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# Non-renewable resource taxation: policy reform in Australia*

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In July 2010, the Australian Government announced that, effective from 1 July 2012, the petroleum resource rent tax will apply to all offshore and onshore oil and gas projects (including liquefied natural gas and coal seam gas projects), and a minerals resource rent tax will apply to coal and iron ore projects. State/territory governments mainly apply ad valorem royalties to oil and gas, coal and iron ore projects; these royalty payments will be creditable under the Australian Government's resource rent taxes. This paper argues that a hybrid system allows governments to collect a minimum return to the non-renewable resource through the ad valorem royalty and a share of the rent from higher-profit projects through the rent-based tax. This paper also provides updated and expanded estimates of the potential shortfall in resource taxation revenue over the period 1992–1993 to 2009–2010 by comparing actual revenue with revenue under a range of hypothetical Brown taxes.

**Key words:** Australia, minerals resource rent tax, non-renewable resource taxation, output-based royalty, petroleum resource rent tax, profit-based royalty.

## 1. Introduction

By international standards, Australia has substantial natural wealth in the form of mineral resources (see, for example, BP 2011 and Geoscience Australia 2010; the terms mineral resources and non-renewable resources are used interchangeably in this paper). Reflecting this comparative advantage, Australia is a leading exporter of a wide range of mineral resources including energy commodities such as coal, liquefied natural gas (LNG) and uranium, and mineral commodities such as iron ore, gold, base metals (copper, lead, zinc), nickel, mineral sands and diamonds (ABARES 2010). In 2009–2010, the value of Australia's mineral resources exports was $139 billion, accounting for 46 per cent of total exports of goods and services (ABARES 2011).

In Australia, non-renewable resources are assumed to be owned by the community and governments, on behalf of the community, assign explora-

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tion and production rights to the private sector in return for some payment, usually referred to as a resource tax or royalty. The objective in resource taxation policy is to enable the government to collect a reasonable return on the extraction of the community's non-renewable resources (that is, to collect a major share of the resource rent), while ensuring the costs of the policy are not excessive (costs include administration and compliance costs, and negative impacts on private investment and production decisions). Similar to the experience in many other countries, resource taxation arrangements vary widely in Australia (a brief overview of the international experience is presented in the Appendix). Since the mid-1980s, the Australian Government has applied a mix of rent-based taxes and output-based royalties to oil and gas projects in offshore areas. Output-based royalties mainly apply in other jurisdictions (typically levied at a constant rate, but variable rates also apply; see http://www.ret.gov.au).

There are two important concerns with output-based royalties: first, resource projects are likely to be closed prematurely compared with the outcome where no resource taxation arrangements apply, and there is an increased likelihood that projects will be placed on care and maintenance during mining downturns; and, second, governments are likely to collect an inadequate share of the resource rent, particularly during periods of relatively high industry profitability (for example, because of higher world commodity prices). These concerns were recognised in the final report of the Australia's Future Tax System (AFTS) Review (see Henry *et al*. 2010). In response, the Australian Government announced the resource super profits tax (RSPT) in May 2010, to apply from 1 July 2012. Following consultations with industry, in July 2010, the Australian Government announced revised resource taxation arrangements comprising the current petroleum resource rent tax (PRRT) and a new minerals resource rent tax (MRRT).

This paper examines the economic justification for mineral resource taxation and the recent policy reform process in Australia. Transitional arrangements are important, particularly for managing the implementation costs and sovereign risk implications of policy reform, but are outside the scope of this paper (these issues are discussed in, for example, Daniel *et al*. 2010 and Ergas *et al*. 2010). Using the approach in Hogan and McCallum (2010), a study commissioned by the AFTS Review Panel, this paper provides updated and expanded estimates of the potential tax revenue in Australia that would have been collected under a range of hypothetical Brown taxes over the period 1992–1993 to 2009–2010.

The structure of the paper is as follows. Section 2 provides a brief overview of Australia's resource taxation reform process. Section 3 outlines the economic justification for mineral resource taxation. Section 4 provides estimates of the potential tax revenue shortfall in Australia under a range of hypothetical Brown taxes. Section 5 provides some concluding comments.

## 2. Resource taxation reform in Australia

Since the mid-1980s, there have been a number of important policy developments including, most notably, the introduction of the Australian Government's petroleum resource rent tax in 1987. However, there continues to be considerable variation in resource taxation arrangements between different jurisdictions and, in many cases, within a jurisdiction (an overview of Australia's resource taxation arrangements is available at http://www.ret.gov.au). The complexity of Australia's resource taxation framework is an issue that has been increasingly recognised in recent years by governments and industry participants.

In July 2004, the Ministerial Council for Mineral and Petroleum Resources (MCMPR) directed its Standing Committee of Officials (SCO) to examine and report on the competitiveness of the fiscal environment in which Australia's mineral and petroleum industries operate (MCMPR 2006); resource taxation arrangements are an important component of this fiscal environment. As part of this process, ABARE examined resource taxation policy options in Australia's mining sector and, in particular, assessed the potential net economic benefits of extending a profit-based royalty such as the Australian Government's petroleum resource rent tax (PRRT) system to onshore mineral resources; the report concluded:

> There is the potential for significant efficiency gains under a profit based royalty since royalty payments would only be made when the project has earned profits in excess of a threshold rate of return. Resource rent is likely to be higher under a profit based royalty than under an output based royalty.
>
> Overall, the PRRT is a competitive and efficient resource taxation system that has enabled the Australian Government, on behalf of the community, to collect a reasonable share of the resource rent in areas where this arrangement applies.
>
> Given Australia's substantial mineral resource assets, it is likely that there would be significant net economic benefits in extending a profit based royalty such as the PRRT to onshore mineral resources. The possible exception to this arrangement may be low value high volume nonmetallic minerals – apart from selected nonmetallic minerals such as diamonds and gemstones, resource rent in the nonmetal ore mining industry may be insufficient to justify the introduction of a profit based royalty with its higher administrative costs. (Hogan 2007, p. 8)

On 13 May 2008, the Treasurer announced a comprehensive review of Australia's tax-transfer system (Swan 2008). The final report of the AFTS Review was delivered to the Treasurer in December 2009 and publicly

released in May 2010. The Review Panel recommended that Australia's current resource charging arrangements should be replaced with a uniform rent-based tax (set at a rate of 40 per cent) administered by the Australian Government, but excluding lower-value minerals for which it can be expected to generate no net benefits:

> Subject to transitional arrangements, the new rent-based tax should apply to existing projects, replacing existing charging arrangements. The allocation of revenue and risks from the new tax should be negotiated between the Australian and State governments. A cash bidding system could also be adopted to supplement the resource rent tax and promote the efficient allocation of exploration rights. (Henry *et al*. 2010, p. 48)

The RSPT was announced on 2 May 2010 as part of the Australian Government's response to the AFTS Review (see Australian Government 2010). Under the proposed RSPT, a rent-based tax would apply to all non-renewable resources (excluding lower-value minerals). A refundable credit for royalties paid to state/territory governments would be available under the RSPT (capped based on existing and announced arrangements). Projects within the scope of the PRRT would have the option of opting into the RSPT or staying in the PRRT.

On 2 July 2010, following consultation with industry, the Australian Government released details of revised resource taxation arrangements (see Australian Treasury 2011). Effective from 1 July 2012, the PRRT will be extended to include all offshore and onshore oil and gas projects (including LNG and coal seam gas projects) and a MRRT will apply to coal and iron ore projects (see Table 1). State/territory royalty payments will be creditable

**Table 1** Key fiscal settings in the Australian Government's petroleum resource rent tax (PRRT) and proposed minerals resource rent tax (MRRT)

| | PRRT | MRRT |
|---|---|---|
| Resource tax | | |
| Uplift rate | LTBR + 5% | LTBR + 7% |
| Risk premium in the uplift rate | 5% | 7% |
| Tax rate | 40% | 22.5% |
| Annual profit of exempt projects | < A$0 million | ≤A$75 million |
| Company income tax | | |
| Tax rate to 2012–2013 | 30% | 30% |
| Tax rate from 2013–2014 | 29% | 29% |
| Combined tax rate (where PRRT/MRRT payments are positive) | | |
| Combined tax rate to 2012–2013 | 58.00% | 45.75% |
| Combined tax rate from 2013–2014 | 57.40% | 44.98% |

Notes: The uplift rate is also referred to as the threshold rate of return. LTBR is the Australian Government's long-term bond rate. Under the PRRT, different uplift rates apply to exploration costs of new entrants. The tax rate for the MRRT includes a tax rate of 30% and an extraction allowance of 25%. The combined tax rate is calculated as $t_r + t_c \times (1 - t_r)$, where $t_r$ and $t_c$ are the resource and company income tax rates, respectively.

under the Australian Government's resource rent taxes (not capped), but no cash rebate will be provided.

## 3. Economic justification for resource taxation

### 3.1. Economic rent and resource rent

The profitability of resource projects has two broad components: normal profit and economic rent (or supernormal profit). 'An economic rent is the excess of the return to a factor of production above the amount that is required to sustain the current use of the factor (or to entice the use of the factor)' (Henry *et al*. 2010, p. 171). Mining is a risky activity and it is important to recognise that normal profit includes a risk-free component and a risk premium that compensates risk-averse private investors for the risks associated with the investment. Thus, for example, a policy change that increases sovereign risk, and hence the risk premium, over the medium to longer-term increases industry costs and reduces resource rent (all else constant).

The economic justification for non-renewable resource taxation is based on the presence and size of resource rent which is the return to the community's mineral resources (Daniel *et al*. 2010). Resource rent in the mining sector excludes the costs and risks associated with the following economic activities:

- Production – the cost of producing resources from established oil and gas projects or mine sites (including abandonment costs such as mine site or field rehabilitation costs).
- New resource developments – the cost of developing new resource projects based on petroleum fields or ore deposits that are known but not yet developed.
- Exploration – the cost of finding new petroleum fields or ore deposits. An important characteristic of the mining sector is that private investors may explore in a number of locations before discovering an economic petroleum field or ore deposit (see, for example, Hogan *et al*. 2002). Exploration costs include the cost of failed exploration projects as well as successful exploration projects.

Resource rent exists because of the quality and scarcity of mineral resources. Quality rent occurs because of the quality differential of petroleum fields or ore deposits: for a given price, resource projects based on higher-quality (or more productive) petroleum fields or ore deposits earn a larger excess of revenue over costs than marginal resource projects. Scarcity rent occurs when a resource is in short supply relative to its demand: scarcity rent 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.

Resource rent is a major source of economic rent in most mineral resource industries, although it may not be the only source of economic rent.

Economic rent may represent a return to factors other than the mineral resource such as superior managerial skills and innovation (technology adoption is particularly important given the dynamic nature of resource projects). In practice, it is difficult to estimate economic rent and to distinguish between resource rent and other types of economic rent. To reduce negative distortions of a mineral resource taxation policy on industry investment and production decisions, governments should target substantially less than 100 per cent of estimated economic rent; that is, governments should take into account estimation errors and other sources of rent, as well as issues associated with high tax rates that weaken economic incentives for managerial efficiency (see also the discussion in Ergas *et al*. 2010).

*3.1.1. Graphical representation of economic rent*

A long-run supply-demand framework is used in Figure 1 to illustrate the concept of economic rent in a mineral resource industry (based on the presence of quality rent). If private investors are assumed to be risk neutral, the long-run industry supply curve is represented by $S_{RN}$, representing the long-run marginal cost of exploration, development and production including a risk-free return to capital. At the assumed world price of $p_w$, the equilibrium level of industry output is $q_{RN}$.

In practice, mining activity is risky and private investors' attitudes towards risk are assumed to be characterised by risk aversion. The long-run industry supply curve is now represented by $S_{RA}$, where the risk premium is the additional cost component required to compensate risk-averse private investors for incurring risk, and the equilibrium level of industry output is $q^*$. Economic rent is the difference between total revenue ($p_w q^*$) and total costs (the area under the supply curve, $S_{RA}$). This representation of the industry equilibrium focuses on the quality differential of resource projects whereby higher-quality resources earn quality rent (further information on this graphical representation is provided in, for example, Hogan 2007, 2008; and Hogan and Goldsworthy 2010).

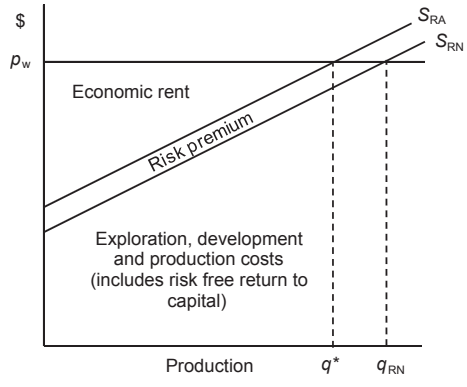


**Figure 1** Illustrative economic rent in a mining industry.

### 3.2. Resource taxation options

Resource taxation policies may be broadly classified according to whether they are based on the profit or production of a resource project:

- Profit-based royalties – includes rent-based taxes that are levied on some measure of the net cash flow of a resource project (for example, the Brown tax, the resource rent tax and the allowance for corporate capital), and income-based taxes that are typically levied on some measure of project profit (supernormal and normal profit).
- Output-based royalties – the most important of these are the ad valorem royalty, typically levied as a constant percentage of the value of production from a resource project (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), and the specific royalty typically levied as a constant (dollar) amount per physical unit of production. The excise is a variant of an ad valorem royalty whereby higher rates apply to higher annual rates of production.

Rent-based taxes are particularly important in considering the key policy options identified in Australia's recent reform process. The Brown tax, named after a tax proposed by Brown (1948), is generally regarded as the benchmark against which to assess other resource taxation options and 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 (the government essentially acts as a silent partner in the resource project). The resource rent tax (RRT), proposed by Garnaut and Clunies Ross (1975), avoids the need for cash payments because it is levied as a percentage of a project's adjusted net cash flow (where negative net cash flows are accumulated at a threshold rate and offset against future net cash flow). The allowance for corporate capital (ACC) underpins the policy recommendation in Henry *et al.* (2010) (instead of the standard deduction for interest on debt, companies are allowed to deduct an imputed return on their entire asset base).

Further information on resource taxation options is provided in numerous papers and, for brevity, is not repeated here (see, for example, Daniel *et al.* 2010; Hogan and McCallum 2010; Baunsgaard 2001 and the references cited in those papers).

Drawing on the approach in Hogan and Goldsworthy (2010) and Baunsgaard (2001), indicative rankings for the basic resource taxation options are presented in Table 2, based on the following four criteria:

- Economic efficiency – indicates the extent to which a fiscal instrument may result in negative distortions to industry exploration, investment, production and shutdown decisions (including effects on investor risk assessments).
- Rent collection (or revenue flexibility) – indicates the extent to which a fiscal instrument collects a reasonable share of the industry's resource rent under different geological and economic conditions.

**Table 2** Indicative rankings for selected resource taxation options, by criterion

| Criterion | Profit-based royalties | | Output-based royalties | |
|---|---|---|---|---|
| | Rent based tax | Income based tax or royalty | Ad valorem royalty | Specific royalty |
| Economic efficiency | 1 | 2 | 3 | 4 |
| Neutrality | 1 | 2 | 3 | 4 |
| Investor risk | 1 | 2 | 3 | 4 |
| Project risk | 1 | 2 | 3 | 4 |
| Sovereign risk (stability) | 1 | 2 | 3 | 4 |
| Rent collection (revenue flexibility) | 1 | 2 | 3 | 4 |
| Government risk (revenue stability) | 4 | 3 | 2 | 1 |
| Fiscal loss (in downturn) | 4 | 3 | 2 | 1 |
| Revenue delay | 4 | 3 | 2 | 1 |
| Administration and compliance costs | 4 | 3 | 2 | 1 |

Notes: A ranking of 1 indicates the mineral resource taxation option generally performs best on the criterion. However, these rankings need to be interpreted with caution as rankings may change depending on the design and fiscal settings for each option. For example, a rent- or income-based tax with significantly less than full loss offset may be more inefficient than an ad valorem royalty applied at a relatively low rate. The rankings are based on the assumption that there are quality differences between non-renewable resource deposits or accumulations, resulting in significant quality rent.

- Government risk (or revenue stability) – indicates the extent to which a fiscal instrument provides relatively stable and predictable revenue, with a particular focus on managing the risks of revenue delay that occurs when revenue is collected well into the production stage of a project, and fiscal loss that occurs when revenue is low as a result of worse than expected project outcomes including, for example, commodity price downturns.
- Administration and compliance costs – includes 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.

In general terms, rent-based taxes tend to rank most highly for economic efficiency and rent collection, while output-based royalties tend to rank most highly for managing government risk (revenue stability) and administration and compliance costs (reflecting lower information requirements for tax administration purposes). Importantly, some aspects of resource taxation policy assessments rely on the subjective judgment of governments (for example, preferences for a relatively predictable and stable revenue stream). The rankings may also vary from those indicated in Table 2 depending on the details of policy design and fiscal settings (see, for example, Ergas *et al.* 2010).

### *3.2.1. Hybrid systems*

A hybrid system that combines a profit-based royalty with an output-based royalty has the potential to balance the risk of fiscal loss to both owners of

the non-renewable resource (the community) and owners of the capital (private investors). A hybrid system allows the government to collect a minimum return to the resource through the output-based royalty and a share of the benefits from higher-quality petroleum fields or ore deposits through the profit-based royalty (see Hogan and Goldsworthy 2010).

Hybrid resource taxation arrangements apply in several countries, particularly to oil and gas projects in developing economies (see Appendix). The production sharing contract was first introduced to oil and gas projects in Indonesia, and variants of this framework have been widely adopted in other developing economies. Production sharing contracts typically include the equivalent of an ad valorem royalty (first tranche payment) and an income-based tax (Baunsgaard 2001) – significant efficiency issues arise in practice, however, when there is significantly less than full loss offset and relatively high tax rates. British Columbia in Canada is an example of a hybrid system applied to minerals.

Hybrid systems are an important feature in the recent policy reform process in Australia. Initially, the AFTS Review recommended that a rent-based tax should replace current resource taxation arrangements in Australia and the 'Australian and State governments should negotiate an appropriate allocation of the revenues and risks of the tax' (Henry *et al*. 2010; p. xxii). The AFTS Review also argued there are mechanisms that are less distorting than output-based royalties to provide State governments with a relatively reliable revenue stream: 'Recommendation 119: Reforms to State taxes should be coordinated through intergovernmental agreements between the Australian government and the States to provide the States with revenue stability and to facilitate good policy outcomes.' (Henry *et al*. 2010, p. 103).

Under Australia's new resource taxation framework, output-based royalties, which tend to be preferred by State governments on revenue stability and administrative simplicity grounds, represent a minimum payment to resource owners. The resource rent taxes (PRRT and MRRT), which tend to be preferred by the Australian Government on economic efficiency and rent collection grounds, provide resource owners with additional revenue from higher-profit resource projects (for example, where rents are generated from higher-quality resource deposits or during periods of relatively high commodity prices).

## 4. Historical estimates of potential revenue collected under hypothetical Brown taxes in Australia

Hogan and McCallum (2010) compared actual resource tax revenue in Australia's mining sector with outcomes under two hypothetical rent-based taxes, the Brown tax and a RRT (each levied at a rate of 40 per cent, the same rate as the Australian Government's PRRT). In each case, the rent-based tax is applied to industry net cash flow before royalties and taxes, and it is assumed that there is no industry supply response to the implementation of the more

efficient rent-based tax. Company income tax revenue would be reduced under any resource taxation arrangement that resulted in lower net cash flow after resource tax payments, but this aspect was not considered in the report.

This section provides updated and expanded estimates of the potential resource tax revenue shortfall in Australia's mining sector using ABS data (see ABS 2008, 2011 and earlier issues). Key financial performance data for Australia's mining sector over the period 1992–1993 to 2009–2010 are provided in Figure 2 (EBITDA is earnings before interest, taxes, depreciation and amortisation). Net cash flow estimates, by industry (subject to data availability), are presented in Figure 3. Net cash flow before royalties and taxes is calculated as EBITDA before natural resource royalty expenses less net capital expenditure. Resource tax revenue is given by ABS estimates of natural resource royalty expenses for the period 1992–1993 to 2006–2007 (these estimates exclude the crude oil excise tax); more recent data for 2007–2008 to 2009–2010 are obtained from federal, state and territory government websites (http://www.ret.gov.au and state/territory budget papers).

Net cash flow before royalties and taxes in Australia's mining sector is estimated to have been $390 billion (annual average of $21.7 billion) over the period 1992–1993 to 2009–2010, and $185 billion ($23.1 billion) over the period 1999–2000 to 2006–2007 (in 2006–2007 present value terms). Over the period 1999–2000 to 2006–2007, the industries covered in the Australian Government's petroleum and minerals resource rent taxes accounted for 91 per cent of the mining sector's net cash flow before royalties and taxes (in present value terms) – oil and gas (53 per cent), coal (23 per cent) and iron ore (15 per cent).

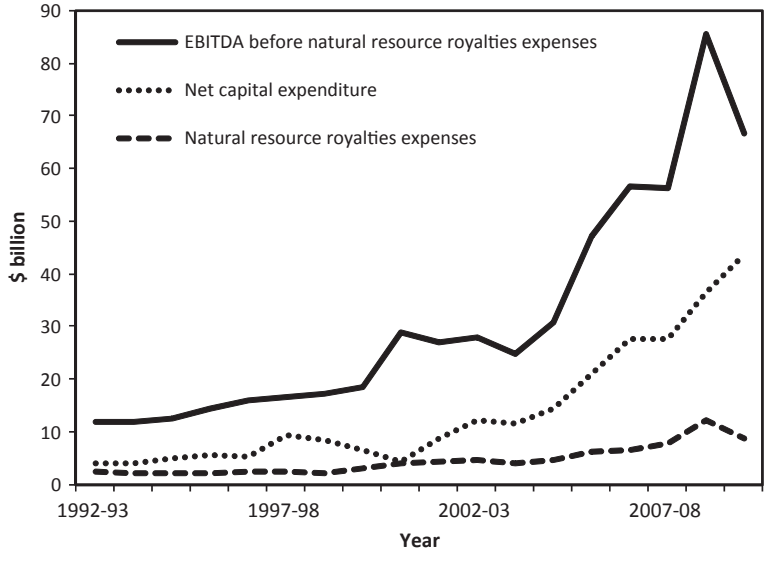


**Figure 2** Key financial performance data for Australia's mining sector (in current prices; mining is given by oil and gas, coal and metal ore mining before 1997–1998).

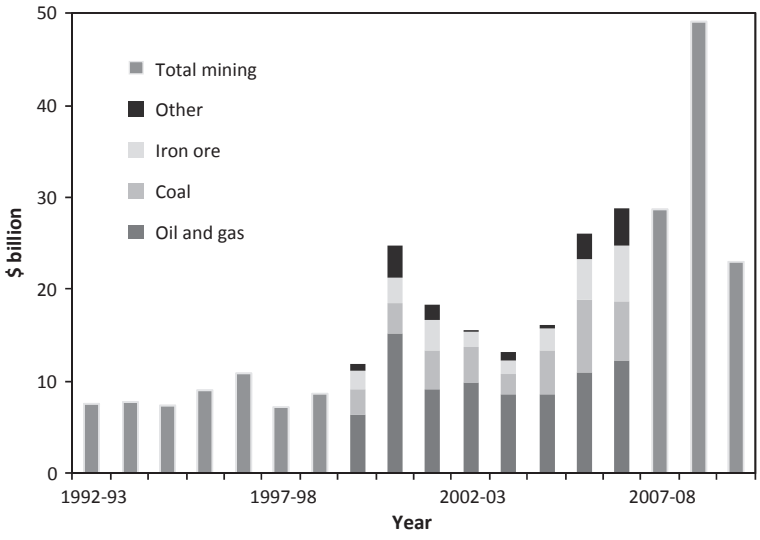


**Figure 3** Net cash flow before royalties and taxes in Australia's mining sector, by industry (in current prices; total mining is given by oil and gas, coal and metal ore mining before 1997–1998).

Estimates of the potential resource tax revenue shortfall in Australia's mining sector are presented in Table 3. Hypothetical Brown taxes that vary according to industry coverage and tax rate are applied to the historical estimates of net cash flow before royalties and taxes, including:

- Forty per cent Brown tax on the mining sector – a 40 per cent tax rate is applied to the mining sector (the same tax rate that applies in the Australian Government's PRRT). Over the period 1999–2000 to 2006–2007, the government collects $74 billion under the Brown tax compared with actual resource tax revenue of $43 billion, indicating a potential resource tax revenue shortfall of around $31 billion or $3.8 billion a year on average (in 2006–2007 present value terms).
- Forty per cent Brown tax on petroleum and 22.5% Brown tax on minerals – a 40 per cent tax rate is applied to the oil and gas industry, and a 22.5 per cent tax rate is applied to the minerals industries (the same rates that apply in the Australian Government's resource rent taxes). Over the period 1999–2000 to 2006–2007, the potential resource tax revenue shortfall is around $17 billion or $2.2 billion a year.
- Brown tax on petroleum (40%) and coal and iron ore (22.5%) – a 40 per cent tax rate is applied to the oil and gas industry, and a 22.5 per cent tax rate is applied to the coal and iron ore industries (the same industry coverage and tax rates that apply in the Australian Government's resource rent taxes). Over the period 1999–2000 to 2006–2007, the potential resource tax revenue shortfall for the petroleum, coal and iron ore industries is around $17 billion or $2.2 billion a year. This is similar to the shortfall in the

**Table 3** Resource tax revenue in Australia's mining sector: actual and hypothetical Brown taxes (in 2006–2007 present value terms)

| | Total | | | Annual average | | |
|---|---|---|---|---|---|---|
| Industry | Actual $b | Brown tax $b | Shortfall $b | Actual $b | Brown tax $b | Shortfall $b |
| *40% Brown tax: 1999–2000 to 2006–2007* | | | | | | |
| Petroleum (oil and gas extraction industry) | 24.2 | 39.3 | 15.0 | 3.0 | 4.9 | 1.9 |
| Minerals | 19.1 | 37.9 | 18.8 | 2.4 | 4.7 | 2.4 |
| Coal mining | 9.3 | 16.7 | 7.3 | 1.2 | 2.1 | 0.9 |
| Metal ore mining | 8.7 | 18.9 | 10.2 | 1.1 | 2.4 | 1.3 |
| Iron ore mining | 4.1 | 11.3 | 7.1 | 0.5 | 1.4 | 0.9 |
| Copper, silver-lead-zinc ore mining | 1.4 | 5.0 | 3.6 | 0.2 | 0.6 | 0.5 |
| Gold ore mining | 1.3 | −0.9 | −2.2 | 0.2 | −0.1 | −0.3 |
| Mineral sand mining | 0.3 | 0.6 | 0.2 | 0.04 | 0.1 | 0.0 |
| Other metal ore mining | 1.6 | 3.0 | 1.4 | 0.2 | 0.4 | 0.2 |
| Non-metallic ore mining | 1.1 | 2.3 | 1.3 | 0.1 | 0.3 | 0.2 |
| Total mining | 43.5 | 74.0 | 30.6 | 5.4 | 9.3 | 3.8 |
| 1999–2000 to 2009–2010 | 68.9 | 110.3 | 41.4 | 6.3 | 10.0 | 3.8 |
| 1992–1993 to 2009–2010 | 98.9 | 155.9 | 57.0 | 5.5 | 8.7 | 3.2 |
| *22.5% Brown tax on minerals: 1999–2000 to 2006–2007* | | | | | | |
| Minerals | 19.1 | 21.3 | 2.2 | 2.4 | 2.7 | 0.3 |
| Coal mining | 9.3 | 9.4 | 0.04 | 1.2 | 1.2 | 0.005 |
| Metal ore mining | 8.7 | 10.6 | 2.0 | 1.1 | 1.3 | 0.2 |
| Iron ore mining | 4.1 | 6.3 | 2.2 | 0.5 | 0.8 | 0.3 |
| Copper, silver-lead-zinc ore mining | 1.4 | 2.8 | 1.4 | 0.2 | 0.4 | 0.2 |
| Gold ore mining | 1.3 | −0.5 | −1.8 | 0.2 | −0.1 | −0.2 |
| Mineral sand mining | 0.3 | 0.3 | −0.01 | 0.0 | 0.04 | −0.001 |
| Other metal ore mining | 1.6 | 1.7 | 0.1 | 0.2 | 0.2 | 0.01 |
| Non-metallic ore mining | 1.1 | 1.3 | 0.2 | 0.1 | 0.2 | 0.03 |
| *Oil and gas, coal and iron ore: 1999–2000 to 2006–2007* | | | | | | |
| Oil and gas, coal and iron ore (40%) | 37.7 | 67.2 | 29.5 | 4.7 | 8.4 | 3.7 |
| Oil and gas (40%), coal and iron ore (22.5%) | 37.7 | 55.0 | 17.3 | 4.7 | 6.9 | 2.2 |

Notes: In 2006–2007, present value terms with values brought forward at the long-term bond rate (LTBR). Non-metallic ore mining includes quarrying. Total mining includes exploration and other mining support services; only total mining data are available after 2006–2007; total mining is given by oil and gas, coal and metal ore mining before 1997–1998.

previous case because, under a Brown tax, the government would have provided the gold industry with a cash rebate of $0.2 billion a year on average, offsetting the additional revenue that would have been collected from other minerals industries (particularly copper and silver-lead-zinc ore mining).

Resource tax revenue under the hypothetical Brown taxes is consistently above actual tax revenue from the mining sector over the period 1992–1993 to 2009–2010, with the gap (indicating the potential resource tax revenue shortfall) widening over the past decade (see Figure 4). In the mining sector, the recent increase in Brown tax revenue from $11 billion in 2007–2008 to

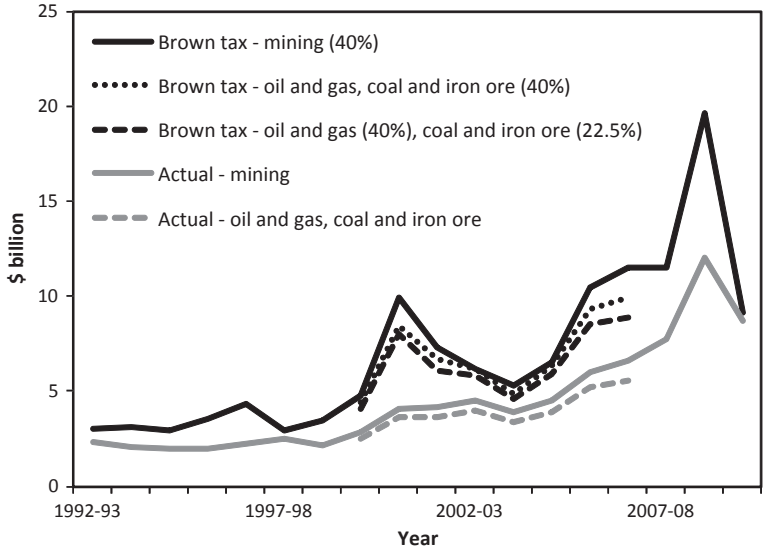


**Figure 4** Resource tax revenue in Australia's mining sector: actual and under hypothetical Brown taxes (in current prices; mining is given by oil and gas, coal and metal before 1997–1998).

$20 billion in 2008–2009 and subsequent fall to $9.2 billion in 2009–2010, which occurred partly as a result of increased mining investment (see Figure 2), highlights the revenue flexibility characteristics of rent-based taxes (that is, revenue under rent-based taxes varies with industry profitability and tends to be more variable than revenue under output-based royalties).

## 5. Conclusion

The Australian Government's recent initiative to apply the PRRT to all offshore and onshore oil and gas projects, and introduce a MRRT to coal and iron ore projects represents an important policy reform. This initiative will substantially enhance the capacity of Australia's resource taxation framework to obtain a reasonable return from the extraction of the community's mineral resources over time (that is, to collect a major share of the resource rent).

This paper has argued that a hybrid approach that combines a RRT with an output-based royalty has the potential to balance important advantages and disadvantages of the individual fiscal instruments. Output-based royalties represent a minimum payment to resource owners and tend to be preferred by State governments on revenue stability and administrative simplicity grounds. Rent-based taxes provide resource owners with additional revenue from higher-profit resource projects and tend to be preferred by the Australian Government on economic efficiency and rent collection grounds. Importantly, a hybrid system has the potential to balance the risk of fiscal loss to

both owners of the non-renewable resource (the community) and owners of the capital (private investors). Increasing the overall efficiency of the resource taxation framework, as recommended in the AFTS Review, would require a negotiated outcome between Australian and State governments (see Henry *et al*. 2010).

The estimates presented in this paper indicate that, particularly over the past decade, there is likely to have been a significant potential resource tax revenue shortfall in Australia. For example, over the period 1999–2000 to 2006–2007, rent-based taxes applied to oil and gas projects (at a rate of 40 per cent), and coal and iron ore projects (at a rate of 22.5 per cent) would have resulted in additional resource tax revenue of around $17 billion or $2.2 billion a year (in 2006–2007 present value terms). Given Australia's large mineral resource endowments and expected continuing strong growth in global demand, future resource rent in Australia is likely to be substantial; this should provide significant benefits to both private investors and the community.

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## Appendix

### International experience

Mineral resource taxation arrangements vary widely between countries and resources, although there are some broad trends that are notable: profit-based royalties are widely applied in the global oil and gas industry; in minerals industries, there has been a shift towards profit-based royalties in developed economies; where ad valorem royalties apply, there has been a shift towards sliding scales to proxy profit-based royalties; and there has been an increase in the application and coverage of mineral taxation arrangements (Daniel *et al*. 2010).

### Oil and gas

The main fiscal instruments applied in the oil and gas industry are profit-based royalties (this includes, for example, the Australian Government's petroleum resource rent tax and arrangements in the Northern Territory, Norway and United Kingdom), and ad valorem royalties set at a variable rate (Gulf of Mexico, Alaska, some Latin American countries) or a constant rate (State governments in Australia). The production sharing contract is an important example of a hybrid approach that is widely applied to oil and gas

projects in developing countries and typically includes the equivalent of a profit-based royalty in addition to an output-based royalty.

## Minerals

In minerals industries, profit-based royalties have been adopted in several developing economies. Profit-based royalties now apply (or are planned) in Canada (Northwest Territories, Ontario, Saskatechewan), Australia (the Australian Government's minerals resource rent tax, Northern Territory) and the United States (Nevada). British Columbia in Canada has a hybrid system where the ad valorem royalty is fully deductible against a profit-based royalty. Indonesia applies a profit-based royalty in addition to an output-based royalty to mineral projects in state reserve areas.

Output-based royalties mainly apply in minerals industries, typically at a constant rate: historically, there has been a tendency for jurisdictions to increase ad valorem royalty rates during periods of relatively high industry profitability, but governments may be relatively slow to reduce rates during mining downturns (see, for example, Hogan and Goldsworthy 2010 and Otto 2006). Following the recent commodity price boom, several jurisdictions now apply ad valorem royalties with sliding scales based on profit or rate of return, price, production or cost to proxy a profit-based royalty.

There has been a significant increase in the application and coverage of mineral taxation. For example, Chile, Peru and South Africa introduced mineral taxation arrangements in recent years, and Western Australia applied an ad valorem royalty to gold production just prior to 2000. Some countries (such as Mexico) and jurisdictions within a country (such as in Argentina) do not apply resource taxation arrangements (the standard company tax does apply).