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Special Taxation of the Mining Industry*

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The efficiency and equity arguments for changing the structure of, and the aggregate level of, special taxation of the mining industry are reviewed. An economic rent base tax would cause smaller taxation distortions than the current quantity base royalties. A higher level of taxation of immobile factors, including mining resources, as part of a tax-mix change to fund lower taxation of internationally mobile capital would lead to higher Australian economic growth and after-tax returns to labour. The Brown tax, the Allowance for Corporate Capital, and versions of a resource rent tax, including the petroleum resource rent tax and minerals resource rent tax variants, are described and evaluated as measures of economic rent in the mining industry. In principle, the Brown tax has greater transparency and desired efficiency properties.

Keywords: taxation, mining, resource rents.

1. Introduction

The mining industry[3] in Australia, and in most other countries, pays special taxes for the use of community-owned *in situ* resources in addition to taxes levied on businesses in general. General taxes include the personal and corporate income tax, the GST, payroll and transaction taxes. The additional tax in most cases is a form of a royalty.

Adopting one of the recommendations of the review of Australia's Future Tax System (AFTS; Henry *et al.*, 2009), the Commonwealth proposed in May 2010 to replace the royalties from July 2012 with a version of an expenditure tax, which it called a resource super profits tax (RSPT) (Australian Government, 2010). In July 2010, the RSPT proposal was dropped. Instead, it proposed to extend the petroleum resource rent tax (PRRT) to onshore and all offshore oil and gas, to introduce a modified resource rent tax called the mining resource rent tax (MRRT) to iron ore and coal, and to retain current royalties for all other minerals (Gillard *et al.*, 2010). A portion of the higher level of revenue expected to be collected from the new special mining taxes is to fund a tax-mix change.

This paper considers: the efficiency and equity arguments for an economic rent tax that is expected to collect over time more revenue than the royalties; options for measurement of the economic rent; and some of the practical issues associated with transition to the proposed resource

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[3]Throughout the paper, the mining industry and a mine are taken to include energy as well as minerals.

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rent taxes.[4] Section 2 provides a background context of the mining industry, including the underlying reasons for economic rents and details of current taxation. Efficiency and equity arguments for special additional taxation of the economic rents earned by the mining industry are presented in Section 3. As argued by Brown (1948), Garnaut and Clunies-Ross (1975), Emerson and Lloyd (1983) and, more recently, Daniel *et al.* (2010) among others, taxing the economic rent is a more efficient replacement for the current royalty system. Also, the new tax is to fund a reduction of the corporate income tax rate falling on more internationally mobile capital as proposed in AFTS (Henry *et al.*, 2009).[5] Options for the measurement of economic rent are described and compared in Section 4. The options include the Brown tax, the resource rent tax that lies behind the PRRT and MRRT, and the proposed RSPT. These tax bases are also compared with the current corporate income tax base and the option of an open tender bidding auction for the property rights to mine a particular deposit. Some practical issues that arise with the implementation of the government-proposed changes are considered in Section 5, including the treatment of existing mines, sovereign risk and commonwealth–state financial arrangements. A final section draws together conclusions.

2. Mining Industry Context

Important distinguishing characteristics of the mining industry generate economic rents. The mining industry requires significant natural resource inputs as well as capital, labour and management inputs. Capital, labour and management are mobile across the different sectors of the economy, and some are mobile across the global economy. Returns to the mobile inputs allocated to the mining industry, at least at the margin, equate with returns to these inputs in other sectors of the economy. Their cost to the mining sector represents their opportunity returns in other sectors. *In situ* natural resource inputs in contrast are, like land, geographically immobile and fixed in supply. Economic or scarcity rents earned on a particular deposit, or parcel of land, are specific to a particular location and are not mobile within a country or across the globe. Economic rent to the particular deposit is a residual of revenue received less all outlays on exploration, development, operation and mine closure.

The diverse range of attributes of different particular mineral deposits, and their geographical specificity, results in the magnitude of the economic rent varying from one mine to another. Relatively low cost mines have a combination of low exploration and mine-specific technology development costs and large and rich endowments of the desired mineral. For example, there are open-cut and underground coal mines, and then differences in the over-burden, and in the depth and purity of the seam mined. Other factors affecting economic rent include the proximity of the mine to appropriate infrastructure with excess capacity, and relatively low-cost challenges regarding the environment and heritage values. These are the inframarginal mines on the low part of the social opportunity cost curve.

At the other extreme, there are marginal mines. They have a combination of higher exploration and technical development costs, smaller and poorer desired mineral endowments, require more expensive outlays on labour, capital and management inputs extraction methods, large complementary investments in transport infrastructure, and greater challenges in terms of environmental amenity and heritage values alternative uses of the site. The different natural resource attributes of different mines within a particular industry result in a supply curve reflecting the social opportunity cost of labour, capital and management inputs, which is upward sloping and far from perfectly elastic.

[4]Many of the same issues are considered in the more technical paper by Smith (2010). There are some differences of areas of emphasis, and even some disagreement over some details, between the two papers.

[5]Note that contrary to the AFTS proposal to use any revenue windfall to fund a reduction in the taxation of more internationally mobile factors of production, and in particular a lower corporate income tax rate, the government proposal is to use only some of the revenue windfall for a tax-mix change. A portion of the revenue gain is to be allocated to an infrastructure investment fund and to fund lower net PAYG tax collected in switching a further share of labour remuneration from wages and salaries to a three percentage point increase in the compulsory Superannuation Guarantee. Changes to the Superannuation Guarantee were not recommended in AFTS.

Most of the services and manufacturing sectors of the economy, in contrast with the mining sector, have a high dependence on economy-wide mobile labour, capital, management and materials inputs, and a small dependence on natural resource inputs. With approximate constant returns to scale technology, the long-run supply curves for most services and manufactured products are close to perfectly elastic. The foregoing observations do not rule out economic rents associated with monopoly market power nor the quasi-rents for initial successful investments in technology and market development in all sectors of the economy.

An important characteristic of the mining industry in modern Australia is its high capital cost intensity. Scale economies and mine lives of at least several decades require upfront investments of hundreds of millions of dollars and, in some cases, billions of dollars. Most of the capital cost then becomes a sunk cost. The high capital intensity of the mining industry combined with the long time lags between investment and production results in large negative cash flows for several years following a large investment. These characteristics are important to the contrasting patterns of cash flows to businesses and governments under the different measures of economic rents discussed in Section 4.

In the short run, which may be several years, the elasticity of supply for each mineral is low. In response to a perceived longer-run increase in demand, it takes several years for investment in expanded capacity to increase production. Topp *et al.* (2008) report an average of three years from the decision to invest until normal production. In the event of a shift inwards of demand, with large sunk costs and relatively low short-run variable costs, market price has to fall a long way before shutting down a mine. The combination of the inelastic short-run supply curve against shifts in demand results in volatility of world prices for most mining products (see, for example, ABARE, 2010). In turn, both economic rents and corporate profits are volatile from year to year.

The mining industry is treated similarly to other industries in terms of general taxes. These include income taxation, the GST, payroll tax, state transaction taxes and so forth.[6] Apart from the immediate expensing of outlays on exploration, which is similar to the expensing of most R&D outlays, the mining income tax base is close to a comprehensive income tax base.[7] For example, there are no significant other tax expenditures (The Treasury, 2010). Then, the effective income tax rate on mining is close to the statutory 30 per cent corporate tax rate. In the absence of any special taxes on the mining industry, economic rents earned on mining projects with relatively favourable natural endowments, or in times of commodity booms, are taxed at about the statutory rate of 30 per cent as corporate income. Under the imputation system, corporate tax paid is a withholding tax for the income earned on equity investments by shareholders distributed as dividends; and it is a flat rate tax on retained earnings that flow onto capital gains, which in turn receive concessions at the shareholder level. Interest on debt finance is deductible to the miner, and taxable as personal income for the saver.

The Treasury Architecture paper (The Treasury, 2008) describes a complex array of different additional and special taxes levied on the mining industry.[8] A PRRT, as a form of resource rent tax, is imposed by the commonwealth on offshore oil and gas projects except the North West Shelf. The PRRT is levied at a 40 per cent rate on a measure of cash flow, but with losses carried forward and indexed by an uplift factor of the long-term bond rate plus 15 per cent for exploration and plus 5 per cent for development and operating expenditures, but no refunds for losses. Excise on North West Shelf energy faces a progressive rate schedule with a top rate of 10 to 12.5 per cent of the well head value. The states impose over sixty different sets of special taxes on onshore mining

[6]As the GST, payroll, transaction and other taxes are not to change under the May 2010 and July 2010 announced reforms, they are not considered further. However, AFTS does propose changes to these taxes.

[7]Under a pure income tax base, if the exploration is successful it should be depreciated over the life of the mining project, and only if it is unsuccessful should it be expensed. Making such a distinction is difficult and costly in practice, and most income tax systems in practice err in favour of expensing. Perhaps, there is some support to compensate external benefits to other miners of exploration.

[8]Of interest is a comparison of the royalties for 2006–2007 in the Treasury (2008) with those for 1978–1979 in Emerson and Lloyd (1983). In particular, as well as the diversity of rates across the different minerals and states in both periods, there has been a marked shift from specific royalties to *ad valorem* royalties over time.

investments. Most are *ad valorem* royalties, with a few specific royalties, and in the Northern Territory (NT) a profit-based tax is levied. The *ad valorem* rates vary from zero (for Victorian gold), around 7 per cent (for New South Wales (NSW) and Queensland (QLD) coal up to $100/t and Western Australia (WA) iron ore) and up to 10 per cent (for QLD coal above $100/t). The NT profit-based tax on economic rents is 18 per cent.

An idea of the relative magnitude of current royalty payments relative to a replacement resource rent tax is provided by the Australian Government (2010, p. 11) for the 2000s decade:

> The effective resource charge (charges as a percentage of super profits earned) has almost halved from an average of around 34 per cent over the first half of this decade to less than 14 per cent in 2008–09.

Over this period, the Reserve Bank of Australia (RBA) index of non-rural commodity prices jumped from around 40 to over 100 (RBA, 2010).

In all cases, the special taxes on the mining industry are deducted as a user fee for the state-owned natural resources in measuring taxable corporate income.

3. Arguments for Change

This section explores the efficiency and equity arguments for an economic rent base tax to replace the current royalty system and to fund a reduction in the corporate income tax rate.

For a long-run perspective, Figure 1 describes key differences between the operation of and the market outcome effects of the royalty system and an economic rent tax. It illustrates also the efficiency argument for replacing the royalty system.[9] A less than perfectly elastic supply curve S reflects the social opportunity cost required to entice labour, capital, management and materials from the rest of the economy for exploration, development, production and mine closure. As argued in the preceding section, it is upward sloping to reflect that some mines have more favourable endowment attributes than other mines. The elasticity will vary from one product to another. A downward sloping demand curve D represents the world excess demand plus domestic demand for the Australian product. For some products, demand will be close to perfectly elastic.

In the absence of special taxes on the mining industry, output is at Q and price P. The triangle PEA provides a measure of the economic rent to the natural resource (and more on its measurement in Section 4 below). In the absence of market failures for the industry, and second best considerations, the P and Q outcome is an efficient one.

Figure 1a shows the effects of a royalty. The tax per unit of output R shifts the supply curve upwards from S to S′ = S + R. At the new equilibrium, output falls to Q′, price rises to P′, royalty revenue is a + b, producers lose some economic rent, and there is an efficiency cost of d + e from too little production and consumption.

Figure 1b shows the effects of an economic rent tax at rate BA/PA, which collects government revenue of c. Relative to the efficient pre-tax outcomes, output and price remain unchanged, and there is no efficiency loss. Producers lose a share of the economic rent. An approximate government revenue neutral swap of an economic rent tax for the current royalties would leave producers as an aggregate better off. However, mines with particularly favourable natural attributes on the bottom of the cost curve will pay more special tax, those with less favourable attributes will pay less special tax, and the marginal investments will pay no special tax.

Figure 1 is built on simplifying assumptions, as is the case for all economic models. Questions have been asked about the validity of key assumptions that are important in deriving the policy implication favouring an economic rent tax as a reasonable description of reality. Two interrelated sets of these questions concern the existence of economic rents to the natural resource and quasi-economic rents on investments in human and physical capital required for profitable mining.

[9]Hogan (2007, section 3) provides extensions to Figure 1 in the form of making specific additions to the long-run cost of risk premiums for risk-averse decision-makers and tax-operating costs, and then allowing for the royalty and profit-based special taxes to have different implications for these specific cost items.

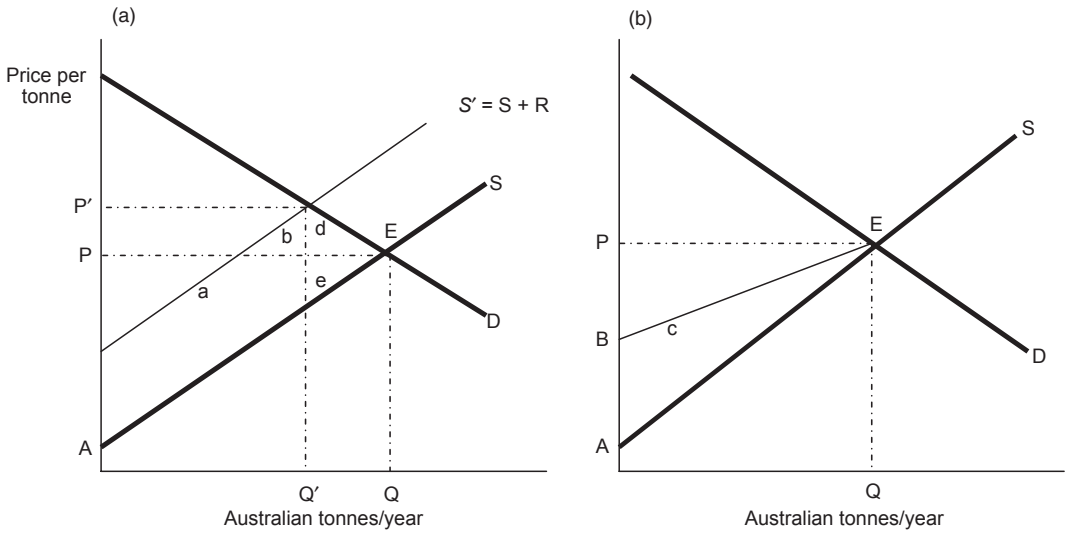

Figure 1. *Comparison of Royalty and Economic Rent Taxes: (a) Royalty and (b) Economic Rent*

Economic rents are earned on the natural resource as a result of the geographical fixity of supply provided by nature and the range of very favourable to less favourable attributes of different mines for each product noted in Section 2.

The geographical fixity of supply of natural resources explains why many mining projects are located in unfavourable places in terms of the availability and cost of mobile labour, capital, management and materials. Executives of mining industries have in front of their desks graphs showing the ranking of mines or wells in their industry by cash and accounting cost per unit of output (see, for example, summary graphs in Daley and Edis, 2010; and references therein). For the main minerals, including iron ore, bauxite, copper and coal, and for oil and gas wells, it is not uncommon for the bottom quartile cost mines to operate at a half or less of the cost of the upper quartile cost units. Topp *et al.* (2008), drawing on Mudd (2007), report the important role of lower quality attributes of new deposits and of extended lives for existing deposits relative to earlier developed mines significantly reducing estimates of mining sector multifactor productivity over the last 30 years, and especially the ''naughties.'' Economic rents associated with the rising supply curve of Figure 1 are generated for the lower cost attribute favoured mines, but not for the higher cost and poorer natural attribute sites.

In the case of building materials such as clays and sands, it is likely that the cost differences between the more favoured and less favoured deposits are relatively small. The long-run supply function for these minerals is highly elastic and relatively small economic rents are available (Henry *et al.*, 2009).

A second set of concerns about the assumptions of Figure 1, and similar economic models, is about human and physical capital, including intangible knowledge for exploration, production and marketing. Clearly, these inputs are required. In the measures of economic rent described in Section 4, all costs of exploration, other R&D and marketing are deductions in measuring the residual returns or economic rent to the natural resource to be taxed. But, one might contest how well such deductible costs are measured in practice.

A referee argued that a resource rent tax on the mining industry would deter risky and costly investments in exploration and R&D to reduce mining costs and improve product marketability. If true, this would shift up the supply curve S in Figure 1b for the resource rent tax (with a rectangle of efficiency loss) to a much greater extent than a royalty of Figure 1a. If the Brown tax model

described in Section 4 is used to measure the economic rent and if an investment in R&D is justified in present value terms in the absence of a Brown tax, it is also worthwhile after a Brown tax, because government takes a constant share of both the revenue gains and the expenditure losses.[10]

Another simplifying assumption of Figure 1 is of a perfectly elastic supply of capital, labour and management resources to the mining industry. Less than perfect elasticity, even over the short term, would result in quasi-rents to these inputs being included in the measured resource economic rent. If the supply fixity is unique to Australian mines, the resource reallocation effects would be minimal.[11] But, if they are more general, higher rates of Australian special mining taxation relative to other countries would encourage a reallocation of such scarce resources to other country mining. The magnitudes of the supply elasticities for the mobile factors, and the associated economic distortion costs, to Australia ultimately are empirical issues, and to date we have at best only anecdotal data.

Recognition of errors in the measurement of economic rent and the possibility of quasi-fixed rents to capital and labour inputs as well as economic rents on natural resources lies behind recommendations to set the resource rent tax rate below the theoretical non-distorting maximum rate of 100 per cent. As Quentin Grafton (pers. comm.) observed, in practice we need to compare imperfect special taxes on mining with other imperfect taxes.

Consider next the comparative effects of shifts of demand and the resulting fluctuations of commodity prices on the tax revenues collected from the mining industry with a specific or *ad valorem* royalty vs a resource rent tax. Given the low elasticity of supply in the short run, with the specific royalty the special tax collection remains fairly constant during commodity booms and slumps, and producers bear most of the fluctuation in returns. With an *ad valorem* royalty, government revenue has a larger pro-cyclical fluctuation than with a specific royalty. In contrast, with a resource rent tax with a higher tax rate than the *ad valorem* royalty rate, a greater share of the swings in revenues and economic rents with commodity cycle fluctuations go to the government. Corporate income tax revenue also moves pro-cyclically with commodity booms and slopes. Then, fluctuations of the aggregate special tax plus corporate income tax revenue are modified towards a middle position. Overall, the resource rent tax option, relative to the royalty, smooths after-tax income and reduces the risks for the miner, and it increases the volatility of aggregate taxation revenue. It is likely that these comparative cash-flow fluctuation properties also favour greater stability and credibility over time of the resource rent tax regime.

If the commodity cycle of the past decade is an example of the future, using Treasury numbers (Australian Government, 2010, p. 11), a resource rent tax rate of around 20–25 per cent would, on average across all mining and energy products, offset the revenue collected under the current set of variable rate royalties.[12]

The government-proposed reforms are expected on average and over time to collect more revenue than the replaced royalties. As argued in AFTS (Henry *et al.*, 2009), this is a part of an approximate constant aggregate revenue neutral tax reform package to change the tax mix away from internationally mobile factors, and in particular capital, and onto immobile factors, and in particular land and natural resources. Specifically, AFTS recommended some of the resource rent tax revenue be used to reduce the corporate income tax rate.[13]

[10]Similar arguments lie behind the long established practice of share farming arrangements in the use of land resources for agriculture.

[11]Any intra-Australia mining investment reallocation would be minimised with a common tax base and rate across the different mining products. Such a strategy was recommended by Henry *et al.* (2009), but the current government proposal is for a heterogeneous system of special taxation of different mining products.

[12]Arguably, the 2000 through 2009 decade of commodity prices has been above the long-term trend with no price slumps of the depths of the early 1980s and late 1990s.

[13]As noted in footnote 5, the government-proposed package does not follow the AFTS proposal to use all the additional revenue above that to replace the current royalties to fund a lower corporate tax rate.

The arguments for a tax-mix change are as follows. As shown in Figure 1b, higher taxation of the economic rent earned on the immobile factors has little effect on the quantity employed of these factors, or on the market price of the product. Its principal effect is redistribution of more of the economic rent from the mine operator to the government. In contrast, source taxation of mobile factors, and in particular corporate taxation of capital income, has a large effect on the quantity of capital employed in Australia. Further, most of the economic incidence of such taxes is passed back to the immobile factors.

For Australia as a small open economy, the availability of international capital combined with the ability of domestic savers to invest in Australia or overseas results in a highly elastic supply of capital to Australian investors. Higher effective taxes on capital income on investments in Australia forces an increase in the required pre-tax return on Australian investments. After some time, the reduced investment results in less capital per worker,[14] a fall in labour productivity, and ultimately a fall in real wages. Conversely, a reduction in Australian taxes on domestic investment leads to an increase in the Australian capital stock and the capital tax reduction is passed on as a higher real wage. De Mooij and Ederveen (2008), in a survey of the literature, find compelling econometric support for these effects. Optimal tax theory argues for a relatively lower tax rate for efficiency on the less elastic factors of production, and in particular on capital relative to land and other natural resources.

Another set of arguments for setting the Australian tax rate on capital income close to the rate of the main countries from whom we borrow and trade concerns the ability of multinational corporations to significantly reduce their tax liability in Australia, and hence the Australian tax take (Auerbach *et al.*, 2008). Revenue can be shifted to the lower tax rate countries via the manipulation of transfer pricing, and deductible overhead and debt expenses can be shifted to the higher tax rate countries.

Evaluating the equity effects of a tax reform package involving a higher rate of special taxation of the mining industry to fund a lower corporate tax rate requires tracing some general equilibrium effects. In an efficient market, changes in disposable corporate income would be expected to flow through to a one-off change in share prices. Higher special taxation of the mining industry (measured as the PRRT, MRRT or RSPT net of royalties plus corporate income tax) reduces the disposable corporate income available for dividends or retained earnings on mining shares. This, in turn, would result in a one-off windfall capital loss for shareholders of mining companies. At the same time, the lower corporate income tax rate provides a one-off windfall gain for shareholders of non-mining companies. After the share price adjustments, shareholders receive the same risk-adjusted after-tax return per dollar investment in shares across the different industries. If all of the additional revenue collected in special taxes on the mining industry were used to fund lower corporate income taxation, as proposed by Henry *et al.* (2009), but not in the government-proposed changes of either May or July 2010, shareholders with balanced funds, including superannuation, will be little affected in net. Further, in time, the efficiency gains that underlie the tax reform package make a positive sum game where the wins more than compensate the losses.

It is not surprising that mining companies spent resources to resist the proposed increase in special taxation of the industry. Such behaviour is predicted by economic models of rent seeking by organised special interest groups (Olson, 1965; Krueger, 1974). And, in this case of mining in 2010 in Australia, the lobbying was well rewarded.

The tax rate or share of the economic rent reallocated to government as a return on society natural resources largely is an arbitrary equity choice. In principle, the rate can be between 0 and 100 per cent. In practice, errors in the measurement of economic rent and efficiency arguments to provide incentives and rewards for firms to develop and implement more efficient ways of mining and marketing requires a rate below 100 per cent. Perhaps some guidance can be taken from the

[14]The change in the quantum of capital in addition is likely to change in the same direction technology and knowledge spill over benefits embodied in the capital, and all three are important contributors to productivity growth.

special taxation of land. Land, like *in situ* mining resources, is owned by governments on behalf of the people, it is fixed in supply, and different parcels of land earn different rents depending on location. There are three sets of special taxation on land: local government rates set at a flat rate on the unimproved value, but varying by municipality and shire, with an average rate around 1 per cent per year; state land tax, except for the NT, applied mainly to land in the CBDs due to exemptions for principal residence, primary production and non-profit organisations with a progressive rate schedule that varies from state to state with top rates from 1.5 to 3.7 per cent of the asset value; and, conveyance duty on the transfer of property (including land and structures) levied at a progressive rate (Henry *et al.*, 2009). If the annual rental return is around 5 per cent of the asset value, a ball park estimate of the aggregate rate of special taxation of land is around 40 per cent. For businesses, these different forms of land tax are deductible against business income tax as is the case for royalties and the resource rent taxes in measuring the corporate income tax base for miners.

4. Measuring Economic Rent on Resources

Table 1 provides a comparative description of three different measures of the economic rent on business investments, including mining investments, together with the tax bases for the corporate income tax and the royalty system. The desired economic rent measure is akin to that shown by triangle PEA in Figure 1. The Brown tax provides the benchmark. The resource rent tax is the basis for the PRRT and the MRRT. The Allowance for Corporate Capital (ACC) tax base underlies the government RSPT. The different tax bases have different time patterns of net cash flows for firms and government revenue. Under certain conditions, all three have the same present value for the mining business and government (Boadway and Keen, 2010).

The Brown tax, which is also known as an expenditure base and the R-base proposed by the Meade Committee, provides the benchmark measure of economic rent to the *in situ* mining resource. Economic rent is measured as gross receipts less outlays on labour and management, materials, and investment in capital equipment and buildings, exploration and R&D. These outlays are the non-natural resource costs of exploration, development, production and mine closure. Deductible outlays for the Brown tax represent the opportunity cost of all non-natural resource inputs if they were employed elsewhere in the economy.[15] What remains is a residual return or rent on the immobile natural resource. For a tax rate, say 40 per cent, the government receives 40 per cent of a positive cash flow, and if the cash flow is negative the government writes a cheque for 40 per cent of the loss. From the criteria of neutrality and efficiency, if the present value to the miner of the stream of revenue less expenses is positive before the Brown tax, and so a worthy investment, a share of this same stream of revenue and expenses after the Brown tax also is positive; and if it is negative before the Brown tax, it is negative after the Brown tax and not a worthy investment.

As well as being a measure of economic rent, the Brown tax has a number of other interesting properties. Immediate expensing of capital outlays, rather than spreading these outlays over time as depreciation allowances under income tax measures, effectively exempts the normal rate of return. The normal rate of return refers to compensation for deferring consumption and offsetting the effects of inflation. The symmetrical treatment of cash-flow gains and losses does not change the risk profile of the miner's investment. Such symmetry of treatment applies also to option values affecting the choice of time of investment to explore and develop a mine in a realistic world of uncertainty about market prices and production costs with new information arriving in the future.[16] Effectively, the Brown tax makes the government a silent shareholder in the project as it

[15]An implicit assumption is that there are minimal distortions elsewhere in the economy so that market prices equal social opportunity values.

[16]Hausman in an article in *The Australian*, 18 June 2010, took the opposite view that the RSPT would discriminate against firm use of option value decisions. But, under the Brown and RSPT taxes, the present value to the firm of different timing of mine investments is affected proportionally, and so if it was optimal to wait before the tax it remains optimal to wait after the tax.

Table 1. *Tax Base and Tax Rate for Special Taxes on the Mining Industry and for the Corporate Income Tax*

Tax system	Tax base	Tax rate
Special mining tax		
Brown tax	Rev − Lab − Mat − Invest	Flat rate; refunds
Resource rent	Rev − Lab − Mat − Invest − LossCF × (1 + Rl + Rr)	Flat rate; no refunds
ACC	Rev − Lab − Mat − Dep − NK × Rl − LossCF × (1 + Rl)	Flat rate; refund only at end of project
Royalty	Quantity or Rev	Specific or *ad valorem*
Corporate income tax	Rev − Lab − Mat − Dep − DebR − Special mining tax − LossCF	Flat rate; no refunds

Notes: DebR = debt interest; Dep = depreciation; Invest = investment outlays; Lab = labour and management; Loss CF = loss carried forward; Mat = materials; NK = $\sum(\text{Invest}_{t-i} - \text{Dep}_{t-i})$ = net capital stock; Rev = revenue; Rl = long-term bond rate; Rr = risk premium.

receives a common share, equal to the tax rate, of any wins and losses incurred over the life of a mining project.

In the context of the time pattern of cash flows for most mining investments, the Brown tax would provide a very different pattern of transfers between the miner and the government to that of the royalty system and the corporate income tax. The capital intensity of mining discussed in Section 2 means that, in the early years of a project, government would be writing large cheques to the miner with the Brown tax. It may be many years of production before government cumulative Brown tax payments and receipts turn positive. Government can borrow to offset these payments at the long-term bond rate. Inevitably, some mines will end up with a negative cash flow over the project life, and government as a shareholder will make a net payment for its share of the loss. In contrast, the government never writes a cheque to miners under the royalty system, the resource rent tax or the corporate income tax.

The cash flow and potential net government payments for failed mines outcomes with a Brown tax have been of concern to governments. At the same time, governments and/or the electorate may be concerned about the credibility and commitment of companies to pay tax on positive cash flows during the mature phases of a mine.

The Industry Commission (1991) and Smith (2010) propose that the concerns about the time path of cash flows, and other concerns with the volatility of government revenue, from a Brown tax could be handled by a separate and explicit resource rent tax fund, even a sovereign wealth fund. In particular, the fund would provide a smoother over time revenue stream to the regular budget. Henry (2010) argues that these functions can be handled through the normal budget process, and he doubts that sovereign wealth funds in practice so far have provided evidence of superior management. The collection of country studies of sovereign wealth funds in Xu and Gawdat (2010) supports the Henry position.

The ACC model was originally proposed by Boadway and Bruce (1984). It was recommended by AFTS (Henry *et al*., 2009) and relabelled as the RSPT by government. It is a modified expenditure tax. Relative to the Brown tax, the ACC replaces expensing of capital outlays with depreciation, as under the income tax. At the same time, it allows an additional deduction for an imputed return on the depreciated capital stock (both equity and debt financed) as under an Allowance for Corporate Equity expenditure tax base model; any losses carried forward would be scaled up; and, in the event of a net loss at the time of mine closure, government would write a cheque to the miner for its share of the loss. The imputed return on the net capital stock and the scale-up factor on losses carried forward would be the long-term bond rate (Fane and Smith, 1986; Henry *et al*., 2009). As under the Brown tax, losses and gains are treated symmetrically. With the government guarantees, mining firms are assumed to be able to borrow at the long-term bond rate against the government share of future depreciation allowances and for any losses carried forward. Also, the risk profile of the reduced miner share of the project is unchanged. Using the long-term bond rate as the scaling

factor, the present value of a project to a miner remains unchanged with and without an ACC and so there are no distortions to investment and production decisions (as told in Figure 1B), and the present value of government tax receipts is the same under the ACC and Brown tax (Auerbach *et al.*, 2008; Smith, 2010, for numerical examples).

In practice, mining companies expressed concern about the credibility of future governments writing a cheque for its share of an accumulated loss under the RSPT.

The resource rent tax is a modified Brown tax. Like the Brown tax, capital outlays are expensed, but at no stage does government write a cheque for negative cash flows, either during a project or at its completion. Losses are scaled up and carried forward. Here, the appropriate scaling factor for neutrality of effects on mining investment and production decisions is the long-term bond rate plus a risk premium in recognition that a loss will not be compensated in the manner of the Brown tax or ACC. In Garnaut and Clunies-Ross (1975), the scale-up factor was the rate of return required by a miner to commit funds to the risky exploration and production project. The practical problem is that the risk of loss varies by project. Further, no government has access to the information to set the risk premium project by project.

The current PRRT is a working example of a resource rent tax, and the proposed MRRT to apply to iron ore and coal is a further variant. The MRRT has a more generous risk adjustment of 7 rather 5 per cent of the PRRT, a 25 per cent so-called ''extraction allowance'' as an additional deduction and a lower tax rate of 30 per cent.[17] The effective MRRT tax rate is 22.5 per cent (= (1 – 0.25)0.3)) compared with the PRRT rate of 40 per cent.

In general, the resource rent tax will not have a neutral effect on business investment and production. The use of a common or average risk loading for all mining projects within an industry will mean a subsidy to relatively low-risk projects and a tax on relatively more risky projects. In the context of Figure 1b, at the efficient P and Q combination, the line BE would be pushed upwards for a tax and downwards for a subsidy resulting in too little or too much investment and production, respectively. Also, the choice of production methods will be distorted.

By comparison with the Brown tax, RSPT, PRRT and MRRT, the income tax[18] falls on the normal rate of return on the investment in addition to the rent on the mineral resource. As all other investments throughout the economy are income taxed, it is appropriate that the corporate tax also be imposed on the mining sector using the same tax base and rate for reasons of neutrality of taxation of the normal rate of return on capital.

Rather than government estimating the economic rent, competitive bidding by miners for the right to mine particular sites provides an option to draw on private information held by miners to reveal the present value of the rent (Dowell, 1981; Porter, 1984).[19] In principle, the option seems attractive. But, there are concerns about its application in practice. Because firms bear all the project risks, they will use a firm risk-adjusted discount rate in calculating the present value of the economic rent in their bids. The sovereign risk that future governments may impose additional special taxes on those mines that are subsequently revealed to earn much higher rents than anticipated (together with no compensation for those that generate less rents) leads firms to build in a significant risk premium. Then, as Emerson and Lloyd (1983), the Industry Commission (1991) and others have argued, the winning bid will be much <100 per cent of the risk-free present value of the rents that correspond with the Brown tax and ACC bases; but closer to the resource rent tax base. Seldom will there be enough reasonably informed firms with access to the required funds to support a competitive assumption. As an important point of comparison, the auction method requires large upfront cash-flow payments by the firm for both the right to mine and the initial

[17]There are other special design features of the MRRT. Relative to the PRRT, and the Garnaut and Clunnies-Ross model, mines with a profit of <$50 million a year are exempt. Relative to the proposed RSPT, royalties are to be creditable but not refundable or transferable.

[18]Here, the income tax includes corporate income tax, the taxation of shareholder dividends and capital gains, and the income taxation of debt investors in projects.

[19]The auction method can have other and perhaps more important functions, including the allocation of a mineral lease to the superior producer.

capital investment. This is the opposite of the Brown tax cash-flow pattern. Finally, retrospective bidding for existing mines, and challenges in applying the system to major extension and/or maintenance projects of existing mines, suggests that the auction method would be restricted to Greenfield mines.

Of course, the economic rent tax and auctioning mechanism are not mutually exclusive. Emerson and Lloyd (1983) and later the Industry Commission (1991) argue that given the reality of government imperfect knowledge about mineral reserves, output prices and input costs, and imperfect measures of economic rents, a mixture of a pre-specified Brown tax or resource rent tax with an upfront auction for new mines system likely will be more efficient and generate more government revenue.

5. Some Issues of Implementation

There are a number of important details to be resolved to effect a transition for an established mining industry with current royalty arrangements to an economic rent system of taxation yielding a higher level of revenue. These include the treatment of existing mines, sovereign risk and commonwealth–state financial relations.

Existing mines were planned and developed under the royalty system. But, the form of royalty and especially the rates have changed over time. In general, rates have been ratcheted upwards in times of commodity booms. Given that most of the past investments are sunk costs, the proposed increases in special taxation primarily redistributes more of the rents on existing investments to government, and has negligible effects on production decisions. Over the longer term, the more important efficiency concern in changing the special mining taxes, and in particular raising the net tax collected, is about the sovereign risk discussed below and its effects on future investment decisions.

As argued by Smith (2010), the option of grandfathering current royalties for existing mines would delay any significant additional revenue collection for many years. Also, it would bring complexity and high operating costs for existing mines when they make investment upgrades to be taxed under the new tax structure in the future. At the same time, Smith notes that current mines represent an atypical set of profitable mines and excludes those that failed. Thus, taxing only the remaining profitable mines raises the effective tax rate above the statutory rate. Although valid in the context of the Brown and ACC taxes, Smith's argument is of less impact with the resource rent tax that does not compensate losses at mine closure.

In terms of equity, Garnaut (2010) and Henry (2010) argue that applying a constraint that no one should be made worse off with tax reform, and in particular as it affects capital income more than labour income, is very costly if the changes generate significant national productivity gains. Such a constraint would, for example, have ruled out most of the microeconomic reform agenda of the 1980s and 1990s. From another perspective, over the last few decades both the measures of company income, and in particular allowable depreciation, and company tax rates have changed significantly.

One strategy to address concerns associated with ''changing the rules'' for existing mines would involve shifting to the new economic rent tax base and adjusting the tax rate to meet equity concerns. Actual past expenditures and receipts would be used to measure the tax base. The initial tax rate could be an approximate revenue neutral replacement for the current royalties. Over time, the tax rate would increase to that under the new system.

Sovereign risk associated with future governments changing taxation arrangements, and also such matters as security of property right tenure and environmental requirements, work to increase the level of uncertainty about future returns from mining investments. Such uncertainties warrant a rise in the required risk premium, with the result of a reduction in investment and production levels. At least in the short run, the current proposals for changes in the special taxation of mining are argued by the industry and others to have raised the sovereign risk. But, what of the longer run? Arguably, a special tax based on sharing economic rent, and at a higher expected long-term revenue collection, will prove a more sustainable and enduring tax system, which, in turn, will reduce the sovereign risk relative to the royalty system. Along with the income tax, the economic rent tax collects more revenue in times of commodity booms and less in times of

commodity slumps. Also, it collects more from the more favourably endowed mines than other mines. These design properties appeal to notions of reasonable and fair. Together, these properties suggest that the economic rent tax will be more robust to calls for changes on equity grounds if and when industry profitability changes in the future. Even so, increases in the rate of tax in the future cannot be ruled out. In terms of empirical evidence, while the design and rate of the PRRT have not changed significantly since its implementation in 1984, there have been many changes, and all in the upwards direction, in many of the royalty rates over the last two decades. Overall, after a transition period, a comprehensive economic rent tax at a common rate on all mining is likely to reduce the sovereign risk.

However, it is difficult to be confident that the current very different proposals on different mines will be stable over time. Oil and gas are subject to a relatively high 40 per cent rate under the PRRT, coal and iron ore to an effective 22.5 per cent effective rate under the MRRT, and other minerals are to continue to pay a range of royalty rates, with some having no special mining tax.

Constitutionally, onshore mineral and energy resources are owned by the states (and territories), and they collect the royalties. The reforms for the special taxation of the mineral industry involve replacement of the state royalty revenues. As part of a much wider taxation reform agenda embracing all state taxes, the AFTS (Henry *et al*., 2009) proposed establishing a new intergovernmental agreement. In contrast, the commonwealth-proposed reforms retain company royalty payments to the states and the commonwealth directly compensates the companies for these payments, and with details of the future path of royalty rates and payments to be determined. Neither proposal is without serious challenges and costs. Greater certainty for miners and for both tiers of government, and simplicity, seem more likely if the more ambitious AFTS strategy was to come to fruition. But, the commonwealth's more pragmatic proposal clearly is a quicker and easier option to negotiate.

6. Conclusion

Shifting from the present output base royalty system to an economic rent base system for special taxation of the mining industry offers a number of advantages. First, it would reduce efficiency losses by reducing distortions to the choice of mining investment and production decisions associated with the current royalties. Second, additional revenue from a relatively non-distorting tax on an immobile factor as part of a tax-mix change package, which funds lower tax rates on more distorting taxes on internationally mobile factors, will raise the national productivity and the effective incomes of the relatively immobile factors, including labour. Third, more favoured mineral deposits contribute more than the less favoured deposits, and more is collected in times of commodity booms and less during commodity slumps. Fourth, together these characteristics are likely to reduce the sovereign risk. Once the challenging transitional adjustments are accommodated, a comprehensive economic rent base tax on all mining should reduce the risk premium required of mining investments.

The expenditure or Brown tax is the ideal benchmark for measuring the economic rent on mining investments. Concerns with governments writing cheques, and often large sum cheques, to miners in the early stage of new projects when cash flows are negative have led to the development of Brown-like tax bases. The AFTS review proposal for an ACC system, which was relabelled by government as an RSPT, has the same economic properties as the Brown tax and requires government cheques only for mines that are still in loss at the time of shut down. Resource rent taxes, which are the underlying framework of the PRRT and the proposed MRRT, exclude any government writing of checks to the miners, but at the cost of adding a risk premium to the uplift factor on losses carried forward. The challenge is that the risk premium varies by mine and is unknown to government.

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