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Measures Supporting
Minerals and Primary Metals
Extraction and Processing:
Case Study: Australia

Marnie Griffith

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Abstract

Measures Supporting Minerals and Primary Metals Extraction and Processing Case Study: Australia

Marnie Griffith

Efforts to document government support benefiting specific sectors or industries have so far paid scant attention to support given to the non-energy minerals sector. In this paper the issue of support for this sector is explored by way of a case study of Australia, a leading producer and exporter of minerals. After describing the mining sector in the context of the Australian economy and the role of government in the exploitation of the country's vast resources, the study identifies and documents support measures based on the OECD's framework for organising and analysing support to the fossil-fuel sector. The study finds that government support to the mining industry is relatively limited. Measures through which the Australian federal government assists the mining industry include tax concessions related to corporate expenditure on R&D and on exploration and other expenditure, a fuel-tax rebate and the provision of geoscientific data at zero or minimal cost. The State governments provide preferential electricity prices to aluminium smelters. Monetary estimates of the cost to government of these measures are provided where available.

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Executive Summary

Australia operates in a relatively competitive policy environment, with overall levels of assistance to industries low and falling. The role of government vis-à-vis the mining industry might be summarised as follows:

- Set regulations that put limits on the operation of the mining industry in terms of environmental and social responsibilities — for example, Native Title legislation; environmental legislation and occupation health and safety regulations.
- Facilitate as much as possible mining-industry growth by removing impediments to minerals exploration and development — examples include the provision of pre-competitive geological information at zero or minimal cost; infrastructure provisions; and the new Enterprise Migration Agreements.
- Set relevant fiscal variables such as resource rent taxes.

Measures by which the Australian government supports the mining industry have been found to comprise: federal budgetary assistance, comprised to a large extent of R&D tax concessions; other tax concessions, mostly related to capital and exploration expenditure; a fuel-tax rebate; the provision of geoscientific data at zero or minimal cost, including through State and Territory assistance; and State government electricity-price subsidies to aluminium smelting. Monetary estimates of the cost to government of these measures are provided where available.

Although some of the measures listed are horizontal in that they benefit more than one sector, the mining industry has a number of unique characteristics that mean it often stands as the major recipient of a support measure, even when it is not this measure's sole or direct target. Nevertheless, overall levels of support to the mining industry are likely less than that to other sectors such as agriculture or manufacturing.

Introduction

In recent years, efforts have been undertaken to gather information on measures supporting fossil fuels.¹ Fossil fuels are, however, not the sole commodities that attract government support, as evidenced by the growing knowledge base the OECD has been building for sectors such as agriculture and fisheries. One particular sector that has received little attention though, despite its importance for downstream manufacturing activities, is the non-energy minerals sector. This paper explores the issue of support to the non-energy minerals sector by way of a case study of Australia. It identifies and documents support measures in that country based on the OECD's framework for organising and analysing support to the fossil-fuel sector. Unlike the work on fossil fuels though, no attempt has been made to systematically quantify the measures identified. This, and the evaluation of the impacts that support measures have on the environment and the economy, is left to future research.

Given the large potential and the wide diversity of Australia's non-energy mineral resources, the scope of the study is deliberately circumscribed to a selected basket of minerals that play a prominent role in the country's extractive activities. These commodities are iron ore, gold, bauxite, alumina and aluminium, copper, and lithium.

The paper is structured as follows. Section 2 introduces the Australian mining sector in the context of the country's overall economy and the role played by the Federal government in exploiting mineral resources. Traditionally, agriculture and manufacturing have been the largest recipients of industry assistance. Over the past forty years, effective rates of assistance have fallen from approximately 20% and 35% for agriculture and manufacturing respectively, down to around 5% for both (Productivity Commission, 2012). Effective rates of assistance for mining are estimated at 0.1%. Hence, industry support for Australia's mining sector must be viewed in the context of a general environment of low levels of government protection and support. An overview of the minerals policies of the Federal, State and Territory governments is presented in Section 3. Section 4 details the ways in which the Australian government supports the mining sector. The analysis is guided by the OECD's matrix of support measures that was applied to the production and use of fossil fuels. Information is provided on the policy context of the support measures identified, as well as on their monetary estimates and their potential impacts on the broader economy and the environment, where available. Section 5 concludes.

Australia's mining sector and the role of government

The importance of mining to the Australian economy

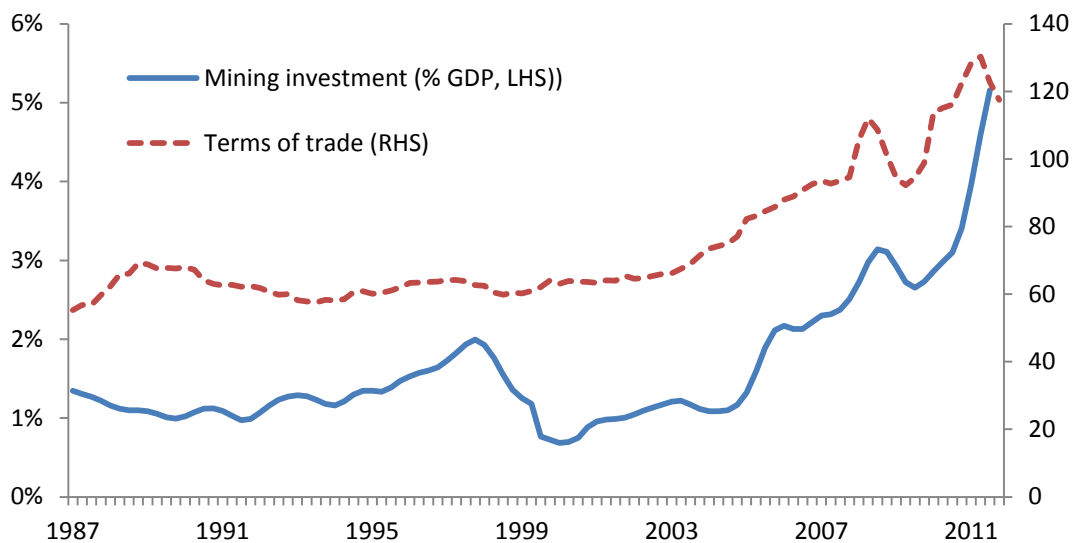
Much of Australia's wealth rests on the exploitation of its abundant natural resources (McLean and Taylor, 2003). Australia has the world's largest economically-demonstrated reserves of brown coal, lead, mineral sands (rutile and zircon), nickel, silver, uranium and zinc, and the second largest reserves of bauxite, copper, gold and iron ore (contained iron) (Geoscience Australia, 2009).

Mining has been an important though volatile contributor to Australia's economic growth, through the gold rush of the 1850s; the iron ore and nickel-led booms of the 1960s; the discovery of oil and gas in Bass Strait (Victoria) and, later, the Northwest Shelf (Western Australia and the Northern Territory); and the development of hard coal in NSW and Queensland.

1. See, for example, OECD (2013).

Australia is currently in the midst of what has been termed “the most remarkable resources boom in its history” (Gregory and Sheehan, 2011). This current boom has been driven in large part by sustained, rapid economic growth in China (Garnaut, 2012). Gregory and Sheehan (2011) define a resources boom as being either a strong increase in resources investment as a share of GDP, or as a strong increase in the terms of trade — that is, a boom in either volume or price terms. Typically, these two types of booms do not coincide;² in this case they do (Figure 1). Resources investment currently accounts for 5% of GDP, and this share may well increase further (Gregory and Sheehan, 2011; RBA, 2011).

Figure 1. Mining investment and the terms of trade in Australia



Source: (ABS, 2012c); (ABS, 2012g); RBA Statistics, Table G04, Other price indicators.

Impacts of the mining boom on the Australian economy

This boom is highly significant in the context of the broader Australian economy. Over the course of the boom (starting in the mid-2000s):

- the share of resources in the total value of commodity exports has increased from around 40% to around 70% (ABS, 2012d);
- the share of mining in total industry capital expenditure has increased from around 16% to over 50% (ABS, 2012g);
- the share of mining employment in total employment has doubled, albeit from a small base — from around 1% to just over 2% (ABS, 2012e).

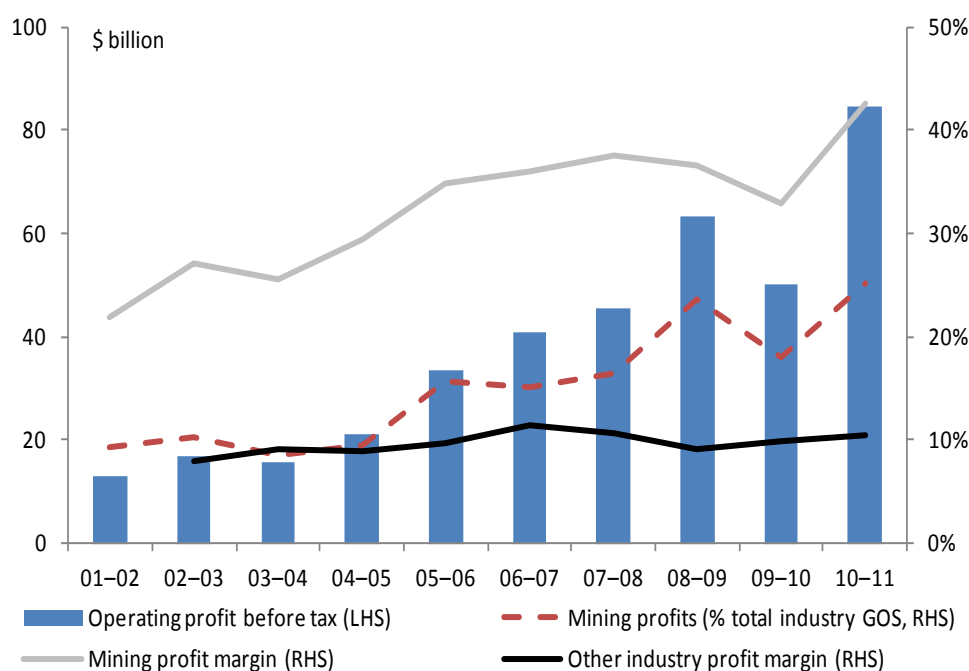
2. Terms-of-trade peaks have typically emerged from global booms (e.g. early 1920s, early 1950s) that have not lasted long enough to generate a major investment response, whereas surges in resource investment have often been associated with the exploitation of new resource supplies to meet newly developing market opportunities, such as coal and iron ore for the Japanese market after the mid-1960s (Gregory and Sheehan, 2011).

Gregory and Sheehan (2011) summarise the main impacts of the current mining boom as being: higher terms of trade, which increase real income but dampen demand for Australia's other export-oriented industries; and the direct macroeconomic effects of mining investment.

Mining-industry profits and taxation

According to *Australian Industry* (ABS, 2012b) data, pre-tax profits have doubled in five years, rising from approximately AUD 40 billion dollars in 2006-07 to over AUD 80 billion in 2010-11 (Figure 2). These values are in current prices, not real terms, but it is noteworthy that inflation in Australia has not been high over this period.

Figure 2. Measures of mining industry profitability in Australia



Source: (ABS, 2012b; ABS, 2006).

Pre-tax mining profits as a percentage of total industry profits have increased from around 10% in the early 2000s to around 25% in 2010-11. The profit margin of the mining industry (defined as pre-tax profit divided by sales and service income) rose from around 20% in the early part of the 2000s to over 40% by 2010-11, while that of industries excluding mining stayed at around 10% over the same period. The mining sector's profit margin greatly exceeds that of other industries.

These measures may be relatively crude indicators of industry profitability, but they do nevertheless show clearly that the mining industry accounts for a large and growing proportion of the gross profit and the operating surplus generated by Australian industry.

While measures of profitability have grown, tax revenues appear to have not kept pace. There are two main classes of taxes on mining: corporate income tax, and royalties and resource-rent taxes.

According to a report examining Australia's minerals resource taxation arrangements (Hogan and McCallum, 2010), tax revenues from the mining industry totalled around AUD 14 billion in 2006-07. Approximately half of this came from corporate income tax, and the other half from taxes on the resource. Approximately half of the resource taxes were attributable to the oil and natural-gas sector

Corporate income tax is levied on the mining industry at a rate of 30% — the same rate as that paid by other industries. Mining company-tax payments increased from AUD 1.4 billion in 1999-00 to a peak of AUD 13.4 billion in 2008-09, before falling to AUD 6.8 billion in 2009-10 (ATO, 2012). Comparing these payments to the operating profit before tax, as measured by the Australian Bureau of Statistics (ABS), suggests an effective tax rate much lower than the headline rate of 30%.

One factor acting to dampen tax revenues in cash-flow terms are depreciation allowances associated with the very high levels of investment expenditure. Tax revenues are, however, likely to increase in the future with the eventual exhaustion of depreciation allowances (Gregory and Sheehan, 2011), and with the introduction of the minerals resource rent tax (see Section 3 below).

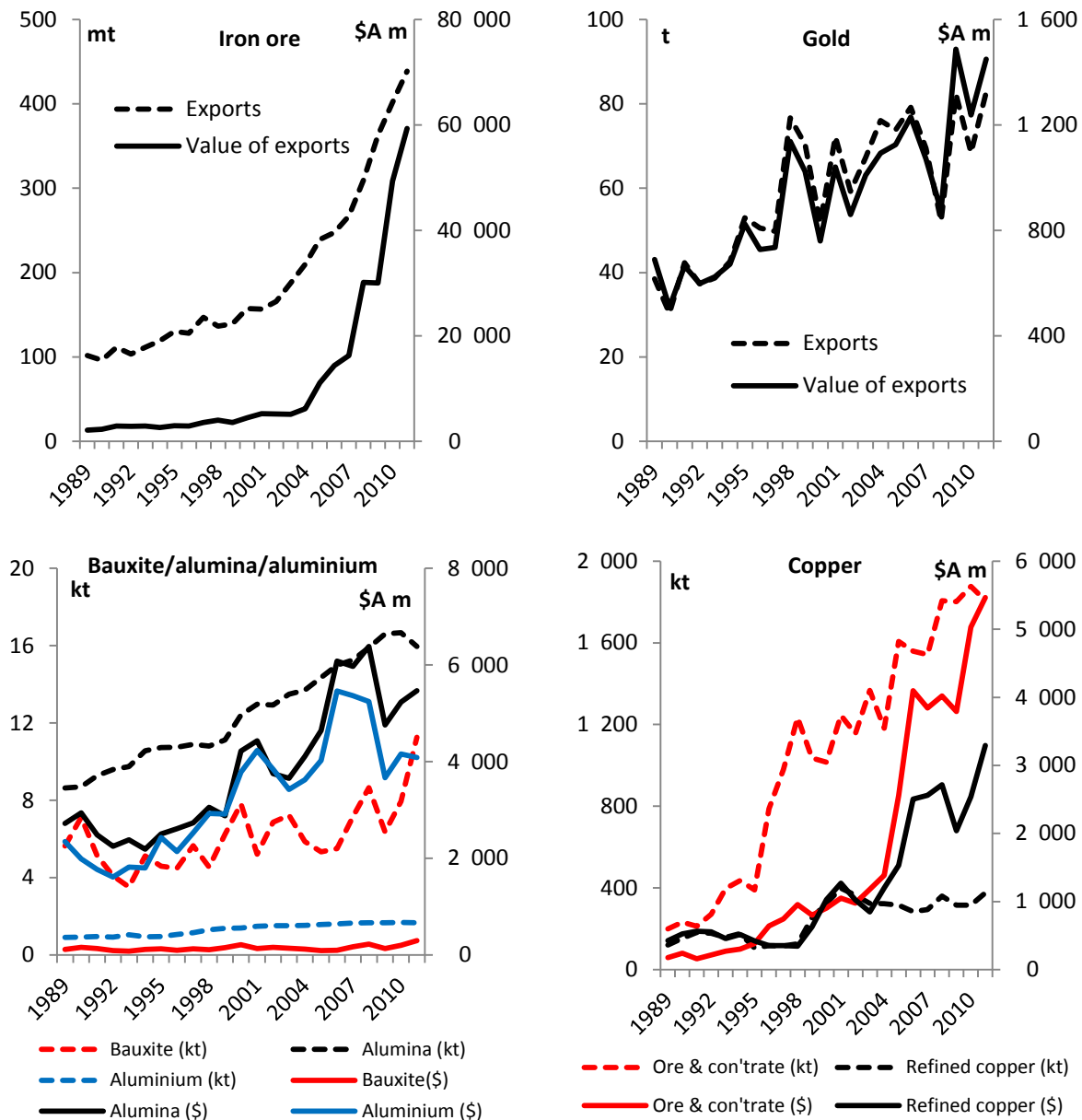
Estimates presented in the Australia's Future Tax System report show that royalties and resource taxes were about 50% of mining profits over the period 2000-05, but that this share had declined to under 20% by the close of the decade, in part because output-based royalties failed to react to the profitability increase (Henry *et al.*, 2009).

Top minerals

Using 2011 export values, Australia's four top mineral commodities are iron ore, gold, bauxite, alumina and aluminium, and copper.

Figure 3 summarises trends in the volume and value of exports of these minerals over the past two decades. As almost all production of these commodities is exported, export volumes serve as a good proxy for production. Both the volume and value of Australia's mineral commodities have increased over the past 20 years. In some cases, such as iron ore and copper, these increases have been substantial. In general, values have increased more than volumes, reflecting the abovementioned resource-price boom.

Figure 3. Australia's top mineral commodities by export value



Source: (BREE, 2011).

Lithium

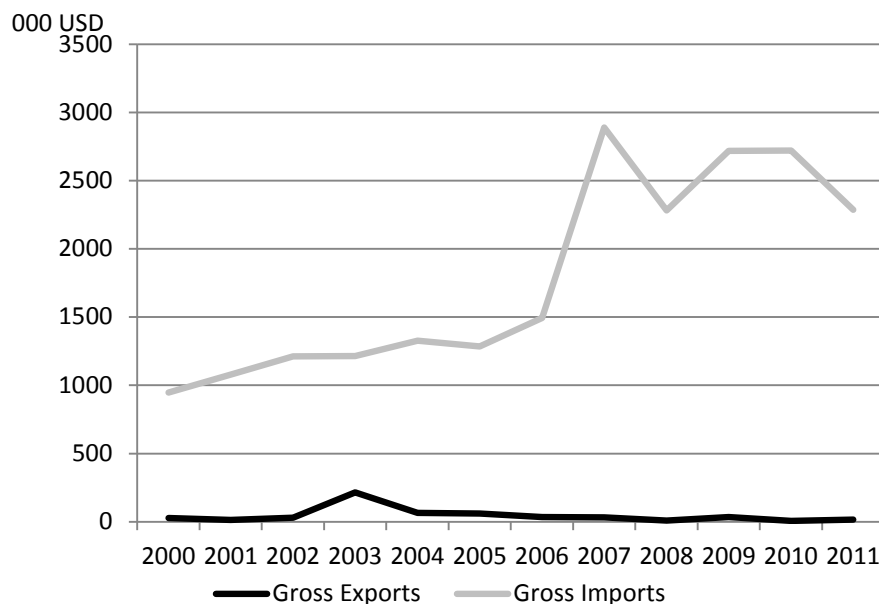
Lithium has witnessed a strong increase in its demand over the past decade, due mainly to the growing use of lithium carbonate in batteries (for cars and electronic consumer goods). Other uses of lithium in various forms are found in ceramics, greases, primary aluminium, and glass production. Industry estimates indicate that global demand could triple or even quadruple over the next ten years (Talison, currently the leading global lithium producer).

Australia was the world's second-largest producer of lithium in 2009, after Chile, and possesses significant amounts of the world's identified resources (Geoscience Australia,

2012a). The country produces lithium minerals from spodumene³ deposits (as opposed to brine-based lithium originating in Latin America), most of which are located in the southern part of Western Australia. The largest resource is located in the Greenbushes deposit, with some other resources also located at Mount Cattlin and Mount Marion. These mining operations have recently been significantly expanded. Total 2011 production of spodumene concentrates by the Greenbushes and Mount Cattlin mines (WA) reportedly reached around 421 kilotonnes (kt), or an estimated 11.7 kt of contained lithium.⁴ This represents an increase of about 39% on 2010 production (Geoscience Australia, 2012b).

Spodumene concentrates are mainly exported to Asia, as well as Europe and North America. No unique HS code exists for lithium ores so that trade statistics are not available at a sufficiently disaggregated level. Australia is not a major producer of lithium carbonate, which is mostly produced from lithium brines and is the main form in which lithium enters international trade. Consequently, Australia does not export much of this product, or of lithium oxide. In fact, the country is a net importer of these compounds (Figure 4).

Figure 4. Australia's exports and imports of lithium oxide and carbonate



Source: UN Comtrade.

3. Spodumene is a lithium-bearing material found in hard rock, which is then processed further into e.g, lithium carbonate from which chemical and technical lithium is made.
4. The conversion to lithium content assumes a 6% Li₂O grade (with the true value lying somewhere between 4.8% and 7.5%).

Short overview of Australia's minerals policies

By law, in Australia, ownership of mineral or petroleum resources is vested in the Crown (to simplify slightly, the States and Territories for onshore resources, and the Federal government for offshore resources). As a result, the government has the ability to set the legal requirements for mining access for exploration and production.

Commercial exploration or development of these resources is left to the private sector. The role of the government is for the most part to set the regulatory framework for the mining industry and to collect royalties and tax revenues. For Penney et al. (2012), this minimal level of government involvement has enabled the Australian industry to be innovative to remain competitive.

The Federal, State and Territory governments have differing roles and responsibilities with regard to resource exploration and development, though there is a large degree of overlap. For example, though each State and Territory has its own environmental legislation regarding resource access and development, there are cases in which relevant Commonwealth legislation may be referred to.

The Federal government sets the fiscal conditions. It collects company income tax on mining profits, and sets parameters such as depreciation allowances for capital and fuel-excite rebates. The Federal government also collects royalties and resource-rent taxes on oil and gas projects in Australia's offshore areas, and as of 1 July 2012 also collects tax under the minerals resource-rent tax, which applies a 22.5% rate to large iron-ore and coal projects (with annual profits exceeding AUD 75 million). The introduction of this tax is discussed further below.

The State and Territory governments are the day-to-day managers of their mining industries. State and Territory governments issue permits to explore⁵ and develop land, grant land tenure, and ensure that projects meet environmental and occupational health and safety standards.

States and Territories collect royalties associated with mineral production in their jurisdictions. Output-based royalties include both those on the value of production (*ad valorem*) and those on the volume of production (specific).⁶ Royalties have been the traditional way to collect rent around the world, but can sometimes be regressive and inefficient by design. A key concern with output-based royalties is that they do not collect an appropriate amount of rent when resource prices surge during boom times. There has therefore been a global swing away from royalties towards either rent or income-based taxes (Hogan and McCallum, 2010). Arrangements regarding royalties vary widely among jurisdictions, and within jurisdictions, between commodities and locations.

Native title

In 1992, the High Court of Australia, as part of its decision on *Mabo vs Queensland (No 2)*, recognised legally for the first time the entitlement of Indigenous people to their lands. This was followed by the passing of the *Native Title Act 2003*. One of the conditions to be met

5. Typically, exploration permits are allocated on a first-come, first-served basis. This approach is inefficient in that: (a) it does not allocate the right to the most efficient producer, and (b) it provides incentives to explore earlier than if private property rights were well-allocated (Henry et al., 2009).
6. While most States and Territories collect royalties based on the volume of production, the Northern Territory imposes a royalty on profits (excepting some uranium mines where royalty arrangements are with the Commonwealth).

to establish Native Title is to demonstrate a continued traditional connection to the land. Thus, Native Title tends to be awarded in remote and regional areas of Australia, often coinciding with mining-industry interests.

Native Title is significant. There are currently more than 600 Indigenous Land Use Agreements registered, with areas affected covering over 17% of Australia. It is an integral part of the social and legal landscape for mining companies.

Environmental legislation

The States and Territories are the main authorities for the environmental management of mines within their jurisdiction. Exact requirements and processes differ between areas. There are, however, also areas of commonality.

Generally, mining companies first develop a relatively detailed document describing the project, including anticipated environmental impacts and responses in the development, operational, closure and rehabilitation phases. The relevant State's or Territory's environmental department, along with the resources department, assesses the application, to determine the level of environmental significance and whether further environmental impact assessment will be required. Public notification and a period of time for appeals are also generally required. If the issue is proving contentious, a public inquiry may be ordered. Project approval is generally tied to an environmental management system.

In particularly complex or significant cases, when the project might potentially impact on matters of national environmental significance, the Commonwealth *Environmental Protection and Biodiversity Act 1999* compels the Commonwealth to intervene.

Occupational health and safety

The mining industry in Australia has one of the lowest rates globally of mining-related fatalities and other injuries. Yet it is still the most fatal of any industry in Australia. Safe Work Australia reports that the mining industry in Australia has twice the fatality rate of other industries.

The National Mine Safety Framework was first endorsed by the Ministerial Council on Mineral and Petroleum Resources in 2002. It aims to harmonise occupational health and safety standards across the States and Territories of Australia. At a minimum, the legislation complies with the *International Labour Organisation Convention 176* dealing with health and safety in mines.

Summary

Overall, the approach of the Australian governments to the mining industry might be summarised as follows:

- Set regulations that put limits on the operations of the mining industry in terms of environmental and social responsibilities, for example, Native Title legislation; establish environmental legislation and occupation health and safety regulations.
- Facilitate as much as possible mining-industry growth by removing impediments to minerals exploration and development — examples include provision of pre-competitive geological information at zero or minimal cost; the provision of infrastructure; and the new Enterprise Migration Agreements.
- Set tax and royalty rates so as to collect economic rent from the exploitation of Crown-owned resources.

Policies that support the mining sector

The concept of what constitutes a subsidy or a support measure is inherently complex and eludes a universally accepted definition.⁷ This section attempts to describe the measures that support the Australian mining industry. The analysis and presentation of the material is guided by the OECD's matrix-like framework for classifying measures supporting fossil fuels, an adjustment of which is reproduced in Annex 1. Where available, monetary estimates of support are also presented.

The majority of the measures identified are *horizontal* in nature, in that they benefit all mining regardless of commodity. The main exceptions are certain measures benefitting the aluminium-smelting industry, which has been identified as receiving commodity-specific subsidies in the form of low electricity prices. In addition, commodity-specific measures aimed at energy commodities (oil, natural gas, and coal) have already been documented by the OECD in the context of its work on support to fossil fuels.⁸ No specific support measures for lithium have been identified.

Existing estimates of government support

One official source of data on support in Australia is the Productivity Commission's annual *Trade and Assistance Review*. Other government sources of information include the Australian Bureau of Statistics, the Australian Taxation Office and Budget Papers.

Productivity Commission Trade and Assistance Review

The Productivity Commission is the Australian Government's independent research body into productivity and other economic issues. It is required to report annually on industry assistance and its effects on the economy in the *Trade and Assistance Review* publications. The latest edition is for the 2010-11 financial year (Productivity Commission, 2012).

The Productivity Commission divides its forms of assistance into three broad areas: tariff assistance; budgetary outlays; and tax concessions. The mining industry in Australia receives almost no tariff assistance (the mining industry exports the bulk of its output, and very little is imported). Indeed, given that it pays tariffs on imported inputs, its net tariff assistance position is negative. No export taxes are applied.

In the area of budgetary assistance, the estimate for mining in 2010-11 totalled AUD 505.9 million, which corresponds to about 6% of total budgetary assistance across all industries. AUD 371.4 million of this related to tax concessions for private R&D, while a further AUD 75.9 million was spent on public R&D. Thus, of the Productivity Commission estimates of assistance, almost 90% of the total accruing to the mining industry was directed towards R&D. The R&D tax concession and the premium R&D tax concession ran from 2001 to (1 July) 2011; it has been replaced by an R&D tax incentive scheme for which figures are not yet available. Prior to 2001, there were other R&D incentive schemes in place.

Private-sector R&D benefits both the firm itself and the wider economy. Rates of return to businesses on investment in R&D are matched by indirect returns (as other businesses take up the ideas generated), implying a high total "social" rate of return. Jones and Williams (1998)

7. Bruce (1990) notes that there is no conceptual answer to the question of how broadly to define the concept of an industrial subsidy. OECD (2005) observes that definitions can differ between sectors, countries, organisations and analysts, but that the PSE-CSE (Producer Support Estimate – Consumer Support Estimate) framework developed by OECD for agriculture is increasingly used for measuring government support to other sectors as well.
8. For a description of these, see OECD (2013).

reviewed existing estimates for the social rate of return to investment by business in R&D and found rates lying between 30% and 100%. For public R&D, the Centre of International Economics estimated in 2001 that CSIRO's mining R&D projects had benefit-cost ratios of between 3 and 39⁹ (House of Representatives Standing Committee on Science and Innovation, 2003).

These Productivity Commission estimates are, however, not comprehensive — they do not cover assistance provided by State or Territory governments, and do not cover differential tax arrangements (including excise taxes), programmes affecting the labour market, and resource-access arrangements for mining.

The Productivity Commission also periodically reports on State and Territory industry assistance. The latest estimates are for 2008-09, and were included in the 2009-10 *Trade and Assistance Review* (Productivity Commission, 2011). Coverage there is even more limited than that for Federal government estimates. Only expenditure items are assessed, thereby ruling out non-budgetary assistance such as tax concessions and infrastructure pricing. The stated purpose of the Report is to give some indication of the level and distribution of support offered by each State to shape industry.

Total estimated State and Territory Assistance to the primary industry and resources sector in 2008-09 was just under AUD 2.5 billion (Productivity Commission, 2011). A separate estimate for mining is not available, so this figure covers support to agriculture, forestry and fisheries as well, which is likely to account for a significant proportion of the total.

Other government information

Australian Industry includes an entry termed “funding from government for operation costs” (ABS, 2011; ABS, 2012b). This is defined by the ABS to include funding from federal, state and/or local government for operational costs (for example, wages and salaries, rent, food). It includes bounties, subsidies, export grants, apprenticeship and traineeship schemes, community-service obligations, and amounts reimbursed under the fuel-tax credits. It excludes funding from government for specific capital items. The ABS estimates government funding for operational costs for the mining industry at AUD 1.48 billion for 2010-11, up from AUD 1.22 billion in 2009-10.

Data on the amounts claimed under the fuel-tax credit scheme are also available from the Australian Taxation Office (ATO). The ATO estimates that mining accounts for approximately AUD 2 billion of a total of AUD 5 billion claimed in both 2009-10 and 2010-11 (ATO, 2012).¹⁰ The fuel-tax rebate does not single out the mining industry as the sole recipient, but the conditions of eligibility for the rebate are such that the mining industry is far and away the largest claimant of the scheme.

Bruce (1990) characterises subsidies as being either: direct or indirect; cash or implicit; input or output-based; and general or sector-specific. The OECD's PSE manual sets out six

9. Unpublished confidential report, “Assessing the Contribution of CSIRO”, compiled by the Centre for International Economics for CSIRO.
10. These data represent a reasonably large discrepancy between the two sources, as the amount for a single item from the ATO exceeds an aggregate quantity from ABS including this item. There is no obvious answer to why this has arisen, except that the ABS figures are estimated based on survey data. One could conclude that the fuel tax credits must at the very least comprise a large portion of ABS's total government funding for operations, and it seems this is likely to be case. In 2006-07, when the energy credits scheme (as it was then called) was accounted for separately to other government funding for operational costs, it comprised more than 80% of their sum.

principles to guide the measurement of support to agriculture (OECD, 2010). Principle 3 states that policy measures available throughout the entire economy should not be considered in the estimation of agricultural support. However, support measures that are nominally general may still have uneven sector-specific impacts (Bruce, 1990), and Principle 3 is later qualified, so that measures for which agriculture is the major, rather than only, beneficiary may be counted.¹¹ After mining, the next-largest recipient of the fuel-tax credit in 2010-11 was the transport, postal and warehousing sector, which claimed AUD 988 million in credits — less than half that claimed by the mining industry.

In addition to the estimates of budgetary assistance as calculated by the Productivity Commission and the fuel-tax rebate, Treasury data show an immediate exploration and prospecting deduction, with claims of AUD 500 million for 2010-11 (Australian Treasury, 2013), and which has been in place since 1968. Other specific accelerated-depreciation schemes existed in the past for mining buildings and certain mining-related capital goods, but they were phased out in 2001. The last positive tax expenditures generated by these provisions on a cash-flow basis occurred in FY2008/09, as capital acquired prior to 2001 kept depreciating after that date for tax purposes.

The sections below discuss other measures in detail and provide monetary values (where available) for some that are not included in the estimates above. The estimates presented are summarised in Table 1 and attributed in Annex 1 to the OECD's matrix.

Table 1. Summary of estimates of support to the mining industry in Australia

Item	Source	Year	Amount	Notes
Federal budgetary assistance	Productivity Commission, 2012	2010-11	AUD 505.9 million	Of this, 90% related to R&D (AUD 371.4 million in tax concessions; AUD 75.9 million in public research).
State budgetary outlays	Productivity Commission, 2011	2008-09	AUD 2.5 billion	Shared between agriculture and mining.
Fuel-tax rebate	ATO, 2012	2010-11	AUD 2,031 million	
Exploration and prospecting tax deduction	The Australian Government the Treasury, 2013	2010-11	AUD 500 million	Claims for immediate deductions.
Geoscience Australia	Department of Finance and Deregulation, 2011	2008-11	AUD 60-84 million	
Labour and infrastructure	–	–	No estimate	
Electricity pricing (aluminium smelting)	Hamilton and Turton, 1999		AUD 410 million	Estimates appear to be based on lower prices paid only.
	Turton, 2002		AUD 210-250 million	
Payment to Point Henry aluminium smelter		2011-12	>AUD 40 million	One-off payment to secure continued operation.

11. Both the agriculture PSE and the fossil-fuel PSE use thresholds to determine at what point a measure that is general on paper becomes specific in practice (e.g. when the sector in question attracts more than 50% of all support).

Pricing access to natural resources

The mineral resources of Australia, owned by the Crown, generate resource rent, due to their finite supply. True resource rent is difficult to measure: it is often proxied by measurable quantities such as profits, and defined as the excess of profits over costs, including a required rate of return that includes consideration of the riskiness of the venture.

While the Crown owns these resources, it does not directly engage in their exploitation — the government recognises that it does not have the knowledge, experience and market discipline to most efficiently extract resources. It is private industry that generates this excess of profit over costs. Thus, rent must be shared between the owners (the government) and the developers (the miners) of the resource, ideally in a way which is both efficient and fair.

In an ideal world, the government could extract up to 100% of the rent and the mining industry would continue to invest in Australia. In practice, however, there is international competition for mining capital, and potentially, if rent extraction were too great, investment in Australia might be seriously affected. Nevertheless, in light of the recent profitability of the mining industry, by 2010 a broad consensus had emerged that the existing taxation arrangements in Australia were not collecting an appropriate amount of rent (Hogan and McCallum, 2010; Henry et al., 2009). That is, Australian governments were perceived as having undercharged for access to the resource.

As part of a sweeping review of taxation in Australia, the Henry Review recommended that a resource-rent tax be levied on all minerals at a rate of 40% of rents to provide a fair return to the Australian community (Henry et al., 2009). The federal government accepted the Henry Review recommendation, and announced in early May 2010 that it would introduce a resource super profits tax (RSPT) at a rate of 40%. Plans for the RSPT were, however, met with opposition from the industry. A modified version of the tax, called the minerals resource rent tax (MRRT), was therefore introduced. The tax was set at a 22.5% rate rather than a 40% rate, and applies only to coal and iron-ore companies with profits exceeding AUD 75 million. It was passed by Parliament in late 2011, and commenced operation on 1 July 2012.

Hogan and McCallum (2010) estimated the amount that would have been collected under a hypothetical resource-rent tax with a 40% rate, and compared it with actual resources taxes collected for 2000-01 to 2006-07. Their estimates indicate a transfer to the mining industry arising from undercharging for access to mineral resources of around AUD 4 billion a year (not including impacts on corporate-income tax). One can only assume that this amount would have been much higher in subsequent years, when rent was likely to have been higher. By the same token, this estimate might be too high for years when conditions in the industry were not so profitable. If this estimate were to be considered a proxy for the magnitude of support (prior to July 2012 and the introduction of the new MRRT), it would constitute a highly significant transfer to the mining sector.

An important factor in considering the economic impacts of under-collecting resource rent is the foreign ownership of mining companies, current estimates of which are in excess of 80% (RBA, 2011; Edwards, 2011). Thus, a substantial amount of rent generated from Crown-owned resources is ultimately not retained in Australia.¹² At the same time, if properly designed, a resource-rent tax is in theory non-distortionary (Henry et al., 2009). Collecting revenue from this source would allow other distortionary taxes to be lowered, thereby reducing economy-wide dead-weight losses.

12. In the short run, a high proportion of profit is reinvested in the Australian minerals sector. However, the amounts reinvested will eventually leave Australia in accordance with ownership (Edwards, 2011).

Pre-competitive geological information

Australia is a large country that remains relatively underexplored. Pre-competitive geological information defining the geology of a basin or region is generated by Geoscience Australia, Australia's national geoscience research and geospatial information agency, and provided to industry at zero or minimal cost. States and Territories also fund geological surveys through programmes such as New South Wales's *New Frontiers* initiative or Western Australia's *Exploration Incentive Scheme*.¹³ The generation of this information is intended to support resource development — Penney et al. (2012) consider the provision of pre-competitive geoscience data as one of the keys to transforming Australia's endowment into exploration and production. However, it also serves other purposes, for example, in natural resource management and disaster preparation and response.

The government launched the Minerals Exploration Action Agenda in 2002, as a response to a perceived crisis in Australian minerals exploration (MEAA Secretariat, 2006). The Agenda recommended four key areas to pursue the development of a sustainable minerals exploration industry: improving access to land; improving access to finance; improving access to pre-competitive geoscience data; and improving access to human and intellectual capital. The Agenda is currently being implemented.

It is estimated that Geoscience Australia spent about AUD 84 million funding the provision of pre-competitive information in 2008, and about AUD 60 million in each of 2009 and 2010 (Department of Finance and Deregulation, 2011). Funding and cost-recovery is an ongoing issue for Geoscience Australia, and the appropriateness of the provision of this service has been brought into question on a number of occasions, most recently in the 2011 Strategic Review of Geoscience Australia (Department of Finance and Deregulation, 2011).

Ultimately, the Strategic Review was supportive of Geoscience Australia's provision of pre-competitive information, on two grounds: first, that this pre-competitive information has public-good attributes that justify government involvement; and second, that the provision of this information furthers the government's goal of attracting exploration and investment.

Exploration is a high-risk activity requiring large investments in capital, and for which there is no guaranteed return. The provision of pre-competitive geoscience data and immediate tax deductions related to exploration are aimed at encouraging exploration, and ultimately production.

As part of the Strategic Review of Geoscience Australia, independent consultants used regression analysis and a general-equilibrium model to analyse the relationships between: (a) an increase in Australian Government expenditure on offshore pre-competitive geoscience and private offshore petroleum exploration expenditure; and (b) an increase in private offshore exploration expenditure and the value of offshore petroleum production (Department of Finance and Deregulation, 2011).¹⁴ They found that: (a) a one-off AUD 1 million increase in federal government expenditure on pre-competitive geoscience is associated with a short-run increase in private offshore petroleum exploration expenditure of AUD 31 million (in 2009-10 AUD), with a three-year lag; and (b) a AUD 1 million year-on-year increase in private offshore petroleum exploration expenditure is associated with a contemporaneous AUD 1.6 million year-on-year increase in the value of offshore production of crude, liquid petroleum gas, natural gas and condensate in 2009-10 AUD.

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13. See OECD (2013) for more information on sub-national measures supporting the generation of geophysical information in Australia.
 14. The consultants focused on offshore petroleum rather than resources commodities generally as the States and Territories also have programmes providing geological survey data for onshore areas.

These estimates were then used to derive significant GDP and employment outcomes as a result of government funding for pre-competitive geoscience information. The consultants claim that closing down the geoscience programme might save on the order of AUD 323 million in direct expenditure over 2011-30 in present-value terms, but could potentially cost AUD 24.9 billion in GDP, in the order of 4 361 full-time jobs per annum. Effects on GNP, of more interest than GDP in considering welfare, were not available. The consultant's reports are confidential so that the robustness of these estimates cannot be assessed. However, they do indicate the existence of a link between measures which encourage exploration, and economic growth and employment.

Infrastructure and labour supply

Infrastructure

Infrastructure is a key determinant of Australia's attractiveness as a destination for mining investment. Australia is at somewhat of a natural disadvantage in this area due to its size and the fact that most resource projects are located in remote locations.

The infrastructure required to support the mining industry includes transport and port infrastructure, energy, water and telecommunications infrastructure, and social services for the labour force, such as hospitals and schools. The Ministerial Council on Mineral and Petroleum Resources classes these into three types: project infrastructure (which mining companies usually build themselves), multi-user infrastructure, and social infrastructure (MCMPR, 2006). In terms of social infrastructure, the rise in fly-in, fly-out (FIFO) work arrangements has tended to minimise the need to provide such services.

The impact of transport-infrastructure constraints on exports has been an issue in Australia for some time (Exports and Infrastructure Taskforce, 2005; Australian Government, 2012), and the rapid expansion in production volumes associated with the mining boom will require continued expansion of related infrastructure.

The Australian government is spending about AUD 36 billion over the years 2008-09 to 2013-14 under the Nation Building Program, focusing on road and rail transport. According to budget documents, "funding for roads is two times higher than it has ever been. For rail, it is ten times higher" (Commonwealth of Australia, 2012). In addition, work has recently commenced into developing the National Ports Strategy and the National Road Freight Strategy.

Specific to mining, the Regional Infrastructure Fund will spend about AUD 6 billion between 2010-11 and 2020-11 to provide infrastructure of direct consequence to mining (Department of Infrastructure and Transport, 2012). The objectives for the programme are to: promote development and job creation in mining communities; provide a clear benefit to Australia's economic development, and invest in Australia's resource or export capacity; and address potential capacity constraints arising from exports production and resource projects. Collections of the minerals resource-rent tax will contribute to the funding (AUD 5.6 billion).

It is beyond the scope of this report to estimate the share of infrastructure spending currently underway that might be considered support to the mining industry once user charges are accounted for. We merely note the government's intention to support mining-industry growth.

Labour supply

A skilled workforce is also a factor contributing to Australia's attractiveness as a destination for global mining capital. The rapid expansion in construction and operational work associated with the mining boom has been met via a combination of a high net

migration rate and a shift of labour into the mining sector (Penney et al., 2012). However, labour shortages, particularly with respect to specific skills, have led to rapid wage increases, and ultimately, are a constraint on the growth of the mining industry.

The National Resources Sector Employment Taskforce was convened in late 2009 to help address concerns about skills shortages in the resources sector. A final report was released in July 2010. The government accepted all 31 of the recommendations, including the recommendation to introduce Enterprise Migration Agreements (EMAs), which allow major resource projects to access overseas labour in cases where there are genuine shortages within Australia. EMAs are only available to projects with capital expenditure exceeding AUD 2 billion and a peak workforce exceeding 1 500 — these conditions limit the number of eligible projects to under 20. The Roy Hill iron ore project in WA was to be the first such project to be allowed to import foreign workers under the EMA, but in February 2013 executives for the company said that the labour shortage in Australia had improved to such an extent that they expected the project could source all its construction workers locally and would no longer need the 1 715 foreign-worker permits it had been granted in principle (Els, 2013).

Outside of the EMA scheme, other arrangements that benefit the resources sector includes a commitment to reduce the processing time of applications for Australia's Subclass 457 Work Visas, which are granted to skilled workers from outside Australia who have been sponsored and nominated by a business to work in Australia on a temporary basis. There are also apprenticeship and workforce development schemes that the mining industry can access, some of which are captured in the 'government funding of operations' reported above (ABS, 2012b).

There are no available estimates of the total monetary value of labour-market support. Under the conditions of the EMA and 457 visas, mine workers are supposed to be paid Australian market-salary rates. If this requirement is observed, then the scheme does not constitute an input subsidy.

Electricity pricing for aluminium smelters

All of the measures discussed above might be considered horizontal, sector-specific support. Electricity-price subsidies benefitting aluminium smelters are an example of a commodity-specific subsidy.

Electricity prices paid by aluminium smelters are set by confidential long-run contracts, drawn up when generators were state-owned and run. In some cases, the price of electricity was tied to the world aluminium price (so the level of support is greater when world prices are lower). While the confidential nature of the contracts means exact prices are not known, various estimates have been made:

- The Australia Institute estimated that prices are around two to three times less than those faced by other industrial users, suggesting support of around AUD 410 million a year (Hamilton and Turton, 1999).
- An updated Australia Institute report provided a lower estimate of the support, between AUD 210 and AUD 250 million per year (Turton, 2002).
- The Grattan Institute estimated that aluminium smelters receive electricity at a price one-half to one-third less than other similar industrial users (Daley and Edis, 2010).

Arguments for the existence of support rest on the price paid by aluminium smelters being less than that for other industrial users. However, there are two factors making aluminium smelters attractive customers for electricity generators: (a) aluminium smelters are significant consumers of electricity — the Point Henry and Portland smelters for example use 20% of

Victoria's electricity — and hence allow generators to operate at scale; and (b) aluminium smelters are a useful complement to other demands, using excess off-peak power and shedding electrical load in peak periods of demand (Kellow, 1986). These advantages must be taken into consideration when estimating the magnitude of support. For Kellow (1986), the interaction between Australian electricity generation and aluminium smelters arose due to both technological and social factors.

These long-run contracts are currently approaching expiration, and contracts are being renegotiated under a different regulatory environment — most of electricity generation has been either privatised or corporatized since the initial contracts were put in place. In Victoria, new contracts have been negotiated between the private electricity generator, Loy Yang, and aluminium producers (including Alcoa) to run until 2036. Despite this, Alcoa was on the verge of closing the Point Henry smelter until the federal and Victorian governments offered over AUD 40 million in grants for capital investments and other measures improving the smelter's competitiveness. In Tasmania, the Bell Bay smelter was reviewing operations with a view to closure, but announced it would continue to operate in the wake of a new deal on electricity lasting until 2025 with Hydro Tasmania (owned by the Tasmanian state government).

In addition to cheaper electricity, the Point Henry smelter in Victoria (owned by Alcoa) received in excess of AUD 40 million dollars as a 'co-investment' payment from the Federal and Victorian governments in late June 2012. In return for this, it agreed to continue operations until mid-2014. The aluminium industry will also receive substantial assistance under the Jobs and Competitiveness Package introduced to help emission-intensive, trade exposed industries adjust to the carbon tax that was brought into operation on 1 July 2012 to maintain their competitiveness, and reduce the chances of carbon leakage.¹⁵ Under these arrangements, the aluminium industry will receive 94.5% of the permits required for the first year free of charge. The Grattan Institute estimates the value of these free permits at AUD 811 million a year, on average (Daley and Edis, 2010).

The aluminium-smelting industry accounts for a significant proportion of Australia's total greenhouse-gas emissions. Most of Australia's aluminium smelters emit more carbon per tonne of aluminium on a life-cycle basis — i.e. accounting for the emissions associated with their consumption of electricity — than the international average (Daley and Edis, 2010). The exception is the Bell Bay smelter in Tasmania, which derives its electricity from hydro-electric power.

The emissions gap between Australian smelters and overseas smelters could widen to the extent that competitors turn to low-emission electricity sources, while Australia continues to produce the majority of its electricity from coal. Thus, for the moment, given that Australian smelters result in more greenhouse gases emissions than the international average, supporting Australian smelters may mean a more deleterious impact on greenhouse-gas production globally under certain conditions. However, longer-term forecasts, such as the most recent one by the Bureau of Resources and Energy Economics (Syed, 2012), project that Australia's fuel mix for electricity generation will decline from 60% in 2012-13 to just 13% in 2049-50.

15. Carbon leakage in this context refers to the increase in CO₂ emissions outside the regulating country taking domestic mitigation action, in this case Australia. The concern for Australia is that an increase in production costs in its aluminium industry as a result of its mitigation policies could lead to the reallocation of production to countries with less stringent mitigation rules (or with no rules at all), leading to higher CO₂ emissions in those countries — i.e. carbon leakage.

Fuel tax rebate

The fuel-tax rebate does not single out the mining industry as the sole recipient, but the conditions of eligibility for the rebate are such that the mining industry is far and away the largest claimant of the scheme. According to estimates provided by the Australian Taxation Office (ATO), mining accounts for approximately AUD 2 billion of a total of AUD 5 billion of fuel-tax credits claimed in both 2009-10 and 2010-11.

The Australian Government does not regard the fuel tax rebate as a subsidy, as the rebate is similar to the tax credits that businesses receive for any Goods and Services Tax (GST) they pay on their purchases of inputs. This is consistent with the application of Australia's general principle of not taxing business inputs, but rather make final consumers pay consumption taxes (Australian Government, 2012). The petrol and diesel excise tax was formerly set at AUD 0.38143 per litre (around a quarter of the consumer price), with the rebate depending on the use and the user. From 1 July 2012, with the introduction of a carbon charge, the rebates for non-excluded industries have been reduced to reflect the carbon charge.

There are many externalities arising from fuel use, including the wear and tear of roads, air and noise pollution, congestion, vehicle accidents, and global warming related to greenhouse-gas emissions (Commonwealth of Australia, 2002). The Fuel Tax Inquiry considered whether a tax on fuel was an efficient means of internalising these externalities. In general it found that, as many of these externalities were not directly and only related to the consumption of fuel, a fuel tax was not an efficient way to internalise them. The exception was in the case of greenhouse-gas emissions. The Inquiry noted that, despite the concessions available on alternative sources of fuel, there has not been a shift in consumption away from petroleum-based products. To the extent that the fuel-tax rebate has prevented a shift away from petroleum-based products, it may have had a negative environmental impact.

Concluding remarks

This report discusses ways in which the government supports the mineral mining industry in Australia. While its emphasis is on the provision of qualitative information, monetary estimates of support measures are also reported where available.

Measures by which the Australian government supports the mining industry have been found to comprise: federal budgetary assistance, comprised to a large extent of R&D tax concessions; other tax concessions, mostly related to capital expenditure; State and Territory assistance programmes; a fuel-tax rebate; provision of geoscientific data at zero or minimal cost; and State government electricity-price subsidies to aluminium smelting. These measures are described in Section 4 and summarised in Table 1 and the Annex.

Perhaps the most significant way in which government supports the mining sector is through the undercharging for access to the resource. This has especially been the case in recent years, when rent generated by the sector was likely significant. This could be considered indirect support, with its magnitude depending on a consideration of what constitutes a fair return to the Australian community deriving from the latter's ownership of mineral resources. One modelling exercise estimated the size of this support at AUD 4 billion per year over FY2000/01 to FY2006/07 (Hogan and McCallum, 2010). On 1 July 2012, the Federal government introduced the minerals resource rent tax (MRRT) to capture more of this rent.

Some measures are not specifically aimed at the mining industry. However, the mining industry has a number of unique characteristics which mean that it often stands as the major recipient of a support measure, even when it is not this measure's direct target. Chief among these is the fuel-tax rebate, of which mining is the biggest beneficiary. Other measures in this

class might include accelerated-depreciation schemes, measures aimed at supporting regional or remote-area development, measures which support large-scale projects, and measures which support indigenous Australians.

Overall, estimates available from the Productivity Commission indicate that levels of support to the mining industry are less than that provided to other sectors of Australia's economy.

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Annex 1.

Matrix of support

Transfer mechanism	Statutory or Formal Incidence							
		Output returns	Enterprise income	Intermediate inputs	Labour	Land and natural resources	Capital	Knowledge
	Direct transfer of funds		Point Henry aluminium smelter, 2011-12	Electricity price subsidy to aluminium smelters				Provision of government exploration services
	Tax revenue foregone			Fuel-tax rebate				Tax credits for exploration; R&D tax concessions
	Other revenue foregone					Under-pricing of access to the resource		
	Transfer of risk to government							Provision of exploration services by the government
	Induced transfers			Provision of infrastructure	Increase labour supply to mining			