

Some Economics of Mining Taxation

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We argue five main propositions. First, the choice between royalties and profit-based taxation involves an efficiency tradeoff, between diminished incentives to produce output on one hand, and diminished incentives to minimise costs on the other (as in Laffont and Tirole, 1993). So the Brown tax is indeed a tax, and one that reduces the incentive to mine. Next, the *ex post* Resource Super Profits Tax (RSPT) falls on quasi-rents as well as on rents, and therefore involves some expropriation. Third, there may be a case in favour of a retrospective RSPT or the like, but it has yet to be made persuasively. Fourth, the successor to the RSPT – the Minerals Resource Rent Tax (MRRT) – has many of the inefficiencies of the RSPT but adds some further serious inefficiencies of its own. Last, the value of revenues from taxes such as the RSPT and the MRRT is usually over-stated, as those revenues are highly risky. The failure to take account of the risky character of those income streams amounts to fiscal illusion and makes it more likely that unwise spending commitments will be made.

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1. Comparing Royalties with Taxes on Rents

1.1 Asymmetric Information

With the Resource Super Profit Tax (RSPT), the Rudd government was attempting to impose a tax on pure economic rent, one that yields government revenue without changing taxpayers' economic behaviour. A bit like the magic pudding: the government takes its cut, but the pudding of investment and economic activity remains unaffected.

A common diagram (Figure 1) contrasts royalties with a resource-rent tax, and purports to show that the former but not the latter are distortionary. The figure shows the long-run supply and demand curves for Australian miners of a commodity, assuming output is sold at a given world price.³ The rent is the difference between the revenue received for the minerals and the cost of supplying them to the market (the triangular area between the supply curve and world price). A royalty drives a wedge between the world price and the price that producers receive for each unit of output, decreasing the quantity supplied to below the efficient level, creating an efficiency cost

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³That is, Australia accounts for a relatively small share of world output of the commodity. If, instead, variations in Australian supply affect the world price, then the demand curve would slope downward. In that case, a royalty would drive up world prices and part of its burden would be borne by foreign demanders. If so, the net gains to Australia from replacing royalties with a profit-based tax are smaller, or more negative.

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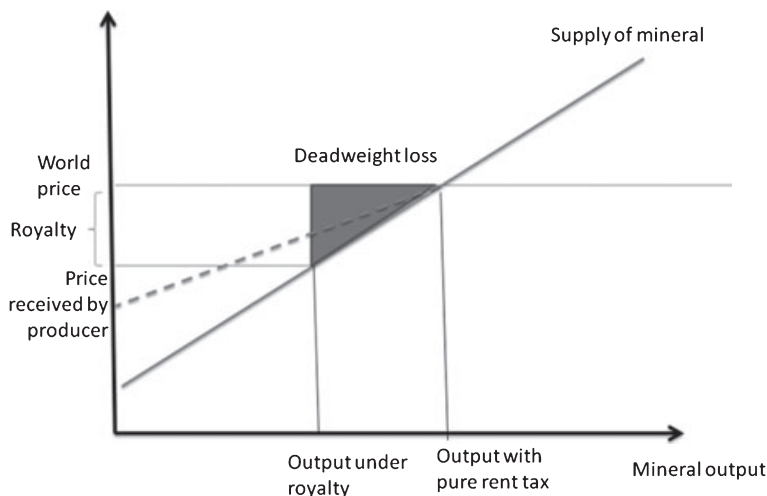


Figure 1. Comparison of Royalty and a Pure Resource-Rent Tax

equal to the shaded triangle (the forgone rents on minerals no longer mined). Thus, royalties are inefficient. (In Figure 1, royalties are shown as a specific tax on output; an *ad valorem* tax would have the same qualitative effect.)

In contrast, a pure profit or resource-rent tax extracts a portion of the rent (between the dashed line and supply curve). As the marginal unit of output earns no rent, no tax is paid on it and the producer receives the world price for it. The pure rent tax, therefore, has no effect on output.

The argument is that if it is efficient for the firm to maximise revenue minus cost, then taxing rents at rate t means the firm now maximises $(1 - t)(\text{revenue minus cost})$, which gives exactly the same behaviour (same output and choice of inputs) as occurs without any rent tax.

“If 100 per cent of the project was a worthwhile investment for the company, 60 per cent of it will be similarly worthwhile, so the [Brown] tax will neither discourage nor encourage investment” (Smith, 2010a, p. 8). Treasury Secretary Henry, as reported in *The Australian* (2010), hinted at this implication: why not a 90 per cent tax, if the resource-rent tax has no efficiency effect? On the same reasoning, 1 per cent of the project, or 0.1 per cent, will similarly be “worthwhile.”

Why does this seem to be an unacceptable conclusion?

The answer is that there will be an output effect of a resource-rent tax, because it falls on more than the resource rent. This is even true for a Brown tax, as the RSPT was broadly intended to be; the effects (discussed in more detail in section 4) are likely to be even more pronounced under a tax with the structure of the Minerals Resource Rent Tax (MRRT).

The problem arises because mining firms generally conduct a variety of activities, not all of which are to be subject to the mining tax; and they may have common costs. In particular, for a rent tax to be neutral requires that the return on the resource component of mining operations can be distinguished *ex post* from the return on the other elements involved in converting resources in the ground into what the tax law defines (with a high degree of artificiality) as a “marketable commodity.”⁴

The argument relying on Figure 1 simplistically assumes that the taxing authority knows the miner’s costs and revenues, and so can measure and, thus, can tax economic rent and economic rent only. In practice, the tax authority must decide which costs to allow as deductions. Inevitably, some true costs will not be deductible, raising the relative price of those costs and leading to a substitution

⁴See, for example, Petroleum Resource Rent Tax Assessment Act 1987 – Sect. 2, Defined Terms, “Marketable Petroleum Commodity.”

away from them: an input distortion that raises costs. The higher the tax, the greater this distortion – a 90 per cent tax raises the price of non-deductible inputs relative to deductible inputs tenfold.

For example, the proposed RSPT taxed income at the project level, with only mine gate costs deductible and revenues assessed back to the mine gate. In practice, mines such as the Rio and BHPB operations in the Pilbara are tightly vertically integrated production operations, involving close and ongoing optimisation between mine and non-mine assets that stretch from extraction to loading onto the ships at port (Ergas, 2009). It is impossible to isolate distinct “projects” within such a complex; nor is there any sensible way of allocating *ex post* income to the various stages, much less adequately recompensing miners for the substantial risky investment that has been made in the conduct of those operations. (Indeed, if they were capable of being readily allocated, transaction costs economics suggests the activities would not be carried out within a single firm but instead, would be coordinated through market transactions.) Rather, allocating *ex post* the income stream arising from this complex of activities into a resource rent on the one hand, and a return on non-mine operations on the other, is an exercise in metaphysics, not economics.⁵

The difficulties involved in such allocations are recognised in a Treasury Minute, dated 20 July 2010, obtained by the *West Australian* newspaper under Freedom of Information Laws (Department of the Treasury, 2010b). The Minute discusses proposals in respect of the RSPT made by the Fortescue Metals Group (FMG). The Minute says that “FMG has a vertically integrated mining and transport business,” which it notes, is “common” for that kind of mining operation. That integration raises issues about defining costs and revenues at the taxing point. FMG, in discussions with government, made proposals as to how this was to be done. Treasury, in recommending those proposals be rejected, recognises that “This is a difficult area of the RSPT and one that is crucially important in ensuring that resource value is not shifted to downstream operations.” However, it is surely equally obvious that there is the risk of income associated with those downstream operations being attributed to “resource value.”

For example, any allocation of a company’s managerial time, effort and expertise against a particular project will be arbitrary.⁶ Furthermore, some costs of rewarding managerial effort, such as bonuses, may not be deductible. The effect is to penalise cost-reducing and revenue-raising managerial effort.

The error associated with Figure 1, that the relevant cost curve is known to the taxing authority, is even greater for exploration. This needs to be broadly defined to include not merely prospecting but everything from initial geological probing to constructing the complex of financing and output contracts associated with large-scale mining operations. The return to exploration is clearly a return on effort. As is clear by the many exclusions on, and disputes about, what counts as exploration in the Petroleum Resource Rent Tax (PRRT), no practical reimbursement scheme can capture every dimension of that effort. Therefore, profits-based taxes will discourage investment in resource development. Royalties, at least at moderate levels, will not, other than for small, likely socially insignificant, mines.

Thus, a real-world profits-based tax⁷ distorts the input mix and directly reduces the incentive to minimise costs, shifting up the cost curve, resulting in an efficiency cost equal to the shaded area in Figure 2. As well as reducing output, the reduced cost efficiency incentive applies to all output produced (a “rectangle” of loss).

⁵A referee noted that although the assets (and other activities like R&D) complementary to the mine are not as geographically fixed as the resource itself, they are closely tied to the particular mine or well; that is, such investments are not perfectly mobile geographically, as our argument implies. However, our point is that the inputs required for those complementary investments and activities are themselves mobile across time, space and projects, before they are committed to the specific mine or well.

⁶In conventional accounting practice, these allocations are usually made on the basis of fully distributed costing (FDC) conventions. From an economic perspective, these FDC allocations are completely arbitrary; see Baumol *et al.* (1987).

⁷In a report on a Senate committee on the government’s mining tax proposals, Dr. Henry is quoted as saying that providing the MMRT was taxing pure profits, then it was not distortive (*The Australian*, 22 November 2010). This seems to be true by the definition of pure profits, and is not a statement about any feasible tax.

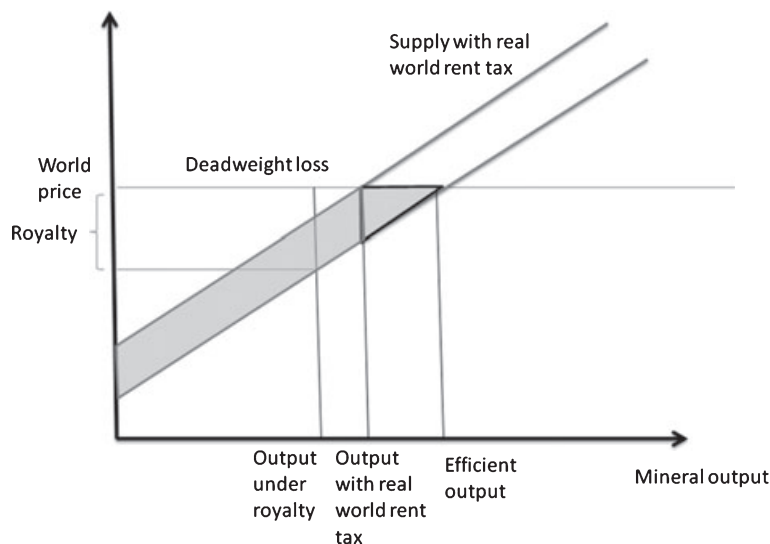


Figure 2. *The Efficiency Cost of a Real World Resource-Rent Tax*

In contrast, a royalty leaves the miner with an almost undiminished incentive to find the least-cost way of mining, but reduces output. Either a royalty or a profits tax (or some combination of the two) could be better for economic efficiency.

Capturing the Rent Value of the Minerals in the Ground

The review of *Australia's Future Tax System* (the "Henry tax review" or AFTS: Department of the Treasury, 2010d), concluded that, but for concerns about the effect of sovereign risk, an up-front auction is the best means for the owner of minerals to convert the rights to mine into cash. Assuming competition, the rights would be expected to sell at a price equal to the second-highest value that prospective miners hold.

For each specific situation there will be a rate of Brown tax that would gather the same revenue as an auction. Assuming, contrary to the argument made before, that the Brown tax has no incentive effects, the required rate of tax would be the ratio of the second-highest bid to the highest bid in an auction that did not take place – possibly the 90 per cent mentioned by Treasury Secretary Henry.

However, the Brown tax will have incentive effects; and large ones, if the rate is this high. There are no such incentive effects from an auction.⁸

1.2 The Brown Tax is a Tax

An essential feature of a tax is that there is no clear *quid pro quo*, except that the taxpayer avoids possible prosecution. There is an element of compulsion missing in market exchanges. Compulsion rather than allocative effects is what distinguishes taxes from prices.

Both an *ex ante* royalty and a Brown tax payable to the owner of the resource can properly be regarded as an agreed payment for the right to extract; neither are taxes – but the former has

⁸Despite the AFTS recommendation, the Discussion Paper issued by the Policy Transition Group that is designing the MRRT proposes to ensure States and Territories cannot capture the full rent from the resource by means of auctions. It does this by recommending that the amount paid for the resource to a State or Territory government cannot be counted as a deduction from the MRRT tax liability. The effect of this is to give the Commonwealth's claim priority and hence to lock in any distortion from the Commonwealth's tax.

efficiency effects. What, then, is the status of an *ex ante* Brown tax (or some variant) imposed by a government *other than* the owner of the resource?⁹

Ben Smith, one of the twenty-two signatories to a letter supporting the proposed RSPT, elsewhere argued that the *ex ante* RSPT is not “really” a tax (Smith, 2010a, p. 21).

The *ex ante* Brown tax is analogised as the government’s taking a τ fractional equity in a project: the government will refund τ times any cash outlays, and will receive τ times any cash inflows.

The operative word is “taking”: the government is not buying equity at the market price. If Brown-style equity funding is at least as attractive as ordinary equity or ordinary debt (and not illegal), then presumably it would be offered in ordinary financial markets. But maybe there is some kind of market failure, in the form of an inefficient gap in the range of financial instruments offered in the private market. This seems very unlikely to be the case. However, if it was so, then presumably miners would welcome and readily agree to take on a Brown tax to obtain the Commonwealth as a desirable equity partner.

Under the Brown tax and its RSPT version, however, the number τ is chosen by Commonwealth government and presented not on a “take it or leave it” basis, as happens in markets, but on the basis of “take it or go to gaol.” The element of compulsion would only disappear if the miner was allowed to choose the rate of Brown tax or RSPT (including zero).

Therefore, the analogy with equity is false: there is an element of compulsion in the Brown tax (and its *ex ante* RSPT counterpart) imposed by the Commonwealth. This makes it a tax, at least to some extent.¹⁰

2. The Retrospective RSPT

The Rudd government would have applied the RSPT to all projects, new and existing. It is obvious why the Labor Government wants to tax existing projects: the RSPT on existing projects would generate significant revenue and soon. In contrast, the RSPT on new projects will not yield positive tax revenues for maybe a decade.¹¹

However, by proposing to tax existing projects, the government has blurred the crucial distinction between two economic concepts, pure rents and quasi-rents.

Pure rents are payments made to a factor of production in excess of that necessary to bring it into existence. Consumers’ Federation of Australia Chair Catriona Lowe wrote (ACTU *et al.*, 2010): “Unlike many other products, the resources aren’t mobile – they are in the ground.” No payment was made or promised to Nature to put them in the ground; any payment to the owner of the resource is therefore pure rent.

In contrast, quasi-rents are payments in excess of the amount required to retain a factor of production in a specific use. Quasi-rents are the returns on productive inputs that are in fixed supply in the short-run but not the long. These are productive inputs, like capital, that would not exist except for the expectation of payment; but, once in existence, will be used even if their owner’s expectations are severely disappointed, so long as the revenue obtained exceeds variable cost (the excess being the quasi-rent).¹²

The RSPT on new projects is intended to tax pure resource rents and, thus, to have no incentive effects. Earlier we argued that this is an impossible ideal. We now argue that, by imposing the

⁹Under the Australian Constitution, the States and Territories, not the Commonwealth, own onshore mineral resources

¹⁰That is to say, the full cost to the miners would be less than the revenue collected through the Brown tax if the miners gain some (gross) benefit from the arrangement. Also, other investors lose from the arrangement, even if offered on an actuarially fair *ex ante* basis, to the extent to which there is now an equity partner (the government) who free-rides on the investment in monitoring undertaken by other shareholders. To the extent to which that free-riding induces other shareholders to reduce their own investment in monitoring, all investors are worse off.

¹¹Because some expenditure on rent-seeking activities would not have been deductible under the RSPT, the tax base for the *ex ante* RSPT could exceed the aggregate net rents. Indeed, in some circumstances rent-seeking may exhaust all the rents, yet all operating mines could pay tax under the RSPT.

¹²For simplicity, we are assuming that the factor of production has no alternative use.

RSPT on existing projects, the government will tax not only any residual pure rents but also quasi-rents. This defeats its stated purpose and risks wider damaging incentive effects.

As noted before, officials have analogised the RSPT to government taking a form of equity in mining ventures, and paying for it, as it were, with a promise of covering 40 per cent of any costs, including losses. Subject to how costs are defined and measured, and ignoring the element of compulsion discussed before, this could be a reasonable representation for new ventures. What miners could fear to lose on the roundabouts, they could hope to gain on the swings. Via the RSPT, the government becomes an equity partner in an uncertain prospect. The history of these projects, for good or bad, is all in the future.

For existing ventures, the analogy between the RSPT and taking equity does not work. Part of the history of existing project has happened. Government is not actually taking good times with bad. Rather, it has chosen to impose the tax when times are good, avoiding the threat of losses it would have borne in an actuarially neutral (i.e. fair) bet.

For new mining ventures, the promised cover for losses (if it can be believed)¹³ is worth something to the prospective miner: it is like an insurance policy with a 60 per cent deductible. For existing ventures, when their investment decisions were made, no promise of RSPT insurance-like cover for losses was then in place. A part, maybe a substantial part, of the value of the insurance-like cover for losses has been lost to the existing miners, for example, in exploration and exploitation ventures that never paid off and were terminated. Even for existing miners, many (perhaps all) of those costs have been written off, so that all those remaining on the books (and hence would come into the cost base for the RSPT) are the costs associated with the ventures that have proven successful.¹⁴

What then the RSPT amounts to is this: for those that have succeeded out of the universe of projects attempted, the government would be requiring that it be issued with equity at a price based not on the market valuation of those projects, but on some estimate of their depreciated initial cost. As a result, even if the RSPT deal was fair and equitable for new ventures (which we dispute), then it is unfair and inequitable for existing ventures, as it taxes the winnings without subsidising all the losses. Simply put, the retrospective tax is a partial expropriation of the value of the existing mines. The implied tax rate on equity is obviously greater for highly leveraged projects, in that the RSPT did not allow for deductibility of interest payments. Assuming (as is only realistic) that refinancing is costly, the entire burden of the RSPT would fall on the equity interest, potentially making actual returns negative (and driving highly leveraged projects into bankruptcy).¹⁵ The value of equity is the value of the firm less the amount of debt. If the government takes a τ per cent share of cash flows, it reduces the value of the firm by τ per cent, which could drive it below the value of debt, making the value of equity negative.

¹³The RSPT involved government taking on obligations to pay out, in the future, 40 per cent of deductible costs accumulated at interest. As calls on these implicit debt issues may fall due when economic conditions have damaged government fiscal positions, it seems unlikely that the promises would be taken at face value, and so they would not be “bankable.” One reason for the government choosing to carry-forward losses rather than immediately paying out a portion of losses as incurred is the large risk immediate payouts imposed on the government budget. But carrying the losses forward imposes large risks on future budgets. Indeed, the revenue reaped now from retrospective taxation of existing mines would reduce the chance that immediate payouts would contribute to a budget deficit, and this revenue may not be available in the future. The current willingness to tax retrospectively and unwillingness to pay out on losses raises expectations that the government may renege on its future promises.

¹⁴Accounting rules generally require the writing down of impaired assets, and the writing off of those assets which will not yield net accounting income.

¹⁵It is not unusual for the financing structure, and especially its debt component, for mining projects to be locked in at the start of project life. A case highly relevant to the RSPT – the financing structure of FMG – is discussed in the Treasury Minute mentioned before. The Minute refers to “FMG’s ‘bootstrap’ project financing, which involves lots of debt and little equity, with the debt repaid from project cash flows.” The Minute estimates that the RSPT would reduce FMG’s cash flows by over 100 per cent in 2013–2014 and by 90 per cent in 2014–2015. It is unclear how FMG would be able to meet its debt covenants given those impacts (Department of the Treasury, 2010a).

The Australian Council of Trade Unions (ACTU) and other organisations (ACTU *et al.*, 2010) say that “the nation’s minerals belong to us.” True, the States own the minerals before they contract with the miners, but the people of Australia do not own the minerals after the States contract away the right to mine, extract and sell them (in return for various payments from the miners).

The ACTU statement says that “The strong demand for our resource exports has sent resource prices soaring and delivered windfall profit gains to the big mining companies.” This sounds like an expression of seller’s regret: “Oh if only I had known that resource prices were going to soar, then I would have asked for more for the right to mine” (but see Section 3).

The many Australians who own shares in the mining companies directly (or indirectly via their superannuation funds) are not suffering from buyer’s regret from soaring resource prices.

Certainly, the Rudd government expected huge RSPT revenues from existing mines. A sufficient explanation is that the new impost will not cause existing mines to vanish: the owners will make the most profit or the least loss by continuing to operate their mines pretty much as planned, so long as they cover running and maintenance costs. Mining capital, once in place, has little value outside its current employment. Therefore, if the government imposes a levy or tax on the capital of existing miners, they will not like it, but they will continue to mine (for the while), and pay the tax. It will be paid out of quasi-rent, the difference between net revenues from continued operation and from not operating.

A similar super-profits tax suddenly imposed on all Australian industries would likewise yield immediate and enormous tax revenues. It would, however, give rise to concerns about expropriation and sovereign risk, and would discourage risk-taking and investment.

3. A Case for a Retrospective RSPT?

In their necessarily brief statement, the twenty-two economists and others (Argy *et al.*, 2010) did not have space to spell out an argument for retrospectivity – although two of them, John Freebairn (in Martin, 2010) and Smith (2010b), had previously mounted vigorous defences. The only statements that went somewhat towards a case for retrospectivity are that

The RSPT will reduce the profitability of mining companies and the value of exploration and mining rights allocated to them by Australian governments on behalf of the public. The current high profitability of these companies means that this is an appropriate time for them to adjust to a more efficient and equitable system of sharing the value of those rights.¹⁶

As a support of a proposal for one of the largest, if not the largest, retrospective imposition of taxes, the statement of the twenty-two does not seem strong. After all, some retrospectivity may be inevitable in most policy changes, but here it was not an incidental feature of the policy: rather, what was proposed was first and foremost a retrospective tax grab.

However, perhaps a case of kinds can be made.¹⁷ It starts with the claim that all but corrective taxes cause misallocation of resources, and all violate some norms of fairness. So it is not a decisive argument that the retrospective RSPT is distorting and unfair. But we need some criteria to sort

¹⁶The last sentence may deliberately echo what was said in another context, namely, that a good time to cut the tariff is when the economy is doing well, even booming; and a bad time is when the economy is weak. (Elsewhere, Freebairn compared tariff cuts with new taxes.) Of course, the Hawke and Keating governments did more than merely promise a pause in tariff cuts if and when unemployment rose significantly. These governments also implemented a set of mutually supporting microeconomic policy changes, starting with financial and exchange rate deregulation: competition policy was extended to the public enterprises; anti-competitive regulation and legislation was reviewed; the Accord was signed and large steps were taken towards deregulation of labour markets. And, closer to tariff policy, specific industry plans were devised for the sectors hardest hit by tariff reductions, especially metal industries, motor vehicles, and textiles, clothing and footwear (TCF).

¹⁷Note that we do not pretend that we are channelling the twenty-two, so these arguments may not appeal to them.

out acceptable from unacceptable violations of the norms of efficiency and fairness. We outline the arguments next, but ultimately find them unconvincing.

It is convenient to start with efficiency. Presumably, on the usual grounds government should favour taxes that have a low ratio of excess burden to revenue. Thus, the question becomes "Is a sudden RSPT levied on the miners such a tax?"

In the absence of an effect on sovereign risk, we would guess that the retrospective RSPT would have a reasonably low ratio of excess burden to tax revenue collected. Most of the present value of the tax revenue would come from the imposition of the RSPT on existing mines. It was argued earlier that the RSPT on existing mines falls mainly on quasi-rents. If so, then it may have a less distorting effect (per unit of revenue) than the usual company tax. (Under the RSPT, company tax remains payable, so the distortion it involves does not disappear. However, the economy-wide company tax rate was to be reduced, presumably in part relying on the revenues from the RSPT.)

The greatest uncertainty is the size and persistence of the effect on investor concerns about sovereign risk in Australia. Although it has been claimed that this effect has been large and will be lasting, the counter argument is that if no such repeat move is made, then the concerns will decline and the costs will fall.

Turning to consider acceptable violations of equity or fairness, there is one kind of argument floating around the discussion which we believe should be rejected. It is the suggestion that somehow the miners have stolen or defrauded the Australian public of a rightful share of mineral wealth; and that a retrospective tax is condign punishment. In fact, the owners of the resources, the sovereign States and Territories, entered into voluntary agreements with the miners; and usually boasted about them. Often the agreements involved companies competing for the mining rights and bidding away expected rents with promised obligations to the state governments. Moreover, the incidence of the tax would not primarily be on mining executives, but on ordinary shareholders (directly or as investors in superannuation funds), many of whom may have purchased shares long after the venture was given State or Territory approval.

But another equity argument could be made. Many contracts include (or the common law infers) clauses of *force majeure*: when unpredictable external events occur, against which no reasonable provision could be made, then all or part of a contract can be set aside.

So the argument could be that, when agreeing to granting mining rights in return for royalties and other considerations, State governments and the miners could not have reasonably expected that the demand for iron ore and coal from China and elsewhere would be as great as it turned out to be. Some State government royalty schemes do allow for higher *ad val.* rates when mineral prices rise above some level, but (so the argument would have to go) no one could reasonably have imagined that the prices would have gone to the levels reached in recent years. Therefore, *ex post* renegotiation of contracts could be reasonable and fair.¹⁸

And it may be in the best long-term interests of some international mining companies: in the absence of the possibility of retrospective renegotiations, future Australian governments may become excessively wary of agreeing to contracts with miners.¹⁹

But none of these arguments is especially convincing. The first, that the tax may be reasonably efficient, rests on the strong assumption that the retrospective grab will have little or no effect on perceptions of sovereign risk, or if it does, that the consequences will be less costly than the social value of the revenue raised. This flies in the face of theory and evidence; rather, it can be

¹⁸And, symmetrically, if mineral prices turn out to be very much less than reasonably expected, it would be reasonable and fair for governments to revise mining taxes downwards (and even refund some upfront auction payments, or expenditure on required work programmes). However, few may take this possibility seriously.

¹⁹Notice that this argument is not that same as the arguments for taxing the winners in a fair lottery (which are that the demand for lottery tickets is not very responsive to the degree to which the lottery is actuarially "unfair;" and that such taxes reduce feelings of envy: only the latter could be used in the case of the RSPT, if we ignore capital gains taxes and focus on "foreign" winners).

shown that once governments expropriate, their incentives to expropriate in future rise,²⁰ making the cost (in terms of foregone revenue-raising opportunities) of reestablishing a reputation for not expropriating greater. These costs, which (like all investments in a reputation for trustworthiness) take the form of investment in conspicuously good behaviour, have been entirely ignored in the debate. Given that Australia has many resources left to develop, and that even at existing sites there are substantial expansion decisions to be taken, the costs of expropriating now (in terms of future higher required rates of return on new mining investment) are likely to be substantial.²¹

As for the argument that the high incomes from mining were unforeseen, and that it may be in the interests of the miners to allow government to share in those incomes, that seems questionable on both factual and analytical grounds. Far from the gains being unforeseen, it was widely believed, when the resources were discovered, that they would dramatically increase Australia's incomes.²² What is also clear, however, is that exploiting those resources involved enormous risks: after all, at that time, China was still reeling from the Great Leap Forward while Japan's largest export items were clothing and textiles. Little wonder then that to attract the investment and entrepreneurial skills required, the West Australian State government committed to relatively favourable tax treatment. To paint the RSPT as a response to surprise (rather than as a grab of winnings that *ex ante* were viewed as possible but uncertain), seems contrived.²³

As for the claim that the miners are better off accepting the tax, as the alternative may be worse (for instance, a reluctance to allow new resource development), this too is rather stretched. After all, what is proposed by the AFTS Report is that new resources be auctioned off; it is difficult to see how a threat not to proceed at all (i.e. to forego the auction revenues) could be credible, especially as mining development remains under the control of the States.

Moreover, if what the Commonwealth wants to do is signal a willingness to facilitate further resource development in exchange for a greater revenue share from current projects, it is by no means clear that an RSPT, especially a retrospective one, is an effective signal. Rather, one might have thought a "super-royalty,"²⁴ linked to output volumes, would be a more credible commitment to facilitating future development, as the revenue that the Commonwealth would obtain would depend on expanding production. In contrast, the link to production in the RSPT is at best indirect.

As a result, if there is a case for so large, and so explicitly retrospective, a tax grab, it remains to be made.

²⁰This is because the expected revenue in future resource auctions decreases, so the new equilibrium involves lower upfront revenues, and more frequent expropriation; see Tomz and Wright, 2008.

²¹The issues are the same as those that arise in other areas: expropriation of quasi-rents is socially profitable only if the efficient level of new investment is very low relative to the existing stock of investment, that is, if the vast bulk of the capital efficiently required is in place; see Levine *et al.* (2005). And of course, if there are demonstration effects (so that the government's behaviour with respect to any one sector influences perceptions of how it may behave in other sectors), then the relevant issue is the required flow of investment in the economy as a whole.

²²See, for instance, Treasury (1962) which refers to the resources identified in Western Australia as "the greatest breakthrough in point of resources since the crossing of the Blue Mountains a hundred and fifty years ago," which will "beyond doubt, lift the horizon of Australian growth quite incalculably." It is also clear that Treasury viewed the potential income from new projects as very high in the late 1970s (when the Fraser government expected very high levels of investment in new mining projects), although also recognising that those investments involved substantial risk.

²³Data from the Australian Bureau of Statistics show that from 1987 to 2009 the nominal before-tax rate of return on capital in the mining sector averaged 12.5 per cent. This seems low relative to the cost of capital, suggesting that any rents have been dissipated.

²⁴By this we mean simply a supplementary royalty. Such super-royalties have been used in mining taxation in Australia. For example, they were provided for in certain circumstances under the former New South Wales Coal Mining Act 1973 and until 1 July 2004 under the New South Wales Mining Act 1992.

4. The MRRT

Following negotiations between the newly installed Gillard government and the three largest miners, the RSPT has now been replaced by the MRRT, to be implemented as of 1 July 2012. The MRRT, which (at least at this stage) will apply only to coal and iron ore, has a nominal 30 per cent tax rate applied to cash flow less an allowance for capital costs (both determined at the mine gate), with any negative cash flow carried forward at the long-term bond rate plus 7 percentage points.²⁵ (In fact, the effective tax rate on gross profits is significantly lower than that.) Existing state royalties will be creditable but not refundable or transferable, so that they will be paid in full by projects whose returns do not exceed the threshold for liability. As a result, the MRRT keeps the main inefficiencies of royalties and adds the inefficiencies of a rent tax. For example, royalties discourage production from mines near the end of their life, causing them to shut down too early. But that is precisely when profitability is likely to be low, so there are insufficient resource-rent tax payments against which to credit the royalty payments.

Overall, the MRRT is likely to be an extremely inefficient tax, more distorting than the RSPT. To begin with, because the MRRT is triggered by a rate of return threshold, it alters the *ex ante* distribution of rates of return. (In this it contrasts with a Brown tax, which alters the expected value of a project to investors but leaves its expected rate of return unchanged.²⁶) The effect is to discourage high-risk projects (as they require a high rate of return, which, if achieved will be taxed), while leaving unchanged the viability of low-risk projects (which will be financed even at a lower expected rate of return). As a result, the MRRT will distort investment away from risky projects (including risky ways of reducing costs at existing mines). Accentuating the resulting inefficiency is the fact that marginal projects will continue to pay royalties (as the return on those projects will not exceed the MRRT threshold and hence will lack the tax liabilities against which royalties could be credited), so that the royalty distortion will remain at the lower end of the project distribution, while the MRRT distortion will cut in at the higher end.

The nature of this “distribution distortion” (see Zeckhauser and Wernerfelt, 2010) can be seen from Table 1. Panel (a) refers to a project that involves an investment cost of 100, a carry-forward rate of 13 per cent and has a gross return before tax of 109 in a recession and of 143 in a boom, with those two states of the world being equally likely, so that the expected return is 126. Assuming that the MRRT is applied at a 30 per cent rate,²⁷ the MRRT reduces the expected return on investment from 26 to 21.5 per cent, an effective tax rate of 17.3 per cent. In contrast, in panel (b), while the project still involves an initial investment cost of 100, and still has an expected return of 126, the gross pre-tax return is far more variable, being 0 in a recession and 252 in a boom. By truncating the (necessarily greater) upper side, the MRRT reduces the expected rate of return on the more risky project from 26 to 5.15 per cent, an effective *ex ante* tax rate of 80.2 per cent. As a result, it seems highly likely that projects such as that in panel (b) would not proceed, while projects with a payoff structure such as that in panel (a) will.

²⁵The rate of return threshold is given effect by a provision that allows costs to be capitalised at the long term bond rate plus 7 percentage points. As investment outlays made once the tax is in effect can be written off immediately, the resulting rate is the rate above which there is a tax liability. For example, an entity that spent \$100 on developing a project in year 1 would be allowed to carry forward that expenditure at a rate of $1 + r$, where r is equal to the long term bond rate plus 7 percentage points. If revenues in year 1 are less than $100(1 + r)$, then MRRT is not payable, and the shortfall can be carried forward again at the long term bond rate plus 7 percentage points.

²⁶Assume a Brown tax in which government contributes 40 per cent of costs but takes 40 per cent of revenues. As revenues and costs fall proportionately, the expected rate of return is unchanged. Obviously, compared with a situation without a Brown tax, the expected value of the project to investors is reduced by 40 per cent.

²⁷The actual tax rate in the MRRT is considerably more complex than this, but we use the “headline” rate to illustrate the point. If anything, the distribution distortion is stronger in the tax as actually proposed.

Table 1. *The Effect of the Minerals Resource Rent Tax (MRRT) on a Less Risky and More Risky Project*

Panel (a): Less risky project			
State	Gross return before tax	MRRT payment	Gross after-tax return
Recession	109	0	109
Boom	143	$9 = 0.3 \times (143 - 113)$	134
Expected value	126	4.5	121.5

Panel (b): More risky project			
State	Payoff before tax	MRRT payment	Payoff after tax
Recession	0	0	0
Boom	252	$41.7 = 0.3 \times (252 - 113)$	210.3
Expected value	126	20.85	105.15

But there are other distortions as well. Because the MRRT depends on the rate of return relative to the carry-forward rate, it can give rise to an Averch–Johnson distortion, in which it is profitable for low-risk projects (whose weighted average cost of capital is less than the tax-free rate of return) to increase their capital intensity or to postpone production (thus accumulating credits at the threshold rate, which is greater than the weighted average cost of capital (WACC)). Additionally, it may be profitable to smooth costs and revenues inefficiently (thus avoiding high return periods) if this reduces the MRRT tax liabilities. Finally, the MRRT, which is intended to only apply to earnings from the “resource in the ground” (i.e. excluding entrepreneurial income associated with investments beyond the mine gate), will encounter all the difficulties that have bedevilled the PRRT, on which it is loosely based, as to the allocation of costs and revenues between mine and non-mine assets.²⁸ It will, in other words, have to address the issues raised in section 1 with respect to cost and revenue allocation, with the resulting distortion of incentives to cost reduction and revenue expansion – but with those distortions interacting with the distribution distortions to risk-taking and with the distortions because of royalties.

Overall, the MRRT’s impact will be threefold: it will make investing in Australian coal and iron ore projects less attractive compared with investing in these resources overseas; within Australia, it will shift investment from coal and iron ore towards resources that are not subject to the tax; and finally, within Australian iron ore and coal projects, it will penalise projects that have high risks (and therefore require high expected rates of return if they are to be undertaken), relative to projects with lower risks.

These impacts are not free of distributional consequences. Rather, the MRRT is relatively favourable to mining entities that have four characteristics. First, their Australian projects are mature, hence have required rates of return below (and possibly well below) the MRRT threshold of the long-term bond rate plus 7 percentage points. Second, they have a portfolio of projects within Australia, and hence can benefit from the proposed transfer-of-credit rules in the MRRT (which facilitate the transfer of unused credits within a corporate entity relative to their transfer by sale

²⁸After twenty-four years of operation, there remain substantial areas of dispute in tax law as to liability under the PRRT, including: the delineation between exploration and development activity; the treatment of indirect expenses; the precise definition of the taxing point; the requirements for substantiation of expenditure; and the precise scope for transfer of expenditure between projects. Several of these issues are the subject of current litigation, and are likely to make their way to the High Court. Unlike the MRRT, the PRRT specifies different carry-forward rates for different types of investment (exploration, development and so on), which reduces somewhat the distribution distortion (as the more risky phases attract higher carry-forward rates) but creates additional implementation complexities.

between corporate entities).²⁹ Third, their Australian projects have high current market values, and hence will benefit from the starting valuation rules for the MRRT, which reduce the entry liability for projects with high current market values.³⁰ Fourth, they can readily shift investment overseas, and hence can continue to pursue higher-risk projects, but in jurisdictions where the MRRT's distribution distortion does not apply.

It is easy to see that these characteristics closely match those of the three mining companies (BHPB, Rio and Xstrata) that negotiated the MRRT with the Gillard government. Unsurprisingly, the tax which emerged from those negotiations minimises the adverse impact on these entities while likely harming the market prospects of smaller miners (whose projects are typically riskier) and imposing substantial efficiency losses on the Australian economy as a whole.

5. The Value of the Revenues

Public discussion of, including government commentary on, the RSPT and now the MRRT has focussed on the "rivers of gold" that it is claimed these taxes will yield. However, these claims embody fiscal illusion. When valued appropriately, the transfer of wealth from the miners to the taxpayers is less, possibly far less than is suggested by Treasury estimates of tax collections.

As we have noted, the RSPT amounts to a compulsory acquisition of equity (at a price based on the original investment cost of the project). In contrast, the MRRT amounts to a compulsory acquisition of a call option on income from the project above a specified rate of return. Both these incomes streams are risky. The issue then is their value to taxpayers.

In effect, when taxpayers "invest" in a mining project, they are taking on a degree of risk that requires compensation. In a classic article, Arrow and Lind (1970) showed that if a government project is "small" (in relation to the total wealth of taxpayers) and "the returns from a given public investment are independent of other components of national income," then the social cost of risk for project flows that accrue to taxpayers tends to zero as the number of taxpayers tends to infinity.³¹ That is, government investments with fully diversifiable risks spread over many households should be evaluated using the riskless rate.

However, the risks associated with mining projects are not fully diversifiable. Rather, the state of the economy determines the degree to which the relevant assets are used and the value of the services they provide, so that, contrary to Arrow and Lind's assumption, the project returns are not independent of overall incomes. As a result, there is an element of systematic risk attached to the project's net benefits: and as Bailey and Jensen (1972) put it, the mere fact of public financing does not reduce the social cost of that systematic risk, or the need to reflect it in the discount rate, by "one iota."

This suggests that the discount rate for the income stream from the RSPT would be pretty close to the private sector cost of equity for mining projects: given how deep and broad global equity

²⁹While the precise rules are still being defined, it seems that credits associated with royalties, for instance, will be transferable within but not between entities.

³⁰On transition an amortisable starting base choice is available of either: (i) the last audited book value at 1 May 2010 of the tangible mine site improvements and assets (excluding value of the resource). This is amortised over five years and the underappreciated value uplifted by LTBR plus 7 percentage points; or (ii) the market value of all the mine assets including the value of the resource. This is amortised over the effective life of the assets (not exceeding twenty-five years). Capital expenditure up to 1 July 2012 is then added to the starting base. Compared with the RSPT, this provision is favourable to the larger established miners, as the value of the future revenues from the resources they are currently mining are allowed to be capitalised into the starting base. (That value was excluded from the proposed entry valuation base for the RSPT.) The impact will be to reduce these miners' tax liability, all the more so as the major miners are undertaking substantial expansion projects which will be added onto the entry cost base. Another Treasury Minute obtained by the West Australian discusses the MRRT and warns against allowing use of market valuations as that would pose "significant risks for the integrity of the MRRT" because companies would inflate the value of their assets to reduce the tax they paid (Department of the Treasury, 2010c). That said, the proposed depreciation rules for the starting base have the effect of front-loading the (reduced) tax liability and are in that way consistent with the Labor Government's objective of securing a large initial revenue flow, albeit at the expense of reduced and more risky tax revenues in future.

³¹This is the so-called Arrow-Lind theorem.

markets are, it is unlikely that Australian taxpayers would bear the systematic risk associated with mining investments at much lower cost than that those global markets require. An economically meaningful presentation of the expected revenue stream from a Brown tax would take account of this valuation effect, and discount those revenues materially.

Matters are even starker for the MRRT, which gives taxpayers a call option on the miners' income stream. Such a call option can involve a high degree of risk, as is readily illustrated by an example.

Thus, assume an existing mine generates a net income stream of \$143 in a boom or \$109 in a slump, with the two being equally likely, giving a next period expected payoff of \$126.

To value this project, we use the Capital Asset Pricing Model (CAPM), which requires knowledge of market returns in each state so that we can work out how the project's returns co-vary with the market. Assume therefore that the market return is 13 per cent in the boom and 5 per cent in the slump (with an expected return of 9 per cent). Assume that the risk-free rate is 6 per cent.

Given these assumed parameters, the asset beta is 1.88,³² which gives the required return of: $6\% + 1.88 \times (9 - 6\%) = 11.65\%$. The value of the project is $\$126/1.1165 = \112.85 , which gives a return of -3.4 per cent in the slump and 26.7 per cent in the boom, for an average of 11.65 per cent.

If the project costs \$100, the present value of the rent is \$12.85. If we impose a Brown tax of 30 per cent on the project, the government would pay out \$30 in the first period and raise either \$42.9 ($= 0.3 \times \143) or \$32.7 ($= 0.3 \times \109) the following period. The expected value of the revenue in the second period is \$37.8. If the revenue was certain, the present value of the net revenue raised would be $\$5.66 (= \$37.8/1.06 - \$30)$. But the revenue is risky. As the Brown tax takes a share of the project, it has the same beta as the project and a discount rate of 11.65 per cent should be used to calculate its value. The market value of the Brown tax revenue is $\$3.86 (= \$37.8/1.1165 - \$30)$, which is 30 per cent of the rent ($0.3 \times \$12.85$). The market value of the revenue is only 68 per cent of the expected value.

The difference between the expected and market values of the Brown tax revenue (\$1.80) is the compensation for the risk tax payers now bear. It is the tax rate times the relevant risk premium, $0.3 \times 5.33\% \times \112.85 .³³ As the risk premium is usually at least half or more of the return, a substantial portion of the revenue raised merely compensates taxpayers for the extra risk imposed by the tax. Note that the CAPM model assumes that all diversifiable risk (e.g. from having many different projects at different stages) is indeed diversified and the risk premium compensates for systematic risk, which cannot be diversified by anyone, including the government.

A resource-rent tax makes taxpayers forced shareholders in mining firms and imposes non-diversifiable risk on them. The extra risk is costly, and makes taxpayers worse off unless they receive an appropriate share of government spending as compensation. In contrast, private equity shareholders choose to bear the risk and receive higher expected returns to compensate.

Now bring in an MRRT which has a carry-forward rate of 13 per cent and a tax rate of 30 per cent. The cost base is \$100 and so no tax is paid in the slump and $0.3 \times (\$143 - \$113) = \$9$ in tax is paid in the boom. The expected value of the tax revenue in period 2 is therefore \$4.50. The tax is equivalent to a call option for 30 per cent of the revenue at a strike price of \$113. How much then is the tax revenue worth? The tax gives a payoff of \$9 in the good state and \$0 in the bad state. The market value of this call option in period 1 is $\$2.65 = \$4.5/1.696$.³⁴ In other words, valued in the conventional way, the revenue, merely one period ahead, is worth only some 60 per cent of the headline tax take. This reflects the option's very high beta (21.2), which implies a very

³²In the CAPM model, if the market return is R_M and the asset return is R_k then the beta for asset k is $\text{cov}(R_M, R_k)/\text{var}(R_M)$.

³³The WACC is 11.65 per cent and the risk-free rate is 6 per cent; so, the risk premium is $1.1165/1.06 - 1 = 0.0533$ or 5.33 per cent. A referee stressed that the part of the revenue collected from the risk premium is "dead revenue," which merely compensates taxpayers for the risk transferred to them. The certainty equivalent tax revenue is the appropriate measure of the consumption expenditure that the revenue can fund.

³⁴A portfolio of the company and -3.78 units of the option would give a certain outcome and so must earn a return of 6 per cent, the risk-free return.

high discount rate.³⁵ The option gives a return of 239.2 per cent in the boom state and –100 per cent in the slump state, with an expected return of 69.6 per cent.

In short, far from yielding “rivers of gold,” such taxes yield highly risky returns, which taxpayers would rationally discount substantially in arriving at an estimate of the social value of the income stream.³⁶ However, the promise of such “rivers,” unaccompanied as it is (not least in AFTS) by any qualification as to the risk being placed on taxpayers, encourages fiscal illusion, that is, an underestimate of the social cost of funding spending commitments. This seems to make it more likely that such taxes will serve to increase low value public spending, compounding the inefficiencies involved in raising the revenue.

6. Conclusions

Although it is beyond a short paper to present definitive arguments about what would be the best forms of mineral taxation, we do offer the following suggestions and comments:

1. Any new Commonwealth mining tax should
 - (a) apply to new ventures only;
 - (b) be levied at a modest (internationally competitive) rate.
2. Any new arrangements should form part of a broader agreement with the States and Territories on the future of intergovernmental fiscal relations, rather than adding to the common-pool problems of vertical fiscal competition.
3. Current Commonwealth Grants Commission (CGC) policies redistribute a State’s mineral tax collections to other States. This reduces the incentive for States and Territories to introduce efficient allocation of exploration and mining rights and efficient taxation of minerals; and encourages States to use work-programme bidding for mining and exploration rights, rather than cash auctions. To obviate these distortions, the CGC should be required to treat the proceeds of auctions of new exploration and mining rights, royalty payments and state mining profit taxes as capital receipts with zero net effect on the jurisdiction’s balance sheet. Furthermore, payments that mining companies make to State governments under these arrangements should be deductible against any Commonwealth tax, to give priority to State government imposts, thus preserving the incentive to tax these resources efficiently.

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³⁵The required rate of return is $6\% + 21.2 \times (6 - 3\%) = 69.6\%$, which implies a risk premium of 60% ($= 1.696/1.06 - 1$).

³⁶A further Treasury Minute (Department of the Treasury, 2010a) obtained by the West Australian discusses a report by accountants Ernst and Young which notes that the RSPT would “have the unintended consequence of increasing the volatility of Australian tax revenue.” The Minute disputes this, stating that the added volatility “isn’t an unintended consequence – it’s a deliberate design feature.” Perhaps, but this feature and its implications were never mentioned by Treasury in its defence of the proposed tax.

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