.3	18.7	18.1	16.9
2000-01 to 2006-07	164.9	159.9	155.0	145.2
Annual average	23.6	22.8	22.1	20.7
Total mining				
2000-01 to 2006-07	161.2	155.6	150.1	139.0
Annual average	23.0	22.2	21.4	19.9

a Minimum rate of return to discount cash flows to investors. **b** Excludes non-metallic mineral mining and quarrying.
Sources: Based on ABARE (2008) and ABS (2008 and earlier issues).

6 Conclusions

The Australian Government's company income tax is an important fiscal instrument in Australia for collecting resource rents. Traditionally, apart from the company income tax, output based royalties have been applied in Australia's mining sector by federal, state and territory governments, largely reflecting the administrative simplicity of these arrangements compared with rent and income based taxes and royalties. Over the past two decades, there have been a number of important policy developments including, most notably, the introduction by the Australian Government of the petroleum resource rent tax (PRRT) in 1987. However, there continues to be considerable variation in resource taxation arrangements between jurisdictions and, in many cases, within a jurisdiction.

The Australia's Future Tax System Review provides Australian policymakers, on behalf of the Australian community, with an important opportunity to consider the effectiveness of current resource taxation arrangements in the mining sector compared with alternative arrangements, particularly rent based taxes. The estimates presented in this report indicate a likely substantial shortfall in actual resource taxation revenue compared with potential revenue, particularly in the recent period 2000-01 to 2006-07. Given Australia's considerable economic demonstrated resources and continuing strong demand from China, future resource rents and hence resource taxation potential are likely to be substantial.

appendix A Factors listed in the Fraser Institute global surveys

The latest Fraser Institute global surveys of the petroleum and metal mining industries were briefly discussed in chapter 5 (based on information in Fraser Institute 2009a, b).

In the Fraser Institute global petroleum survey, respondents were asked how the following sixteen factors influence company decisions to invest in various jurisdictions:

1. Fiscal terms—government requirements pertaining to royalty payments, production shares and licensing fees
2. Taxation regime—the tax burden (other than for oil production, which is reflected under fiscal terms), including personal, corporate, payroll and capital taxes
3. Local natural gas prices—whether regulated rates for natural gas are set to low to recoup exploration and production costs
4. Cost of regulatory compliance—the costs of processing permit applications, participating in hearings etc.
5. Regulatory uncertainty—the extent to which the regulatory environment is unstable; that is, whether there are frequent, unexpected or unjustified changes in rules and requirements
6. Environmental regulations—the costs of complying with regulatory requirements on exploration and production processes and facilities
7. Local processing requirements—the extent to which a jurisdiction requires oil and gas that is extracted locally also to be processed locally
8. Trade regulations—the ability of producers to gain access to markets through the export of crude oil, natural gas and refined petroleum products
9. Labour regulations and employment agreements—the degree of flexibility employers may exercise in hiring and firing, compensation and work rules
10. Local public infrastructure—the availability and quality of schools and colleges, hospitals and recreation facilities
11. Business infrastructure—the adequacy of roads, railways and airports
12. Geological database—the availability of credible and complete data on area geology
13. Labour availability—the supply and quality of labour, and the willingness of foreign workers to relocate to the region
14. Aboriginal land claims—the uncertainty of unresolved claims by native groups, which can interfere with land access and transportation rights-of-way
15. Political stability—the frequency of changes in policies, regulations and elected officials
16. Security—the safety of assets and personnel, and the risk of expropriation.

In the Fraser Institute global metal mining survey, respondents were asked how the following fifteen factors influence company decisions to invest in various jurisdictions:

1. uncertainty concerning the administration, interpretation and enforcement of existing regulations
2. environmental regulations
3. regulatory duplication and inconsistencies (including federal/provincial or federal/state and interdepartmental overlap)
4. taxation regime (including personal, corporate, payroll, capital taxes and the complexity associated with tax compliance)
5. uncertainty concerning native land claims
6. uncertainty concerning which areas will be protected as wilderness or parks
7. infrastructure
8. socioeconomic agreements
9. political stability
10. labour regulation/employment agreements
11. geological database (including quality and scale of maps and ease of access to information)
12. security
13. availability of labour/skills
14. mineral potential assuming current regulation and land use restrictions
15. mineral potential assuming no regulation or land restrictions (but further assuming industry "best practice" standards.

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