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REVIEWING THE FISCAL REGIME FOR MINING

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ABBREVIATIONS AND ACRONYMS

AETR	Average Effective Tax Rate
AHMSA	Altos Hornos S.A.
ACE	Allowance for Corporate Equity
ALP	Arm's Length Price
APA	Advance Pricing Agreement
AUD	Australian Dollar
BPL	Bone Phosphate of Lime (content in phosphate rock)
CIT	Corporate Income Tax
CF	Cash Flow
DSBC	Dead Sea Bromine Company
DWT	Dividend Withholding Tax
DSW	Dead Sea Works
FAD	Fiscal Affairs Department
FARI	Fiscal Analysis of Resource Industries
FAS	Free Alongside Ship
FOB	Free On Board
GDP	Gross Domestic Product
ICL	Israel Chemicals Ltd.
IMF	International Monetary Fund
IWT	Interest Withholding Tax
LME	London Metal Exchange
METR	Marginal Effective Tax Rate
NIS	Israeli New Shekel
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
PSA	Production Sharing Agreement
pct	percent
TA	Technical Assistance
US$	United States Dollar
USGS	United States Geological Survey
VIT	Variable Income Tax

PREFACE

In response to a request from Hon. Yair Lapid, Minister of Finance, a technical assistance mission from the IMF Fiscal Affairs Department (FAD) visited Jerusalem from February 13 to February 27, 2014 to support the work of the Sheshinksi Committee in reviewing the fiscal regime for mining. The mission comprised Michael Keen (Head), Peter Mullins, Oana Luca (all FAD), and Roderick Eggert (FAD expert).

The mission met with Mr. Lapid and members of the Sheshinki Committee: Prof. Eytan Sheshinski, Chairman of the Committee; Prof. Eugene Kandel, Head of the National Economic Council at the Prime Minister's Office; Dr. Adi Brender, Head of the Macroeconomics and Policy Division in the Research Department, Bank of Israel; Adv. Avi Licht, Deputy Attorney General, Ministry of Justice; Mr. Udi Adiri, Budget Department, Ministry of Finance; Ms. Rachel Birenboum, Legal Counsel, Israel Land Authority; Ms. Frida Israeli, Director of State Revenue Department, Ministry of Finance; Ms. Galit Cohen, Director of Sustainable Development, Ministry of Environmental Protection. The mission also appreciates the time given by many other senior officials of each of these ministries and agencies.

The mission met with representatives of the ICL Group (including Mr. Nir Gilad, chairman of the ICL Board; Mr. Avi Doitchman, Executive Vice President, CFO; Mr. Dani Chen, Executive Vice President Corporate Relations; and Mr. David Tadmor and Ms. Efrat Cohen, Tadmor&Co lawyers) and visited the potash mining operations at the Dead Sea. The mission also met with Professor Jack Mintz, advisor to the Sheshinki Committee.

The mission appreciates the excellent cooperation and support of the authorities. Professor Eytan Sheshinski provided excellent guidance, feedback, and support for the mission. The mission acknowledges particularly the work of Ms. Adi Hachmon and Ms. Norden Shalabna (members of the Ministry of Finance Secretariat to the Sheshinski Committee), who arranged the program of the mission and provided important data, information and advice to the mission.

EXECUTIVE SUMMARY

This report is provided to support the work of the 'Sheshinski II' committee in reviewing the fiscal regime for mining. Mining is, and will remain, relatively minor both as a source of government revenue and within the wider economy. Nonetheless, it is important that the fiscal regime deliver to the public an appropriate share of the return to the exploitation of resources that they own while also providing investors with a sufficiently attractive and stable environment. To that end, this report reviews principles, experience and tools in mining taxation, bringing them to bear on the analysis of, and suggesting potential improvements to, the current regime.

The current use of royalties as the sole and in some cases quite burdensome special fiscal instrument for mining is problematic. One of the primary benefits of royalties—that they ensure some revenue from the start of production—is of limited relevance in Israel, where production is highly mature and exploration minimal. More to the fore is their ineffectiveness in achieving one of the primary goals that warrants a special fiscal regime in the extractive industries: the prospect of designing a charge on rents—returns, that is, in excess of the minimum required by the investor—that can raise revenue without distorting commercial decisions. Their insensitivity to profitability means that royalties not only fail to do this, but, perversely, imply that the government actually takes a smaller share of rents when commodity prices are high; and, conversely, that the company faces a very high effective tax on its profits when those profits are low. Simulations reported here show that these undesirable effects are very marked under the current fiscal regimes. Indeed cutting top marginal royalties-even in the absence of any other reform—would in some cases almost certainly increase both government revenue and after-tax profits.

Alternative fiscal regimes—combining a modest mineral-specific royalty with a common profit-based tax—would resolve this structural weakness. The focus of the report is not on the level of the 'government take' from minerals—ultimately a political choice—but on how that take varies with the profitability of the underlying investment. To that end, it reports illustrative simulations (for a hypothetical but not unrealistic project) of alternative fiscal regimes that imply the same government take in a benchmark case but respond very different to project profitability. These alternatives combine a relatively low royalty—which may have some merit in protecting the base against tax avoidance through cost manipulation—with four alternative forms of profit-based tax (retaining, in all but one, the current corporate income tax); and consider too the possibility of converting the royalty into, in effect, prepayment of a profit-based tax. These options differ in important ways—in the required statutory rate of the profit tax, transitional issues, and the time path of government revenues. But they all address the key structural problem, providing structures in which the effective tax rate is lower, not higher, for less profitable outcomes.

Fiscal regimes of broadly this kind are (increasingly) commonplace in mining, including in major mineral producing countries. The treatment they provide would be similar to, but could be simpler than, that adopted for oil and gas following 'Sheshinski I.'

I. INTRODUCTION

A. 'Sheshinski II' and This Report

1. **This report is to support the work of the 'Sheshinski II Committee' established by the Minister of Finance in June 2013.** The mandate of the committee[1] is to review the overall fiscal mechanism that is applied to natural resources other than oil and gas.[2] The Committee (due to report in June 2014) is to make particular reference to Dead Sea minerals—meaning essentially potash, phosphate and bromine—which are the main minerals extracted in Israel. The committee is also to consider the implications of existing agreements that guarantee some degree of stability in relation to royalties. This report does not consider the issues arising from these agreements, but focuses on the economics of the current fiscal regime for mining and alternative structures.

2. **The report is structured as follows**. The remainder of this chapter provides an overview of the mining sector and its current fiscal treatment. Chapter II reviews principles and experience in mining taxation; Chapter III reviews the current fiscal regime and considers alternatives to it. Chapter IV considers issues related to the pricing of minerals for fiscal purposes.

B. The Nature and Significance of Mining in Israel

3. **The mining sector in Israel is a small but important part of the national economy, and plays a significant role in the world production of some minerals.** Mining and quarrying sector accounts for less than 1 percent of GDP and directly provide around 4,000 jobs. Israel is one of the world's two largest bromine producers, and the sixth (or so) largest potash producer. Mining of potash, bromine, magnesium and phosphate is undertaken by one large Israeli conglomerate. Potash, bromine and magnesium are extracted from the Dead Sea, while the phosphate mines are located in the Negev desert. Appendix 1 provides more detail on activities and pricing developments for these minerals

4. **Revenue from mining royalties has been increasing, but remains only a small component of total government revenues.** Table 1.1 shows royalty revenues by the principal minerals from 2008 to 2012, potash being by far the main source. Revenues from royalties have been highly variable over this period, reflecting the volatility in world prices. They accounted, however, for only about 0.12 percent of total government revenues in 2012 (about 0.04 percent of GDP). In addition, however, the sector pays corporate income tax (CIT) and withholding tax on dividends, as well as other taxes and charges. Detailed figures are not available, but government receipts from these sources are likely to have been larger, overall, than those from royalties.

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[1] As described in the Ministry of Finance press release of June 17, 2013.

[2] The fiscal treatment of oil and gas were the subject of the 'Sheshinski I' (2013) report. This recommended a combination of royalty and progressive rent tax, which has been adopted.

Table 1.1. Royalty Revenues 2008–2012 (million shekels)

Mineral	2008	2009	2010	2011	2012
Potash	306.7	139.1	204.9	376.7	352.2
Bromine	32.2	21.0	30.1	42.3	44.2
Magnesium	6.2	3.0	2.5	3.9	4.3
Phosphate	22.3	7.4	12.5	20.2	17.6
Total	367.4	170.6	250.0	443.3	418.4

Source: Ministry of Finance.

C. Current Fiscal Regime for Mining

5. **The current fiscal regime for the mining sector is a tax/royalty regime.** The royalty rates for potash, bromine and magnesium were originally included in the Dead Sea Concession Law 1961, but have been amended from time to time in agreements with the concession holders. The royalty rates for phosphate, other minerals and quarry aggregates, are determined under the Mining Ordinance of 1925. The income tax rules are set out in the Income Tax Ordinance of 1961.

6. **Royalty rates vary depending on the mineral:**

- ***Potash***: 5 percent of the value of sales of up to 1.5 million tons per year, and 10 percent rate above that. The base is the gross sales price reduced by costs of packaging, sales fees, insurance and transport, with the result of this calculation further reduced by 10 percent. The additional 10 percent reduction in the royalty base means that the effective royalty rates are 4.5 and 9 percent for each tier. In practice, production of potash commonly far exceeds 1.5 million tons; the average royalty rate, given production commonly now around 3.6 million tons, is about 7.1 percent.[3]
- ***Bromine and magnesium***: 5 percent, on the same base as for potash
- ***Phosphat***e: 2 percent, although this is in effect a specific amount per ton of production determined by a complex formula, with the price set for each year.[4]
- ***Aggregate***s: NIS 4 per ton of production.
- ***Other minerals***: 5 percent for precious metals and stones and 2 percent for remaining minerals (of which there are at present few), based on the value of the product.[5]

[3] A 10 percent rate was included in the original concession in 1961, but had not been applied until 2010. A higher rate was then introduced for sales above 3 million tons, reduced to 1.5 million tons from 2012.

[4] The formula for the specific royalty is 2 percent of a price, determined every 5 years but adjusted annually to take account of the movement in prices during the year, reduced by costs to net back to an ex mine price, and further reduced by around half to take account of waste rock.

[5] The law does not seem to include a definition of the "value of the product".

7. **The standard CIT rate of 26.5 percent will apply to mining from 2018, as tax incentives for the sector are phased out.** Mining was eligible for tax incentives under the Encouragement of Capital Investment Law 1959 (including a lower CIT rate, accelerated depreciation and lower dividend withholding) but has been excluded since 2011—with a transitional period for existing taxpayers.[6] Dividends paid (to both residents and non-residents) are subject to final withholding at 25 percent unless the shareholder has a significant interest (at least 10 percent) in the paying company, in which case the rate is 30 percent. This treatment (which applies to all companies) is unusual, normal international practice being that withholding tax rates are lower for higher shareholdings. The rate can be reduced under a tax treaty, with most providing rates of 5/10/15 percent depending on the level of ownership of the foreign investor (lower rates applying to higher ownership levels). Intercompany dividends are exempt. Interest paid to both residents and non-residents is subject to final withholding tax of 15 percent on nominal interest or 25 percent on index-linked interest, again reduced by treaties

8. **The only special provisions for mining in determining the CIT base are for depreciation.** Machinery and equipment in mining is subject to straight line depreciation at rates of 7 to 20 percent, with accelerated depreciation for multi-shift use. Other rules impacting the CIT base for all taxpayers include: unlimited loss carry forward; transfer pricing rules, but only for transactions with related non-residents; and a general anti-avoidance rule. Israel does not have thin capitalization rules, although the transfer pricing and anti-avoidance rules could be applied to address concerns with excessive interest deductions. Capital gains are taxed at the CIT rate, but the inflationary component of the gain is excluded, and capital losses are offset against capital gains.

9. **The various royalties and the CIT are collected by different government agencies.** The Income Tax Authority collects the CIT. On royalties, the Ministry of Energy and Water collects those on phosphate; the Ministry of Economy those on potash, bromine and magnesium; and the Israel Land Authority those from quarries.

[6] The transitional rates are: 2011—13.1 percent; 2012 and 2013—13.4 percent; 2014—13.8 percent; 2015 to 2017—18.7 percent; and 2018—26.5 percent.

II. Fiscal Regimes for Mining—Principles and Experience

10. **It is commonplace for the extractive industries—mining and petroleums (oil and gas)—to be subject to special fiscal regimes.** This reflects two features. One is the possibility of particularly high earnings, as a consequence of the fixity (at least over some fairly long horizon) of delivered resource supplies. Especially important is the prospect of significant 'rents'—meaning earnings in excess of the minimum required by the investor—which are an attractive object of taxation because they can, in principle be taxed at up to 100 percent without making the project unprofitable for the investor. The other is that resources themselves are commonly owned by the state,[7] creating a direct public interest in the returns to their exploitation. This latter feature has considerable legal and political significance, but in terms of economic principle it is, arguably, the former that is paramount—and it will be the focus in this report.

11. **The broad economic principles for taxing[8] mining are essentially the same as those for petroleum—so that much of the analysis in 'Sheshinski I' is directly applicable.** The two industries have many features in common, beyond the prospect of high rents, notably: very high sunk costs and long production periods, making the stability and credibility of the fiscal regime especially important to the investor and, by the same token, raising potential problems of 'time consistency';[9] considerable uncertainty, most obviously in respect of final commodity prices (which, as can be seen in Appendix 1 for those most relevant to Israeli production, are not only volatile but very hard to predict in trend) but also in respect of costs and geology; and, ultimately, the exhaustibility of the resource itself. Reflecting the industries' common and marked features, the key concerns and objectives for fiscal regime design in mining (Box 2.1) are thus essentially the same as in petroleum. Traditions and practice differ between mining and petroleum (though with some convergence in recent years),[10] but nonetheless many of the design options that policy makers face are the same. Sheshinski I[11] provides an excellent discussion of these issues,[12] so the treatment here will be brief and focused on issues not elaborated on there.

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[7] The main exception is the U.S., where the property right to subsurface resources presumptively goes to the owner of the surface.

[8] We use the term 'tax' for brevity, while recognizing that royalties are generally regarded as non-tax revenue.

[9] This is the difficulty created by the very different tax-setting incentives that governments face before and after the investor incurs the sunk costs of investment (costs, that is, which cannot be recovered on ceasing activity). Before, the incentive is to offer light taxes in order to attract investment; after, since investors have little alternative, it is to set higher taxes. Even a well-intentioned government can thus have difficulty persuading investors that it will not renege on the tax arrangement it offers prior to investment.

[10] One difference, for instance, is that production sharing agreements (PSAs) have been much more common in oil and gas. There is, however, a broad fiscal equivalence between PSAs and tax-royalty systems—any pattern of payments to the government under one can be replicated by appropriate design of the other (Daniel, 1995). Given this, and that both current arrangements for mining and the new oil and gas regime in Israel are tax-royalty schemes, we do not consider PSA options.

[11] See especially Chapter B.

Box 2.1. Objectives in Designing a Fiscal Regime for Mining

Governments commonly have several concerns, though the balance between them differs:

- The overall ***level of government revenue over a project's lifetime***—conceived of as the present value of amounts received: this is often the primary benefit to a country from the exploitation of its natural resources—public ownership of which establishes a direct and politically highly salient claim to the income generated.
- The ***time path*** of receipts: governments facing constraints on their ability to borrow may prefer to receive revenue sooner rather than later, and this can also respond to political expectations that the public enjoy some benefit as soon as (or even before) production begins. This appears to be less of a concern in Israel, given (as noted in the text) the relatively small absolute amount of the sums at stake.
- The ***volatility of revenue*****:** the greater the variation of aggregate revenues from mining in response to the unfolding of the many uncertainties in mining—prices, costs, geology—the greater the risk that is borne by government. Differences in the willingness of operator and government to bear risk can influence the structure of efficient agreements. Where, for instance, the government is better able to bear risk than are operators, both can gain by putting in place a fiscal regime that puts more risk on the government but offers a higher expected overall tax rate. The relatively small aggregate amounts involved again mean that risks borne by the governments do not seem to be a major concern in Israel.
- Limiting ***distortions to commercial decisions***: leaving decisions at all stages—exploration, development and extraction—to be guided by the same considerations as in the absence of taxation serves to maximize both the tax base and the wider social benefits from extraction, including the after-tax earnings of domestically-owned companies. Limiting distortions is a matter of not only the structure of the fiscal regime at any point in itself, but of its perceived stability: investors will have more confidence to incur the extensive sunk costs of mining the more credible it finds the fiscal regime presented to it.[13]
- …except where there are good ***environmental or other considerations*** to suppose that those decisions would not properly reflect wider social concerns. Mining agreements, for instance, commonly require some form of tax-deductible provisioning for de-commissioning.
- Limiting ***costs of administration and compliance***, to tax authorities and companies respectively.
- ***Transparency***: Public knowledge and understanding of fiscal terms and amounts paid by mining companies reduce the risk of misplaced political pressures and build public support for, and hence credibility of, those terms. Expectations and requirements have risen considerably in recent years, especially in the extractive industries—notably with the Extractive Industries Transparency Initiative,[14] provisions of Dodd-Franks act in the U.S.,[15] and private sector initiatives[16]—but also more widely.

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[12] See also Boadway and Keen (2010, 2013): the former provides an overview of resource tax design and the latter a more formal treatment of royalties and rent taxes.

[13] This is not to say that formal stability agreements are needed: they can bring their own difficulties (Daniel and Sunley, 2010)

[14] http://eiti.org/

[15] This mandated extractive companies listed in the U.S. to disclose taxes paid by country; following an adverse legal ruling, the expectation is that the relevant rule will be rewritten.

[16] Rio-Tinto, for instance, publishes the taxes it pays by country: http://www.riotinto.com/ourcommitment/taxes-paid-in-2012-4757.aspx

A. Instruments for Mining Taxation

12. **There are broadly two types of distinctive fiscal instruments that can be deployed in mining: royalties, and various forms of profit-related taxes**. This section looks at each in turn; the next considers packages constructed from these and other instruments.

Royalties

13. **By 'royalty' is meant here any charge related to production and not to any direct indicator of profit**. While definitions vary—in some cases being broad enough to include rent taxes of the kind discussed below[17]—this matches common usage.[18] Royalties, thus defined, can take many forms: they can be 'specific' (a fixed amount per physical unit of the product)—though this is now uncommon except for low value products, like aggregates—or 'ad valorem' (charged in proportion to the value of production); and they can be levied on a 'sliding scale' that varies with, for example, the level of output (as for potash in Israel) and/or the price of the product. Royalties are often presented as payment for the right to exploit state-owned resource stocks—and for that reason are typically regarded and reported as non-tax revenue—but are analytically equivalent to the output taxes also levied on many non-resource products.

14. **Royalties have merit in ensuring some revenue to the government as soon as production starts, and in being robust against manipulation of reported costs…**Early revenue can have real economic benefit to governments facing borrowing constraints, and political ones in assuring citizens that some social benefit is being derived early in the production process (though these benefits can also be secured by, for instance, signature bonuses or auctions). While both are potentially subject to game-playing, to the extent that companies find it easier to manipulate their reported costs than the value or volume of their production—the latter often being relatively easy to observe for natural resources, at least broadly (though with exceptions, as will be seen later—royalties can also be helpful in safeguarding revenues. These attractions are likely to be least, however, in countries that, like Israel, have good access to world capital markets and strong tax administrations.

15. **…but can discourage socially desirable extraction, development and exploration…**While it is not quite true to say that royalties inherently discourage

[17] As, for instance, in Otto (2013) and Otto et al (2007).

[18] From the perspective of government revenue statistics, IMF (2013), for example, notes that extraordinary taxes on the profits of natural resource companies would generally be classified as profit taxes while a royalty is generally imposed on the production level irrespective of profitability

extraction—that depends on the expected pattern of royalties over time[19]—by adding to the private costs of production, they can make unprofitable what would otherwise be profitable extraction, and in the limit can cause earlier closure of operations that, in social terms, are beneficial. And, recognizing the adverse impact on profitability of extraction, the anticipation of royalties on future production can discourage development and even exploration. (By the same token, it should be noted, where extraction would otherwise be excessive—perhaps because it involves environmental costs that are not fully internalized by the producer, or contract uncertainties mean the extracting firm attaches too little value to resources left in the ground at the end of its concession—discouraging extraction through the royalty structure may be desirable. These do not, however, appear to be significant concerns in Israel).

16. **...is not well-suited to rent capture…**All else equal, for instance, they have the perverse feature, in terms of rent extraction, of taking a smaller proportion of pre-tax rents as government revenue the higher are commodity prices (or the lower are costs). The converse of this, however, is that much of the risk associated with commodity price volatility falls on the investor, not the government.

17. **…and may not be easy to administer.** Implementing ad valorem royalties, for example, requires an ability to value sales—far from straightforward, as will be seen, for commodities (like bromine in Israel) with no routinely quoted world price.[20]

Rent and other profit-related taxes

18. **The term 'rent tax,' often used very loosely, here means one that collects positive revenue if and only if a project yields positive rent.** The rents here, it should be stressed, are those arising over the full lifetime of the project, from exploration onwards, not just those ('quasi-rents') after exploration and development costs have been sunk; and the revenues are assessed in present value.

19. **There are many forms of rent tax**—indeed infinitely many.[21] We focus on just two. The first of these is discussed in Sheshinski I:

- Known variously as the ***R-base cash flow or Brown tax,***[22] or (as in Sheshinski I), the ***rate of return system***, one approach is to allow full expensing of all investment and similar spending, including on exploration, but no deduction for interest or other financing costs, while taxing all (non-financial) receipts; where this gives rise to a

[19] If, for example, the royalty is expected to fall in present value (as would be the case for an ad valorem royalty if the commodity price were expected increase at a pace below the interest rate) then the fiscal incentive is to defer extraction.

[20] On issues in revenue tax administration, see Calder (2010 and forthcoming).

[21] Boadway and Keen (2010).

[22] After Brown (1948)

loss for tax purposes, either a payment is made to the taxpayer in proportion to the tax rate[23] or unused losses are carried forward at an appropriate interest rate.

A key issue here is determining what that appropriate rate is. In principle, so long as the investor is perfectly assured of their tax treatment, it is a risk-free rate.[24] Some upward adjustment is appropriate, however, to the extent that political risk means this may not be so. Importantly however, it is not the firm's cost of capital that matters for this choice; if it is clear the tax will not be refunded in the event of the firm's failure, however, its idiosyncratic required return becomes relevant (though in practice there are of course strong arguments for applying the same rate to all).

The second, which as discussed in Chapter III.B below may have some attractions in the Israeli context, is:

- An ***Allowance for Corporate Equity*** (ACE) system. Unlike the cash flow or R-factor methods, but like the current CIT, this would depreciate rather than expense expenditures and would allow the deduction of interest; the ACE differs from the standard CIT, however, in that an additional allowance would also be given for an imputed (also sometimes referred to as 'notional') return on the book value of equity.[25] By the same argument above, the appropriate imputed rate of return is again the risk free rate, with a case for a higher rate only to the extent of political risk. Box 3.2 describes in more detail the operation of the ACE.

  Schemes of this kind have been adopted by Belgium, Brazil, Italy and others as the central form of CIT—and recommended for adoption in several other countries too.[26] While no country applies an ACE to only a particular sector, there is no inherent reason not to do so: the main risk is that other activities might be channeled through the sector to which the ACE applied, but experience with the ring fencing already applied in mining should minimize the risk.

These schemes are equivalent in present value terms: that is, if applied at the same rate they will raise the same present value of revenue. But they imply quite different time paths of government revenue: the ACE, for instance, involves substantially smaller allowances in the early years of a project and can be expected to raise positive revenue sooner.

20. **Many other special profit-based taxes have been applied in the extractive industries**. These are generally less precisely tailored to taxing the lifetime rents earned on a

[23] As Norway does, for instance, in relation to exploration expenses.

[24] The argument is developed in Bond and Devereux (1995).

[25] A variant—the 'Allowance for Corporate Capital' of Kleinbard (2007)—simplifies even further by applying the same imputed return to debt.

[26] de Mooij (2011) reviews key features of the ACE and, as does Klemm (2007), experience in practice.

project than are the cash flow and ACE. Closest is the R-factor approach[27] adopted for oil and gas in Israel, as recommended by Sheshinski I. Others make no attempt to view projects in their lifetime context but impose taxes, generally at increasing rates, on some measure of current profitability—with, consequently, less assurance than other schemes provide that the present value of taxes paid will closely match the present value of pre-tax profits. By way of illustration, we also consider below one such tax:

- The ***variable income tax***, pioneered in South Africa's gold sector, replaces the standard CIT by a tax on the same base but levied by a formula under which the rate increases non-linearly with the ratio of taxable income from mining to gross revenue.[28]

21. **Profit-related taxes are widely applied in mining, especially by the major mineral producing countries**. Such taxes have been very much routine in oil and gas than in minerals (perhaps because, historically, direct government participation, which implies some share in rents simply in the state's role as shareholder). But they are by no means uncommon in mining, with a wide range of schemes that—while not all rent taxes in the strict sense above—have significant profit relation. Box 2.2 provides a brief overview.

22. **Though less familiar than standard income taxes, profit-related taxes are not necessarily hard to administer**. The cash flow and R-factor approach are simpler than the standard CIT, for instance, in requiring no depreciation calculations or distinction between debt and equity.

23. **Rent taxes can be made 'progressive' through the introduction of multiple tiers—but at the cost of additional complexity…** The rent tax described above, applied as a single tax rate, taxes rents at the same proportional rate whatever the level of those rents. It is possible, however, to design a rent tax to be 'progressive' in the sense of applying higher

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[27] This compares cumulative undiscounted (non-financial) receipts and expenditures in each period and charges tax on the difference between them once the ratio of the former to the latter—the R-factor—exceeds some specified number. Strictly speaking, this is not a rent tax in the sense defined above, because the cumulation takes no account of the time value of money: a firm could, for instance, achieve the specified R-factor, and so become liable to pay tax, only after so many years that the implied rent on the investment is actually negative. Nonetheless, the R-factor has the merits of (relative) simplicity and—having been recommended by Sheshinski I for oil and gas, and adopted—of some familiarity in Israel.

[28] More precisely, denoting by *m* the ratio of the taxable income from mining to mining revenues, tax is charged at the rate

$$T(m) = \max\left\{0, \tau\left(1 - \frac{\rho}{m}\right)\right\}$$

where τ and ρ are parameters: the former is the tax rate towards applied at the highest levels of profitability. The latter is the rate of return above which tax is payable (earnings below this are in the tax-free 'tunnel'). In the current South African regime, for instance (with all quantities expressed in percent), $\tau = 34$ and $\rho = 5$.

Box 2.2. Rent and Income-based Taxes around the World

While special profit-based taxes, often in addition to royalties, have been commonplace in petroleum for many years, mining has traditionally relied only on production-based taxes (though extensive state participation in mining will in many cases have been a form of additional profit tax). The last decade or so, however, has seen a marked transition towards the use of profits-based instruments in mining. Indeed most major mineral producing countries now employ special taxes that are to some degree profit-related.

The profit-related taxes found in mining can be roughly grouped into three types:

- **Pure rent taxation**, in the cash flow from above, has been applied to iron ore and coal in *Australia* since 2011 (the 'Mineral Resource Rent Tax'); the failure of plans for its wider application reflected political resistance rather than difficulties with the mechanism itself. *Liberia* and *Mal*awi have also legislated resource taxes of broadly the cash flow type.

- The **variable income tax**, pioneered in *South Africa*—and perhaps the oldest example of a profit-based tax in mining—replaces the CIT by a charge that formulaically levies a higher rate of tax the higher are current profits, calibrated to apply the standard CIT rate at low levels of profitability. *Botswana* and *Zambi*a also have schemes of this kind.

- A wide variety of **other income-related taxes**, commonly applied at rates that increase with the chosen measure of income and usually in addition to the CIT, are in place, most notably in the Americas. Some *Canadian provinces* and *U.S. states* use hybrid systems of mining tax and royalties that are closer to the concept of income tax rather than that of a production royalty.[29] *Peru* imposes a 'special mining tax' based on operating profit and *Chile* imposes a 'specific mining tax' based on an adjusted income tax base, in both cases at rates that vary with the underlying project profitability.

tax rates at higher levels of rents. This is most easily done under the R-factor approach, since this explicitly relies on a realized return: higher rates can be applied above higher critical levels of the R-factor—which is indeed the approach adopted in Israel's new oil and gas regime. This evidently adds to complexity.

24. **…and distortions, including, in the presence of uncertainty, discouragement of investment**. There is no difficulty in a perfectly certain world, since a progressive rent tax applied to lifetime project returns would still leave the investor positive after-tax rents. Suppose, however, that the returns to investment are uncertain. A proportional tax on rents then simply reduces the expected net rent, and does not change its sign. But a multi-tiered tax that applied a higher rate only in the best outcomes might do so, however, because the investor then fares worse in those outcomes without receiving any offsetting gain in bad outcomes. If the effect is strong enough, positive expected pre-tax rents can become negative

[29] In North American usage, such income-based taxes are often referred to as royalties.

expected post-tax rents.[30] And when the progressivity applies not only over a shorter horizon, it can lead, depending on the precise design, to either more investment being undertaken than would otherwise be the case or less: the former ('gold plating') could arise, for instance where investment spending is carried forward for loss offset at a rate higher than the minimum required by the investor, since the future tax deduction then outweighs the future liability on the return to a marginal investment.

B. Combinations of Instruments

25. **Given the multiple objectives and particular challenges in mining taxation, a combination of charges is generally appropriate.** Many countries have found attractive a regime comprising:

- A ***simple royalty***, with a relatively modest rate, to secure early revenue and safeguard against avoidance;
- A ***rent tax, or other profit-sensitive levy***, to ensure that government revenue increases with project profitability;
- The ***standard CIT***: needed even in the presence of a rent tax,[31] both in order that the normal return to equity not receive favorable tax treatment in the mining sector and to provide an element of taxation that investors from countries operating worldwide tax systems (the leading example now being the U.S.) taxation will be able to credit against their domestic liability;

and, though not the focus here,

- The use of ***auctions*** to extract rents when, as is often the case, investors enjoy some informational advantage—these have had some use for mining in Israel, and are clearly an option to consider for future concessions;
- ***Environmental taxes***, where mining involves external damage best addressed by taxation rather than regulation;
- A range of ***other, typically minor charges***, some—such as surface fees for ground rights—akin to user charges.

26. **The appropriate balance between these instruments depends on each country's circumstances**. The arguments above imply, broadly, that relatively heavy reliance on rent taxation rather than royalties will be more attractive in countries—like Israel—in which the

[30] The final outcome will depend on the investor's attitude to risk: acting in the opposite direction, a proportional tax on rents reduces the variance of returns and in that respect tends to encourage risky investments.

[31] Unless, of course, the standard corporate tax is itself an ACE or other rent tax.

need for immediate revenue is not especially urgent, the tax administration is strong, and the government is not obviously less able to bear risk than the investor. Prospectivity may also matter: royalties can be especially damaging at both extremes—when resource stocks are closer to exhaustion, and when exploration can be discouraged by the expectation of distortionary taxation in the event of success.

27. **Interactions between these components can have significant effects, which design needs to be sensitive to….** Increasing the rate at which a rent tax is applied, for instance, would have no effect if there were no other taxes in place; when a CIT is also implemented, however, it generally will: if investment is discouraged by the CIT, for instance, then adding a rent tax on top will discourage it even more.[32] More mechanically (but perhaps no less importantly) apparently mundane crediting/deduction arrangements can affect both government revenue and investor behavior. Common practice is for a royalty to be deductible against any rent tax, and any rent tax against the CIT. This though seems to reflect not a consideration of the economic implications but rather an informal notion of the royalty as a charge for the resource itself, the rent tax as an additional charge on resource use and both as comparable to business costs in other activities. In some cases, choices made on arrangements of its kind are of little significance, or even equivalent to changes in statutory tax rates: A royalty of 5 percent that is deductible against a tax charged at 20 percent is equivalent for instance, to a royalty of 4 percent that is not.[33] In other cases, however, the arrangements can have a significant impact. Allowing a royalty to be fully creditable against a rent tax for instance, with full carry forward (at interest) of unused credits, effectively converts the royalty into pre-payment of the rent tax. Choices in these matters need to be guided by a clear sense of the ultimate policy objectives and constraints.

28. **…including in their implications for foreign investors. Investors from countries operating worldwide tax sy**stems—most notably the U.S., but also China and other major emerging markets—taxes paid in Israel may be creditable against tax due on repatriation of their earnings in Israel. But this depends on the nature of the tax. The CIT and withholding are generally creditable, and royalties are not. Whether special profit-related taxes will be creditable can be less clear cut, and is a matter best addressed explicitly in tax treaties. The implication, in any event, is that it can be wise to set the relationship between the various charges so as to maximize the amount that foreign investors will be able to credit. Deducting royalties against the CIT rather than not allowing deduction but setting them at a higher rate to offset this can, for example, have minimal impact on tax revenue in Israel but make the fiscal regime more attractive to some foreign investors.[34]

[32] This effect—which is complex—can be avoided by making the rent tax fully creditable against the CIT—but that can defeat the object of the rent tax as special additional charge.

[33] Except if deduction creates a negative liability that is not refunded to the taxpayer.

[34] Further discussion of these issues is in Mullins (2010).

III. The Present Regime and Alternatives

A. Tools for Evaluating Mining Tax Regimes

29. **A (sometimes bewildering) variety of empirical concepts can be used to evaluate alternative mining tax regimes**. Terminology in the area varies, and similar-sounding terms can conceal subtle but important differences; nor is it always clear precisely what is the economic significance of various quantities reported and compared. This section describes the terms and concepts used in the empirical work below assessing the current regime and alternatives that the mission believes have potential merit.

The Average Effective Tax Rate

30. **The average effective tax rate** (AETR) **is the ratio of the present value of government receipts over the lifetime of a project to the present value of pre-tax cash flows, both calculated at some common discount rate**.[35] It is thus a precise indicator of what it is often loosely referred to as 'government take.' Key features of the AETR[36] are:

- Since the calculation is over the project's full lifetime, it needs to take account the treatment of exploration (including the possibility of failure). A method of doing this is described in IMF (2012), but—as noted above—exploration issues are less material in Israel than in many other countries.

- Of critical importance is that the AETR will in general vary with the assumed pre-tax profitability of the project-reflecting for instance assumptions on future commodity prices and input costs: calculations (and cross-country comparisons) based on one set of assumptions on project profitability can give a quite different answer from those based on another. Box 3.1 illustrates and discusses, showing how the AETR varies with the pre-tax NPV for stylized examples of each of the main taxes of interest applied in isolation: a royalty, a resource rent tax, a progressive rent tax, and the CIT.

- The AETR can be calculated on either a backward-looking basis (using historic data on actual project outturns) or a forward-looking one (for a hypothetical project and outcome(s)). The former has the advantage of looking at tax actually paid, and so can reflect, for instance, issues of compliance. But it can be very misleading in evaluating regime changes—since it simply focuses on one of the many outcomes that could have occurred ex ante: profitability might have proved very different from that expected ex ante. The empirical analysis later therefore takes a forward looking approach.

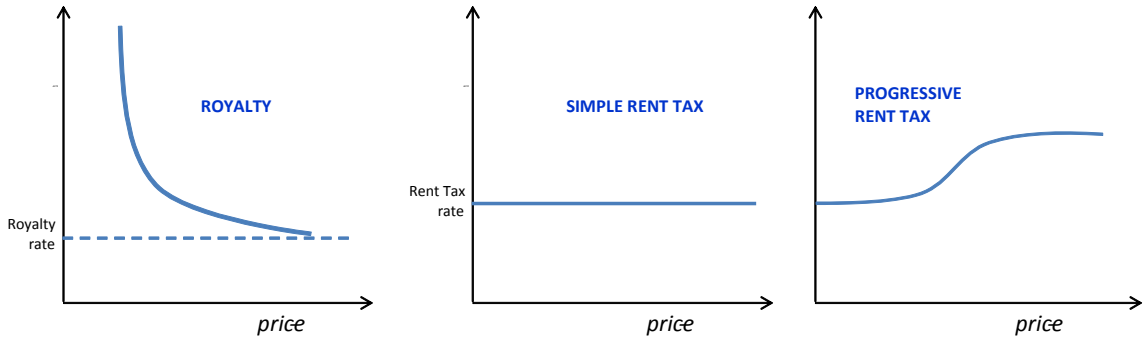
[35] For simplicity (and comparability with the wider literature) we speak of 'tax' here even though the calculation will include any royalties that would commonly be classified as non-tax revenue.

[36] As is standard, only corporate-level taxes are considered here.

Box 3.1. The AETR under Alternative Fiscal Instruments

A key aspect of any fiscal instrument for mining is the relationship it implies between the underlying pre-tax profitability of a project and the associated AETR. This differs fundamentally across the core instruments, including in direction. The charts below illustrate, for the case in which changes in pre-tax profitability are driven by changes in final commodity prices:

- Under an ad valorem royalty (in the leftmost panel), a reduction in the commodity price is associated with an increase in the AETR—and this effect is more marked at low prices, as stressed by FTI Consulting (2013). At very high commodity prices, the AETR is essentially given by the royalty rate itself.
- For a simple rent tax—a cash flow tax, for example, or ACE, the AETR is always equal to the rate at which the tax is imposed.
- For a progressive rent tax, the AETR is rising over some range, being essentially equal at the very highest prices, to the top marginal rate it imposes.



Matters are less clear-cut for the CIT: loosely, if the system provides less than full allowance for all costs, the relationship is downward sloping, with the AETR converging at higher prices to the statutory rate of the tax; if it provides more than full allowance (as for instance if it provides interest deductibility and deprecation at faster than the true economic rate, then it is upward sloping, again converging to the statutory rate.

For regimes comprising more than one instrument, the AETR can be conceived of as the vertical sum of relationships like those illustrated.

31. **A project is attractive to the investor at any AETR less than 100 percent—and in this sense economic principle is quiet as to what is an 'appropriate' AETR**. So long as taxes paid do not exceed the pre-tax rent on a project, investors will receive more than the minimum they require and so will have an incentive to proceed. Within that range, the AETR

thus simply determines how rents are shared between government and the investor—a question on which issues of perceived 'fairness' come to the fore.[37]

32. **The AETR becomes important for efficiency reasons, however, if investors face discrete choices on where to invest…**[38] If, for instance, they can invest in only one mine in either of two countries, their decision will depend on the difference between the two in terms of both pre-tax profitability and AETRs. To isolate tax effects alone, it is common—and is the approach adopted here—to make international comparisons by calculating AETRs by applying different countries' tax rules to the same stylized project; doing otherwise (apart from requiring project information that is rarely available) distracts from the key issue of how the tax system itself, rather than commercial prospects, distort investment.

33. **…though views differ on how relevant a consideration that is**. Investors will face a discrete choice of this kind if there is some limit—financial, managerial or material—to their capacity to invest. Many (perhaps most) believe these constraints are important in the resource sector, in terms, for example of know-how and the availability of specialist equipment and risk capital; and companies themselves, of course, commonly stress their opportunities to move elsewhere. With free entry into the provision of these items, however, one would expect such capacity constraints to be eliminated, at least in the longer run, and so ensure that no project with positive after tax present value go unexploited. In that case, all that matters is again that the AETR be less than 100 percent. The possibility of discreteness seems, nonetheless, to be sufficiently real to deserve serious consideration, and for this—and perhaps informing notions of fairness by benchmarking on the choices of others—cross-country AETR comparisons are of some interest.

34. **No less important than the level of the AETR at a given level of pre-tax profitability is how the AETR varies with pre-tax profitability**. As seen above, different types of fiscal regime can imply very different patterns: under a pure royalty scheme, for instance, the AETR rises as profitability falls; under a progressive rent tax, it increases. This matters for the pattern of risk borne by the two sides: under the royalty scheme, much of the risk is borne by the investor, who fares very poorly if the project outturn proves poor but well if it proves highly profitable; under the progressive rent scheme, it is the government that bears most of the risk. This becomes important when (as of course is always the case in practice) the pre-tax profitability of a project is uncertain ex ante, as investors may require a lower expected tax payment, for example, to compensate them for a scheme that increases the risk they bear.

[37] To the extent, however, that taxing resource rents enables other less distorting taxes to be reduced, however, there is a distinct efficiency argument for their use.

[38] The AETR assumes a profitable project when there has been a discovery. Its relevance is less clear for the choice of where to explore.

'Progressivity'

35. **Though widely used in discussing resource tax regimes, 'progressivity' can have several quite different meanings**. Broadly, it is the idea that tax rates increase markedly as underlying profitability increases—due, say (and this is the case we shall focus on), to higher commodity prices. The inherently multi-period nature of a resource project means, however, that this can be assessed in a number of ways. It might be assessed over the full lifetime of a project, from exploration onwards—in which case it is the AETR just discussed that matters. But it can also be assessed in terms of a project that is already underway—and indeed that is often the context in which the responsiveness of tax revenues to commodity prices has most political salience. This is what will be meant here by 'progressivity.' Even this is less than fully precise, however. For a project already underway, the responsiveness of revenues could be assessed in terms of how either tax payments in the current period or the present value of all future tax payments respond to a change in prices or costs, and for either a permanent or a temporary change in prices. The exercises below consider the effect on the present value of tax payments consequent upon a permanent change in commodity prices, for a project already underway in that development costs have already been incurred. The tax rate shown thus differs from the AETR above and corresponds to one levied on quasi-rents.[39]

36. **By easing political pressures to raise taxes when pre-tax profitability is high, an element of progressivity can enhance the stability of the fiscal regime**. The public commonly expects to see high tax receipts of mining companies when commodity process are high—and if the fiscal regime does not deliver this, there will be pressure to change it. Building in an element of progressivity that helps meet the public expectations automatically can thus make the fiscal regime more robust against pressure for change, and so provide investors with stronger assurance that the announced fiscal regime will indeed be the one applied—an assurance which, as noted above, is especially critical in mining because of the large sunk costs and long production periods involved.

Marginal effective tax rates

37. **By the 'marginal effective tax rate' (METR) on some activity—exploration development, production—is meant the wedge that the tax system drives between the minimum after-tax return that the investor requires and the pre-tax return needed to realize it**. Suppose, for instance, that, to keep its investors content, a mining operator needs to earn 12 percent on an expansion of its facilities but the tax system means that the

[39] More precisely, the quantity considered in the progressivity assessment below (sometimes referred to in FARI analyses as 'government share of total benefits' is P $= T/(NPV - K)$, where T and *NPV* are respectively the present value of tax receipts and pre-tax cash flows over the lifetime of the project, and *K* the initial development expenditure. Since the AETR is simply T/NPV, the two quantities are related as $P = AETR \times (NPV/(NPV - K))$.

expansion will have to earn 16 percent before tax in order to do this. Then the METR on that expansion is 25 percent.[40]

38. **METRs indicate the extent to which the fiscal regime distorts commercial decisions.** A positive METR on development spending means, for example, that such spending will be lower than it would have been in the absence of the tax system; and a negative METR—which can arise even if all statutory tax rates are positive, if deductions outweigh taxable receipts—would mean spending higher than in the absence of taxation.[41]

39. **The AETR indicates how much revenue a fiscal regime raises, and the METR the extent to which it affects business decisions—which can be very different numbers** Take, for instance, a simple rent tax. As seen above, in that case the AETR, evaluated over the full lifetime of the project, is simply the statutory tax rate. But such a tax does not distort decisions at all: whatever exploration or other choices maximize pre-tax profits will also maximize after-tax profits and so all METRs will be zero. In other cases—such as a regime with heavy dependence on royalties—revenue (hence the AETR) may be low in some outcomes but the distortionary effect (captured by the METR) strong.

40. **The focus here is on AETRs**, so complementing the analysis of METRs for mining in Israel—including for alternatives similar to some of those considered below—in Mintz and Chen (2013).

B. Options for Reform

41. **This section applies the tools above to assess the current regimes and alternatives, focusing on potash**—reflecting its particular importance in Israel and the clarity with which it raises more general issues. The simulations use the 'Fiscal Analysis of Resource Industries' (FARI) modeling system and database developed in the Fiscal Affairs department of the IMF.[42]

42. **Fiscal regimes for potash vary quite widely across countries, with Israel marked by a high marginal royalty**. Table 3.1 provides a summary description of the current fiscal regime in Israel and those provided in other significant potash-producing countries. The

[40] = (0.16-0.12)/0.16.

[41] While METRs thus indicate the direction of behavioral response to tax distortions, they do not indicate its extent of that response.

[42] FARI is an Excel-based cash flow model frequently used by FAD's technical assistance missions on extractive industries tax policy. The FARI methodology is "a variant of the process of project evaluation for investment decision-making by companies". For a given mineral project and economic assumptions, the model allows the calculation of a series of indicators (such as AETR and government share of quasi-rents) simultaneously for a number of selected fiscal regimes, under both deterministic and stochastic prices. A detailed exposition of the FARI modeling framework and evaluation criteria is in Daniel et al. (2010).

fiscal regimes in two of the comparator countries, UK and Ethiopia,[43] rely on simple tax/ad-valorem royalty systems similar to Israel's. Canada (Saskatchewan) applies a more complex regime to potash mining composed of three layers of tax: a small ad-valorem royalty, a two-tier mining tax on net income, and a regular income tax. Due to various deductions and credits, however, the ultimate tax take under this regime is not as sizable as this complexity might suggest. [44] Jordan charges specific royalties on production, though the payment is capped at a certain percentage of net profits; additional government revenue from the project is in the form of carried equity participation, assumed at 31 percent. The high marginal royalty in Israel is notable. And Table 3.2 shows that royalties in Israel may be on the high side for other minerals too. But royalties are just one among element of the wider fiscal regime. How fiscal regimes compare when account is taken of all their other features too, and how that in turn may vary with pre-tax profitability, is far from obvious from simple inspection of the Table 3.1 and the like. Summarizing the impact of a wide range of components of the fiscal system is a task for which the AETR is ideally suited.

43. **The current royalty-based fiscal regime for mining can imply AETRs[45] on highly profitable projects that are fairly low by international standards—and high AETRs where profitability is low.** Using the information in Table 3.1, Figure 3.1 shows AETRs for three price scenarios: "low," "intermediate" and "high." What stands out is that the ranking of Israel's scheme with 10 percent marginal royalty changes quite markedly with the assumed commodity price (and hence project profitability): in the low price case, it implies the second highest AETR, in the others, it is below comparators like Canada and Jordan.

[43] The analysis here considers only the general regime in Ethiopia. The mission understands that a negotiated regime, with considerably more favorable terms for the taxpayer, has been implemented there.

[44] Chen and Mintz (2013) provide a detailed discussion of the Canadian fiscal regime for potash.

[45] The government receipts considered in these exercises are those from royalties, CIT, rent and other profit-related taxes, flows associated with any state participation, and withholding on dividend payments to non-residents.

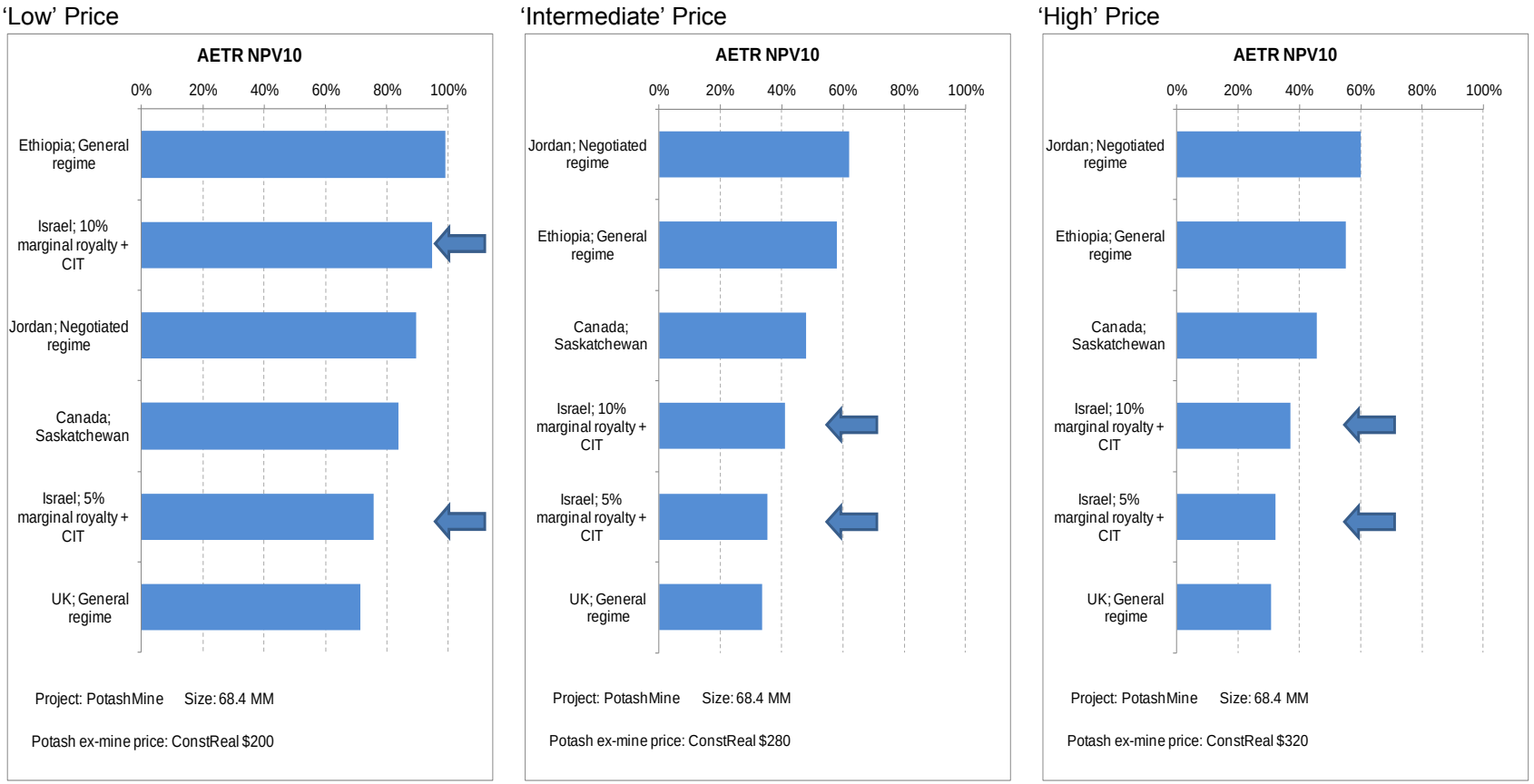
Table 3.1. Fiscal Regimes for Potash—Cross-country Comparison

Fiscal provision	Israel	Jordan	UK	Ethiopia	Canada (Saskatchewan)
Royalty	5% first 1.5MT, 10% for production above. Base: 90% of sales price less costs after mine gate.	JD 125/t, capped at 25% of net profits after tax (excluding royalties)	3% FOB price net of transportation and processing cost	5% of FOB sales value less transportation to point of export less smelting and refining cost	2.1%-4.5% crown royalty on production value [modeled 2.1%]
Income tax	26.5% (starting 2018, with step increases from 13.4% in 2012)	14%[1]	23% (21% in 2014, 20% in 2015)	35%	27% (combined federal and provincial)
Capital allowance	development expenditure: capitalized and amortized over useful life; capex: 7-20% SL[2]	2% to 20% SL depreciation, varying by asset	8% SL to long life assets (expected useful economic life over 25 yrs); 18% SL to plant and machinery	4-yr SL for pre-production costs and capex	pre-production costs: 20% DB; capex 25% DB[2]
Loss carry forward	Unlimited	Unlimited (assumed)	Unlimited	10 years	Unlimited
DWT	25% (0% under some DTAs)	0%	0%	10%	25% (assumed 15% under DTA)
IWT	15%	7%	20%	5%	25% (assumed 15% under DTA)
State equity	None	31% (assumed carried without interest until production)	None	5% (state may acquire without cost)	None
Additional tax	None	None	None	None	Two-tier production tax: 1) base payment of 35% on adjusted resource profits; 2) potash profit tax (15% if profit is less than $59.95/t in 2010 prices, 35% for all other profits)

1. Draft legislation last year sought to raise the income tax rate to 35 percent starting January 2014. It is unclear at this time whether the new rate has been adopted, so these simulations assume that the original rate remains at 14 percent.
2. DB means declining balance depreciation and SL straight line depreciation. DTA means Double Taxation Agreement. Capex means capital expenditure.

Source: Ministry of Finance, IMF FARI fiscal libraries.

Figure 3.1. International Comparison—AETR



Note: Israel is shown with two cases. In the first case, a 10 percent royalty applies on production in excess of 1.5 million tons ("Israel: 10% marginal royalty"). In the second case, all the production is subject to 5 percent royalty ("Israel: 5% marginal royalty").

Source: IMF staff estimates.

Table 3.2. Royalty Rates for Other Minerals

Country	Royalty rate	Royalty base
Australia - SA	3.5 pct [industrial minerals] AUD0.35/ton [sand & stone]	Market value less transportation, insurance, packaging, storage.
Botswana	3 pct [minerals other than precious metals and stones]	Gross market value
Brazil	3 pct [aluminum ore, bauxite, manganese, potassium, salt] 2 pct [iron ore, copper, coal, other mineral substances]	Adjusted revenues; the mining company's net revenue, i.e., the mineral sales revenue less taxes levied on revenue, insurance and freight costs.
Colombia	3 pct [non-metallic minerals]	Gross values of production
Ethiopia	4 pct [industrial minerals]	Gross revenue less transport and processing cost
Israel	5 pct for production up to 1.5 million tons, 10 pct for production above [potash] 5pct [bromine and magnesium] Specific amount, formula-based [phosphate]	90pct of (gross revenue less packaging, sales fees, insurance and transport costs) ---
Malawi	5 pct	Gross value less transport costs
Mongolia	2.5 pct [common minerals, such as construction materials]	Gross revenue
Mozambique	5 pct [base minerals] 3 pct [coal and other minerals]	Gross revenue
Namibia	2 pct [semi-precious stones, industrial and non-nuclear fuel minerals]	Gross revenue
South Africa	Formula-based max 5 pct [refined minerals] max 7 pct [unrefined minerals]	Gross sales
Tanzania	3 pct [industrial minerals, other]	Gross value
Zambia	6 pct [base and precious metals] 6pct [on gemstones, industrial, and energy minerals]	Norm value [volume x LME prices] Gross value [FOB realized value]

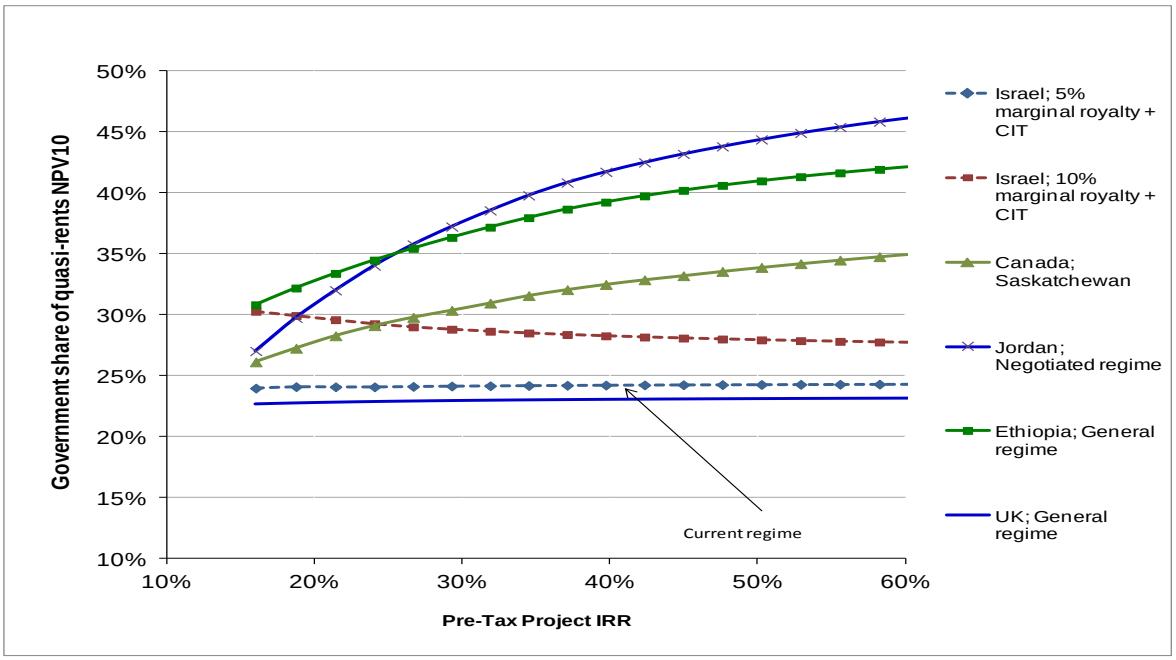
Source: FAD FARI libraries.

44. **By the same token, the heavy dependence on royalties results in a more regressive structure than found elsewhere.** Figure 3.2 shows that Israel alone has a strongly regressive fiscal regime, failing to capture a proportionally higher share of the quasi—rents on more profitable projects. Canada and Ethiopia manage to do so because of the additional profit-related elements embedded in their regimes (mining tax on net income, and respectively a small government equity), as does Jordan (for which, given the information available to us, the model assumes a large public stake in the project).

45. **Irrespective of any other reform, there is a strong case for reducing the top marginal royalty rate for potash**. Since production routinely exceeds the 1.5 million tons at which the higher royalty rate applies, both the operator and the government would benefit by

setting a single marginal rate equal to the current effective average royalty (which is about 7.1 percent): this would leave both profits and revenue unchanged at current production levels—but the lower royalty on additional production would provide an incentive for more extraction and hence both increased after-tax profit (since the operator would not respond to the incentive if it did not benefit by doing so) and additional government revenue (since the gain would be over that raised at present). Underlying present arrangements, presumably, is a presumption that greater production implies greater profitability. But output can clearly be a bad proxy for profitability—and an unnecessary one when instruments are available to target profits directly.

Figure 3.2. International Comparison—Progressivity



Note: The range of pre-tax rates of return on the horizontal axis is obtained by increasing the assumed potash price ex-mine from US$196/ton to US$347/ton in 3 percent increments. For the same levels of pre-tax profitability, the government share of quasi-rents is different from the AETRs shown in Figure 3.1.because the two indicators use different bases (quasi-rents and respectively, rents over the full project lifetime).The discount rate is taken to be 10 percent.

Source: IMF Staff estimates.

46. **A modern mining tax regime, combining modest, simple royalties with some form of rent or profit-related tax--akin to the new regime for oil and gas—has attractions in Israel**. It would have the merits described in Chapter II.B above, with some assurance of revenue at all times and a degree of progressivity that can address public concerns and so enhance the stability and credibility of the regime. Such a system would be the extension to minerals of broadly the same regime as has been applied to oil and gas since Sheshinski I.

47. **The rates of the royalty and rent or profit tax can be calibrated to achieve whatever AETR is desired**, for some reference project. Replicating that under current arrangements would require a reduction in royalty rates in order to offset the revenue anticipated from the additional tax on profits. This report takes no view on what the appropriate reference AETR and project ought to be. For illustrative purposes, however, the alternatives considered below are calibrated to have the same AETR as does the current regime for the 'intermediate profitability' case in Figure 3.1.

48. **Of the various forms of rent tax that might be chosen, the case for one with a progressive structure is relatively weak….**given the additional complexity and distortions that (as seen in Sectoin II.A) this can create, and that the revenue at stake for very highly profitable outcomes is likely to be quite modest for the government's overall revenue performance. In this respect, the envisaged arrangement would differ from that in oil and gas, for which the upside revenue gain has far more macroeconomic significance.

49. **…and that for an ACE relatively strong.** Since the ACE differs from the current CIT only in providing an allowance for equity, it has an advantage not only of familiarity to operator and government but, even more to the point, eases transition problems. Adoption of a cash flow form of rent tax, for instance, would require transitional arrangements to deal with undepreciated capital and pre-existing borrowing, since both depreciation allowances and interest deductibility would cease to be provided. Such arrangements can be designed,[46] but the complexity and additional effort involved would be avoided altogether under an ACE, since depreciation and interest deductions simply continue as before. Box 3.2 describes more fully the calculation of tax due under an ACE.

[46] For instance, immediate expensing could be provided for undepreciated value of assets at the time of transition, perhaps subject to an annual upper limit phased over time to protect revenue.

Box 3.2. Calculating Liability under an ACE Form of Resource Rent Tax

The base for the ACE-type resource rent tax in tax period *t* –call this B_t—would simply be the company's taxable profits for that period, exactly as defined for the standard CIT (so reflecting whatever depreciation allowances, interest deductions and so are available),[47] denoted Π_t, less the product of (a) the book value of the company's equity at the start of the tax year, E_t, and (b) the imputed rate of return on equity, ρ, (which would be the same for all companies). That is:

$$B_t = \Pi_t - \rho E_t \ ,$$

and liability would be simply τB_t, where τ is the rate of the ACE-type rent tax. Equity at the start of tax period *t* can be constructed as equity at the start of the previous tax period, $t-1$, plus retained earnings (including net dividends received, and net of all taxes paid at corporate level, including the ACE) during $t-1$ plus sales of new equity less equity repurchases in $t-1$.

To prevent multiple deductions among related mining companies, and an advantage to mining companies investing in non-mining activities, the equity base for each company should exclude its holdings in other companies. Arrangements would also be needed to ensure that any companies operating in both resource and non-resource activities receive an equity allowance corresponding only to the former; this is likely to be a significant problem in practice, however, only to the extent that companies with CIT losses in non-resource activities might seek to use them to reduce tax on resource activities.

50. **These considerations lead us to consider, by way of illustration, four possible alternatives to current arrangements**, the rates of which are chosen so that they have the same AETR—and so raise the same revenue—as the current regime with 10 percent marginal royalty does in the 'intermediate' case of Figure 3.1. These are (with full detail in Table 3.2).

- A 4.5 percent royalty, deductible against a 1.8 percent cash flow tax;
- A 4.5 percent royalty, credited—with full carry forward--against a 12.5 percent cash flow tax;
- A 4.5 percent royalty, deductible against a 1.8 percent ACE; and

[47] One could of course take as reference for the ACE some CIT base quite different from the current—but there is no obvious reason, and it would add to complexity, to do so.

- A 4.5 percent royalty combined with a variable income tax (VIT) at rates from 26.5 to 31 percent;[48] the VIT has the same base as but replaces the CIT, which remains unchanged in all other cases.

Note that, importantly, the first and third schemes will raise the same present value of revenue not only in the intermediate case being used to calibrate the exercise but in all other outcomes too: this is because the royalty rate is the same, and, being rent taxes, the cash flow (CF) tax and ACE collect revenue equal in present value to the product of the tax rate and the pre-tax net present value (recall the picture in Box 3.1). We return to this point shortly.

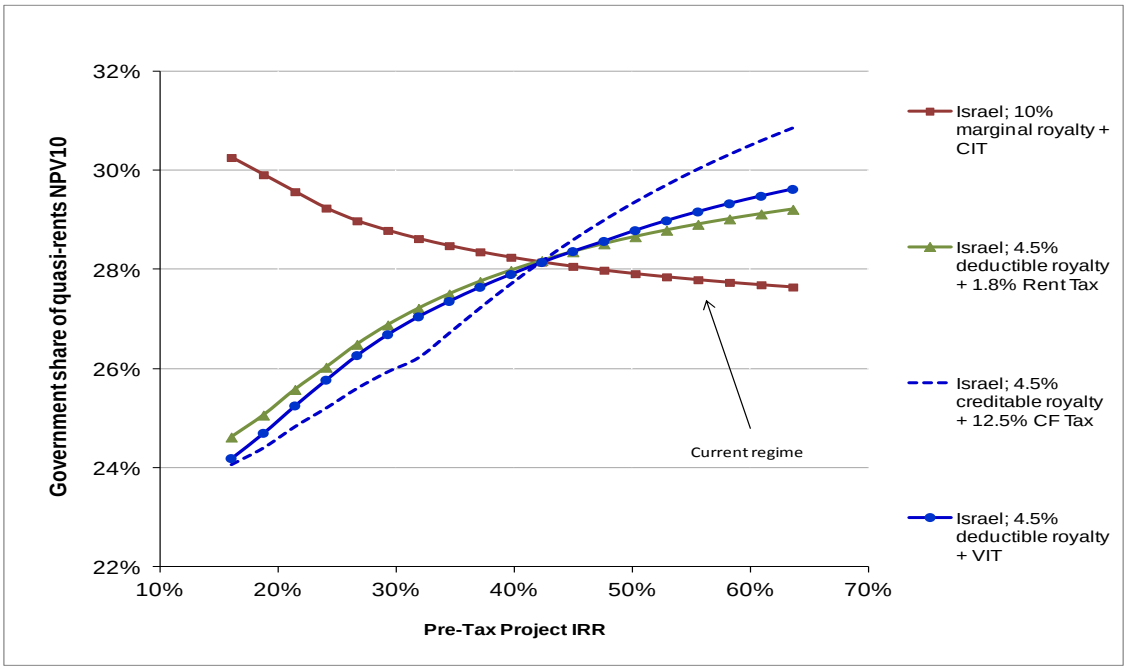
[48] Unlike the profit taxes in the other alternatives, the VIT has two parameters that could be varied to ensure the same revenue, given the 4.5 percent royalty, as in the benchmark, case. The approach taken here (in the notation of footnote 28 above) is to set $\rho = nominal\ bond\ rate$.

Table 3.2. Alternative Fiscal Regimes

Fiscal provision	CF tax with deductible royalty	CF tax with creditable royalty	Income Tax with Allowance for Corporate Equity	Variable Income Tax
Royalty	4.5% of ex-mine price (without further price adjustment)	4.5% of ex-mine price (without further price adjustment)	4.5% of ex-mine price (without further price adjustment)	4.5% of ex-mine price (without further price adjustment)
Income tax	26.5%	26.5%	26.5%	See below
Capital allowance	development expenditure: capitalized and amortized over useful life; capex: 7-20% SL	development expenditure: capitalized and amortized over useful life; capex: 7-20% SL	development expenditure: capitalized and amortized over useful life; capex: 7-20% SL	development expenditure: capitalized and amortized over useful life; capex: 7-20% SL
Loss carry forward	Unlimited	Unlimited	Unlimited	Unlimited
DWT	25% (modeled 0%)	25% (modeled 0%)	25% (modeled 0%)	25% (modeled 0%)
IWT	15%	15%	15%	15%
State participation	None	None	None	None
Additional tax	1.8% Cash Flow tax. CIT and royalty are deducted from the CF tax base. Losses are carried forward with uplift equal to the nominal bond rate.	12.5% Cash Flow tax. CIT is deducted from the tax base; royalty is creditable against the tax. Losses, including from unused royalty credits, are carried forward with uplift equal to the nominal bond rate.	An ACE at the rate of 1.8%. This and the CIT not deductible against each other. Losses are carried forward with uplift equal to the nominal bond rate.	Variable Income Tax in lieu of CIT, with 31% top rate and 26.5% minimum rate. Formula: 31- (113/x), where x is the ratio of taxable income to gross revenue from mining.

51. **Since all four regimes raise the same revenue in the benchmark case, the key difference between them is in how they respond to different project outturns**. This is reported in Figure 3.3. Among the alternative regimes, the cash flow tax with creditable royalty is the most progressive (because, in effect, the royalty ceases to have bite, but simply acts as prepayment of the rent tax), followed by the variable income tax. The ACE and the cash flow tax with deductible royalty, being equivalent in present value terms as noted, are shown by the single line marked 'rent tax.'

Figure 3.3.Progressivity under the Alternative Regimes

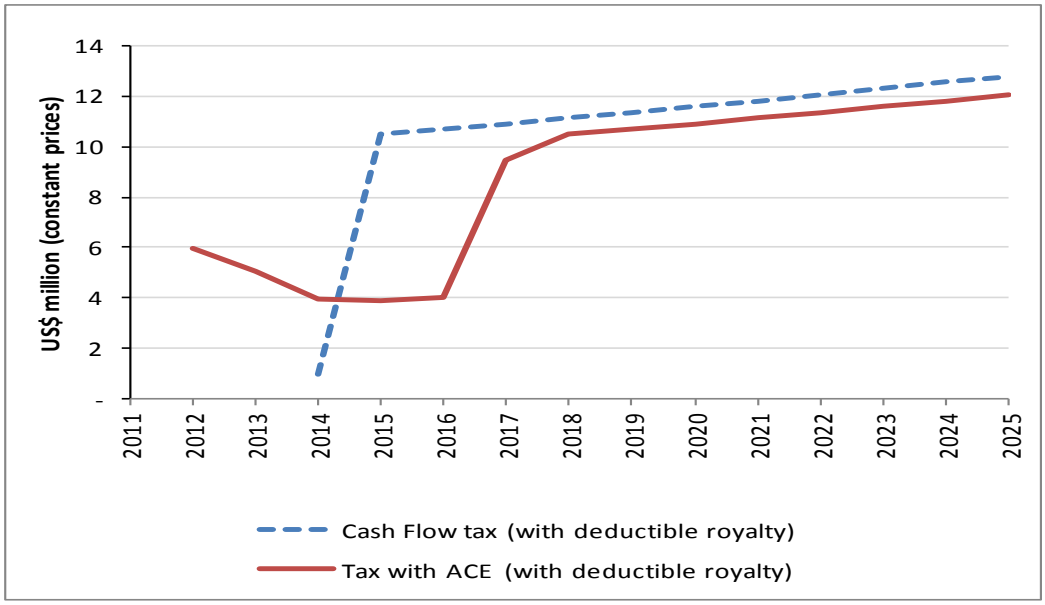


Note: The range of pre-tax rates of return on the horizontal axis is obtained by increasing the assumed potash price ex-mine from US$196/ton to US$347/ton in 3 percent increments. For the same levels of pre-tax profitability, the government share of quasi-rents is different from the AETRs shown in Figure 3.1.because the two indicators use different bases (quasi-rents and respectively, rents over the full project lifetime).The discount rate is taken to be 10 percent.

Source: IMF Staff estimates.

52. **Though equivalent in present value, the cash flow and ACE options differ in the time profile of revenues**, especially in the early years of production (Figure 3.4). Under the cash flow tax (the dotted line , receipts are delayed until the initial capital has been fully recovered (as shown by the dotted line), while some ACE is due from the first year of production (since the tax depreciation rules allow only a limited share of capital expenditure to be deducted in any given year).

Figure 3.4. Time Path of Revenues under ACE and Cash Flow Tax



Source: IMF staff calculations.

53. **There would be merit in applying a regime along these alternative lines, combining a modest royalty with a special profit-related charge--to all minerals, with differing royalty rates but a common rate of rent taxation—with the possible exception of aggregates.** The team has not considered all minerals that are (or might be) mined in Israel. The primary rationale for uniform application, however is precisely the difficulty of anticipating where rents might arise, and the difficulties created by taxing them ex post if an appropriate mechanism is not put in place ex ante. There being no compelling rationale for taxing returns in excess of the minimum required differently in different mining activities at different rates—and some risk of transfer pricing and other avoidance activities if they are—a single rate of rent taxation would be appropriate. Since normal price-cost margins vary substantially across minerals, however, some differentiation in royalty rates is needed to limit the distortions created by the royalty element. If rents do not arise then of course the rent tax liability will be zero. The main downside of applying this component is thus the additional costs of administration and compliance involved, so that there is a case for not applying the rent component to minerals for which the prospect of rents is truly remote—as is likely to be the case for aggregates, decades of experience around the world suggesting that these rarely prove especially profitable.

IV. TRANSFER PRICING AND SEGMENTATION

The issue

54. **Royalties, rent taxes and the CIT all require the use of some price to value minerals.** For a royalty, the amount payable is based on the value of the minerals extracted,[49] which is related to the price of the minerals. For a rent tax, some price is needed to determine how much value is attributed to the upstream activities to which the charge is intended to apply. And a price is needed for the CIT in order to assess a company's taxable receipts. Importantly, the price is serving a somewhat different function in each case: what is needed for the royalty, for instance, is some reasonable proxy for value; for the CIT, however, the goal is precise assessment of the transaction value received by the company.

55. …**which can be problematic, however, for sales between related parties**. The ideal basis for all three taxes would be an 'arms length price' (ALP): one, that is, which would be charged between unrelated parties. Where an ALP cannot be directly observed and verified, however, there is a risk that the transfer prices between related parties will be manipulated so as to allocate profits towards whichever faces the lower statutory tax rate. This is often a particular concern (real or imagined) in mining when, as in Israel, extraction and the industrial production of finished products is undertaken by separate entities that are under common ownership. Even if a company makes some sales to unrelated parties, the prices of these transactions may not be appropriate as a basis for valuing inter-group transactions since, if the sales to unrelated parties are a small part of the total, their price might be manipulated with an eye to the valuation for tax purposes of sales to related parties

Approaches

56. **Commodity prices in world markets can provide an important starting point.** It is not uncommon for countries to use international market reference prices, such as from the London Metals Exchange, as the basis for royalty calculations. This can provide certainty for both taxpayers and the tax administration. Often these initial prices are adjusted for certain costs to determine the price of the raw material ('net back'). This is illustrated in Box 4.1, which outlines the main options for valuing minerals for the purpose of ad valorem royalties. The most commonly used is the sales price or the free on board (FOB) export price. If there are concerns about costs for net back, options include using the gross price and applying a lower royalty, or reducing the gross price by an arbitrary percentage. Note that the approach to pricing may differ for the purposes of the various taxes. It may be, for instance, that while there is no usable world price for a raw material itself, there is such a price for one in which it is embodied: some rough adjustment to the latter may then be acceptable for royalty purposes, but not meet the accuracy of ALP expected for purposes of CIT.

[49] Unless the royalty is in specific form, which, as noted earlier, is rare. 'Sliding scale' royalties may make the royalty rate itself price-dependent.

Box 4.1. Common Options for Calculating Ad Valorem Royalties

Methods differ in the deductions they allow in working back to the value from an observed price to the value of resources as extracted:

- ‘**Gross market value’:** either the actual sales price to an unrelated third party or, more commonly, an international market reference price (such as from the London Metals Exchange).
- **Export value** (‘FOB price**’): gross** market value reduced by allowing a deduction for shipping and insurance costs, with the allowable cost deductions often (and best) agreed in advance**.**
- **Mine head value.** In addition to a deduction for shipping and insurance costs, this allows a deduction for the costs of domestic transportation from the mine head to the point of export.
- **Net smelter return.** In addition to transportation and insurance costs, a deduction is allowed for the cost of refining or processing the mineral.

57. **Reference prices are available for all the minerals produced in Israel, but differ in the degree to which they likely approximate actual transaction prices likely accuracy.** International market reference prices are readily available for the most important minerals produced in Israel, potash and phosphate rock. International reference prices are also available for magnesium metal and compounds, but provide less transparency than is the case for potash and phosphate rock given the relative thinness of the market. Reference prices are also available for bromine and bromine compounds—these, however, are especially problematic. Box 4.1 describes available reference prices.

Box 4.2. Reference Prices for Minerals Produced in Israel

For ***potash***, the most widely quoted price is FOB Vancouver, Canada, reflecting the export price that Canadian producers receive for standard grade potassium chloride once it is transported from mine to port and loaded onto a ship.[50] The trade publication *Fertilizer Week* publishes weekly prices for several varieties of potash at various locations (such as FOB prices for standard and granular forms of potash at major points of initial shipment including Baltic, Carlsbad, China, India, Middle East; and delivered prices at important points of use in fertilizer production including China, India, and southeast Asia).

For ***phosphate rock***, the most widely quoted price is FAS (free alongside ship) Casablanca (Morocco) for material containing 70 percent calcium phosphate by weight.[51] *Fertilizer Week* publishes weekly prices for several varieties of phosphate rock at various locations (e.g., FOB prices for phosphate rock with different concentrations of calcium phosphate at major points of initial shipment, and delivered prices at important points of use).[52] *Fertilizer Week* also publishes similar reference prices for intermediate products produced from phosphate rock, such as diammonium phosphate (DAP) and phosphoric acid. For both potash and phosphate rock (and its downstream intermediate products), actual transaction prices are based on bilateral negotiations between a seller and a buyer, who use one of the reference prices as a starting point for negotiations.

For **magnesium metal and compounds**, *Platts Metals Week* reports reference prices for magnesium metal in the United States, China and Europe.[53] *Industrial Minerals* reports reference prices for magnesite (magnesium oxide), which is sold in a variety of forms including caustic calcined magnesia, dead burned magnesia, fused magnesia, magnesium hydroxide and magnesium sulphate.[54] Each form is typically sold at a price based on a reference price, adjusted for chemical and physical differences between each form and the reference product.

For **bromine**, prior to 2007 the U.S. Geological Survey (USGS) reported U.S. bromine prices in its *Minerals Yearbook* series (reporting prices published by two of the leading producing companies); but USGS have not reported prices since then. The USGS also reported and reports delivered values of elemental bromine imported into the U.S. Price figures also occasionally appear in the trade press. For example, in October 2013, Albemarle announced it would sell raw bromine at a delivered price of $2500/metric ton.[55] In early 2014 in China, the price of elemental bromine is reported at approximately US$2900 per ton in early 2014.[56] These announcements and irregularly reported prices can be indicative of actual prices but also can represent attempts by sellers or buyers to test the waters and influence actual transaction prices.

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[50] World Bank, www.worldbank.org, accessed February 23, 2014.

[51] World Bank, http://www.worldbank.org, accessed February 23, 2014.

[52] www.crugroup.com/content/products/fertilizerproducts/fertilizerweek/Fertilizer_Week_November_2013.pdf, accessed February 23, 2014.

[53] www.platts.com, accessed February 21, 2014.

[54] www.indmin.com, accessed February 21, 2014.

[55] Albemarle press release, October 27, 2013, www.prnewswire.com/news-releases/albemarle-to-raise-prices-of-elemental-bromine-and-hydrobromic-acid-55608812.html, accessed February 21, 2014.

[56] www.sunsirs.com/uk/prodetail-643.html, accessed February 23, 2014.

58. **If a reasonable price cannot be confidently inferred from international markets or transactions with unrelated parties, some other mechanism is needed.** In particular**,** the methods used to determine an ALP for CIT purposes identified in the *OECD Guidelines on Transfer Pricing for Multinational Enterprises and Tax Administrations* (the 'OECD Guidelines'), which are used in Israel, may be useful. These methods[57] are:

- ***Resale price***—price is based on that of goods sold to an unrelated party, reduced by an appropriate gross profit margin for the seller;

- ***Cost plus***—price is based on the costs incurred by the supplier plus a mark up taking account of the functions performed and the market conditions.(This method is used, for example, for pricing gas under Australia's Petroleum Resource Rent Tax);

- ***Transactional net margin***—price is based on a net margin allocated using an appropriate base (such as costs, sales, or assets); and

- ***Profit split***—price is based on each party's contribution to the profits on the disposal of a final product to third parties.

59. **To further protect revenue, the price used could be the higher of more than one.** For example, the price could be the greater of the actual price for a transaction (whether or not with a related party) or a market reference price. This approach is currently used in Israel to determine the royalty for phosphate.

60. **The prices used for the royalty and rent tax may help apply the CIT transfer pricing rules, but these need clarifying to ensure coverage of domestic transfer pricing.** While Israel has laws covering transfer pricing[58], these refer only to international transactions—but as just seen, domestic transfer pricing can also be an issue, especially where domestic companies or activities are taxed at different CIT rates. This is the case for the mining sector where the same corporate group both extracts raw materials and uses them as input to some productive activity. The general anti-avoidance provision[59] could apply in these cases, but difficulties could be avoided by making it clear in the transfer pricing provisions that they can apply to domestic transactions.

61. **Advance pricing agreements between tax authorities and mining companies can be helpful—potentially for all taxes.** An advance pricing agreement (APA), covering the transfer prices, or methodology for their calculation, that will be accepted in some future transaction(s), can reduce the potential for tax avoidance through related party transactions

[57] Other than the comparable uncontrolled price method, which is essentially the price for an unrelated third party transaction as discussed above.

[58] Section 85A of the Income Tax Ordinance and Income Tax Regulations (Market Price Determination, 2006)

[59] Section 86 of the Income Tax Ordinance.

and provide certainty for both taxpayers and tax administrators. The Income Tax Authority in Israel is able to enter into APAs using its power to make advance tax rulings[60] (for a fee). This practice could be adopted for the mining sector.

62. **A very different approach would be to integrate upstream and downstream activities of related companies…**The royalty and/or rent tax would apply to an integrated project: that is, would be based on the final sale of a product, whether the raw material or some final product such as fertilizer, to unrelated parties. This approach dispenses with the need to specify some price for transactions between upstream and downstream affiliates—and so may seem attractive when, as in the case of bromine, there is considerable difficulty in identifying such a price.

63. **…but this raises both conceptual and practical difficulties**. Such integrated tax treatment in sometimes found in relation to gas (in Papua New Guinea, for example), but creates its own difficulties:

- ***Conceptually, the aim of an upstream fiscal regime is to measure and capture economic rent inherent in the non-renewable mineral resource***—determining the value of the resource at the first point of delivery from the mine. The integrated approach effectively assumes that the downstream enterprise earns only a normal return, so that the combined rents are in fact attributable only to the upstream activity. That may often be a reasonable approximation, in that the downstream activity is usually a lower-risk investment that is unlikely to earn significant economic rent. Nonetheless, the possibility would remain of inadvertently taxing rents arising downstream—which might be non-distorting in itself, but horizontally inequitable between these and other non-resource activities.

  ***In practical terms, in any event, the CIT in Israel requires segregation due to a lower CIT rate now applying to industrial activities than to mining*.** Before 2011, mining was treated as an industrial activity for purposes of the Encouragement of Capital Investment Law, so the CIT did not require it to be segregated from related production activities. Since 2011, however, mining is no longer eligible for the tax incentives—a positive step in itself, but now requiring the two activities to be segregated. Moreover, profits will need to be allocated between the two entities when one has a permanent establishment abroad, for purposes of the CIT to which it will be liable there.

64. **It is important to recognize that transfer pricing is not the only way in which profits can be shifted—addressing which may also require thin capitalization rules.** More effective transfer pricing control can result in more use of other profit shifting devices, such as financing a company with an artificially large amount of debt (issued by an affiliate

[60] Section 158C of the Income Tax Ordinance.

in a lower tax jurisdiction), to take advantage of the deductibility of interest compared to the non-deductibility of dividends. Many countries have introduced rules to protect the tax base against excessive interest deductions. These may be in the form of 'thin capitalization' rules, which limit the deductibility of interest where the debt: equity ratio is, in the authorities' view, 'excessive; or they may be 'earnings stripping' rules that limit interest deductions to some proportion of income (Germany, for instance, limits interest deductions to a maximum of 30 percent of earnings before interest, tax, depreciation and amortization). While Israel could invoke its transfer pricing and general anti-avoidance rules to deal with such profit shifting, more targeted barriers to undue interest deductions[61] may be more effective.

[61] These rules bring their own distortions, being insensitive to the variation of companies' circumstances. More fundamental reform, such as adoption of an ACE as the standard CIT, would address the general problem more effectively.

Appendix 1. An Overview of Mining in Israel

Israel produces several mineral resources and materials, the most important being potash, phosphate rock, and bromine. This appendix summarizes production of these resources and (because of its association with potash) magnesium, and notes several other mining activities.

Only a modest amount of mineral exploration is now underway or expected. Current exploration projects include searches for diamonds and uranium**.**

Potash[62]

Israel accounted for 6 percent of world potash production in 2012. Countries with larger shares were Canada (26 percent), Russia (19 percent), Belarus (17 percent), China (11 percent), and Germany (9 percent).[63] The largest companies producing potash in 2012, based on facilities at which they had majority ownership, were: Uralkali (Russia, 16 percent), Potash Corporation of Saskatchewan (Canada, 15 percent), Belaruskali (Belarus, 14 percent), Mosaic (USA, 14 percent), K+S AG (Germany, 9 percent) and Israeli Chemicals Limited (ICL, Israel, 8 percent).[64]

Most of ICL's production is in Israel at its Dead Sea Works subsidiary (DSW). ICL also produces potash at facilities in Spain and the U.K.. DSW extracts potash, potassium chloride and several other chemical forms of potassium, through a process that takes waters from the Dead Sea into evaporation ponds in which the mineral carnalite (hydrated potassium magnesium potassium chloride) is precipitated. Potash is recovered from the carnalite through a process that starts with screening and ends with hot leaching; this process also yields magnesium chloride solution and an end brine containing bromine. In other words, DSW produces potash as its principal product and magnesium and bromine materials as by-products. [65] DSW sells some of its potash to unrelated parties but also uses it within the ICL

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[62] "Potash" refers to various forms of potassium, including most importantly potassium chloride (sylvite), potassium sulfate (sulfate of potash or SOP), and potassium-magnesium sulfate (langbeinite or double sulfate of potash magnesia). The dominant use of potash is as a source of potassium in fertilizers, which accounts for more than 90 percent of worldwide potash use. Potash also is used in a variety of other applications including industrial water treatment and soap manufacturing (U.S. Geological Survey, Minerals Yearbook 2011, minerals.usgs.gov/minerals/pubs/commodity/potash/myb1-2011-potas.pdf, accessed February 22, 2014).

[63] U.S. Geological Survey, *Mineral Commodity Summaries 2013*, minerals.usgs.gov, accessed February 17, 2014.

[64] Raw Materials Group, Raw Materials Data, database of January 15, 2014.

[65] 'By-product' means a product recovered along with a principal product that is the primary focus of the operation and around which the main production facilities are designed. A by-product would not be of commercial interest were it not for the associated principal product.

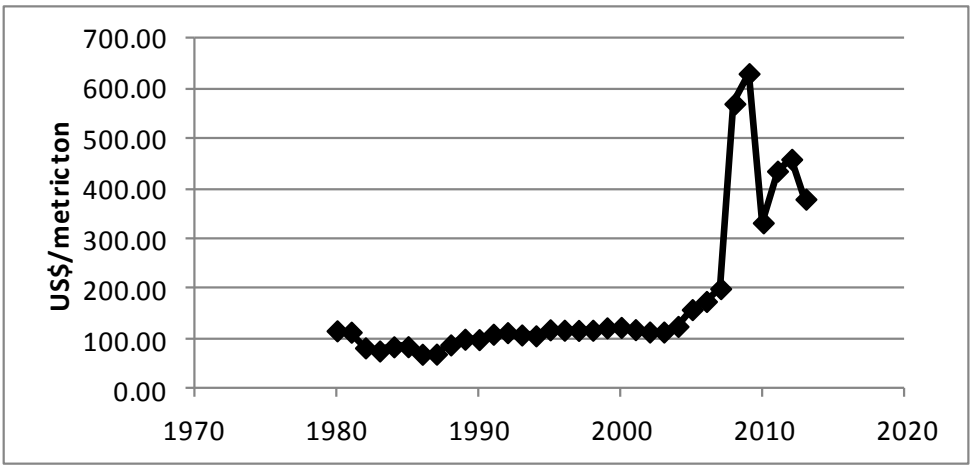
group as an input into compound fertilizers and specialty fertilizers. In 2012 and 2013, 94 percent of ICL's potash sales were to unrelated parties.[66]

The costs of goods sold for DSW appear to be in the mid-range compared to other potash producers, although the company annual reports suggest they are lower than for many other producers. A Morgan Stanley report estimates the 2012 costs of goods sold for leading potash producers, and finds that DSW costs are in the middle of the range. These estimated costs are defined as gross cash costs plus royalties, free on board at the mine, in US$/metric ton.[67] .

Several trade publications and consulting groups publish reference prices for potash and its downstream products. Chapter IV describes sources of potash prices in greater detail.

After a long period of stability, potash prices rose significantly in 2003-2008 before falling by about one-third (Appendix Figure 1.1) In January 2014, the potash price averaged US$ 323 per ton (f.o.b. Vancouver).[68]

Appendix Figure 1.1. Potash Prices, 1980–2013



Note: Annual average, potassium chloride, standard grade, spot, f.o.b. Vancouver.
Source: World Bank, http://econ.worldbank.org, accessed February 23, 2014.

[66] ICL, *Preliminary Publication of Consolidated Financial Data, December 31, 2013*, http://repo.icl-group.com/Lists/ReportsManagement/Financial%20Reports/2013/Early%20Publication%20of%202013%20Financial%20Results.pdf, accessed February 23, 2014.

[67] Morgan Stanley, August 2013, as reported at prosperitysaskatchewan.wordpress.com/2013/10/09/the-end-of-potash-as-we-know-it/ accessed February 17, 2014.

[68] World Bank, worldbank.org, accessed February 23, 2014.

Bromine[69]

Israel accounted for 34 percent of world bromine production in 2012; Jordan accounted for 40 percent. In both cases, bromine is a by-product of potash production from evaporation ponds in which bromine, magnesium, and potash are extracted from waters of the Dead Sea. China is the other large bromine-producing country, with 20 percent of world production in 2012.[70]

The sole producer of bromine in Israel is the Dead Sea Bromine Company (DSBC), a wholly owned subsidiary of ICL. ICL directly consumes most of its production within the group to manufacture bromine compounds at facilities in Israel, China, and the Netherlands; in 2012, ICL consumed approximately 76 percent internally.[71] ICL also sells elemental bromine to unrelated parties. ICL is the world's single largest producer of manufactured bromide compounds, with about 40 percent of the world market. The next largest is Albemarle (USA), a joint-venture partner in Jordanian bromine production, at 24 percent; followed by Chemtura (USA), 14 percent; Chinese companies, 13 percent; and other companies, 9 percent.[72]

There are no regular, published and public prices for bromine and bromine compounds--a significant concern for tax purposes. [73] Chapter IV discusses currently available sources of price information for bromine. The U.S. Geological Survey reported prices of raw bromine until 2007: Figure 1.2. This shows prices ranging between approximately US$600 and US$1000 between 1980 and 2006, rising to US$1400 per ton in 2007. The price of elemental bromine in China is reported at approximately US$2900 per ton

[69] Bromine and bromine compounds are used in the manufacture of flame retardants, pharmaceuticals, oilfield drilling fluids, water treatment chemicals, and other specialty uses (http://albemarle.com/Products-and-Markets/Performance-Chemicals/Specialty-Chemicals/Bromine-and-Derivatives-160.html, accessed February 15, 2014).

[70] U.S. Geological Survey, *Mineral Commodity Summaries 2013*, *Minerals Yearbook 2012*, minerals.usgs.gov, accessed February 16, 2014.

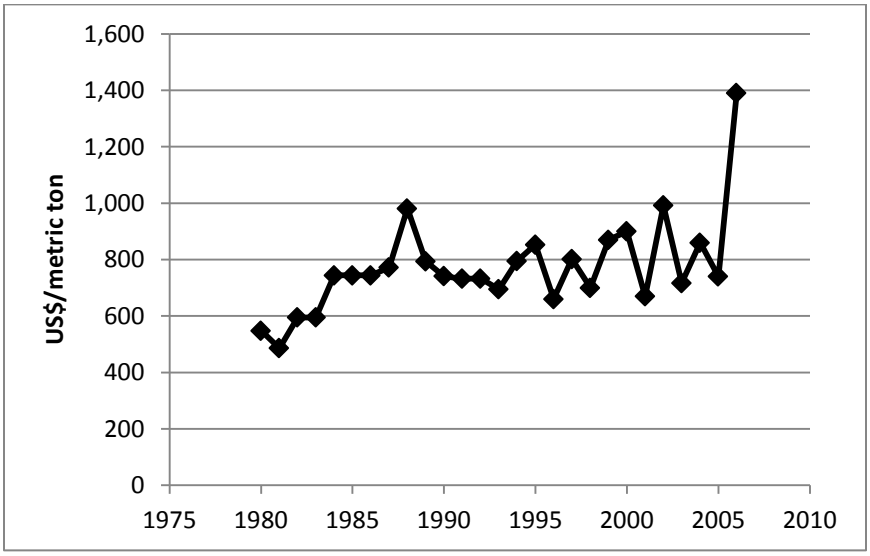
[71] ICL, http://repo.icl-group.com/Lists/ReportsManagement/Financial%20Reports/2012/Annual%20Report%202012.pdf.pdf, accessed February 22, 2014.

[72] ICL, http://www.icl-group.com/aboutiicl-segments/General/db6b0d57-1180-47a2-9624-35fefb085b44.aspx, accessed February 19, 2014.

[73] 'By-product' means a product recovered along with a principal product that is the primary focus of the operation and around which the main production facilities are designed. A by-product would not be of commercial interest were it not for the associated principal product.

in early 2014.[74] This figure compares to Albemarle's announced price of $2500/metric ton delivered in October 2013.[75]

Appendix Figure 1.2. Bromine prices, 1980–2006



Note: US$/metric ton bromine content.
Source: U.S. Geological Survey, minerals.usgs.gov, accessed February 17, 2014.

Magnesium[76]

Israel accounted for 4 percent of world magnesium-metal production in 2012. The largest producing countries were China (85 percent) and Russia (5 percent). Israel also produces magnesium chloride and magnesium oxide (magnesia) compounds. Although Israel accounted for 6 percent of world production capacity for magnesium compounds from seawater and brines, it accounted for less than 1 percent of capacity for magnesium compounds overall, because most of the raw material comes from magnesite mines. All Israeli production of magnesium metal and compounds derives from material recovered as a by-product of ICL's Dead Sea potash facility by Dead Sea Magnesium Company.[77]

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[74] www.sunsirs.com/uk/prodetail-643.html, accessed February 23, 2014.

[75] Albemarle press release, October 27, 2013, http://www.prnewswire.com/news-releases/albemarle-to-raise-prices-of-elemental-bromine-and-hydrobromic-acid-55608812.html, accessed February 21, 2014.

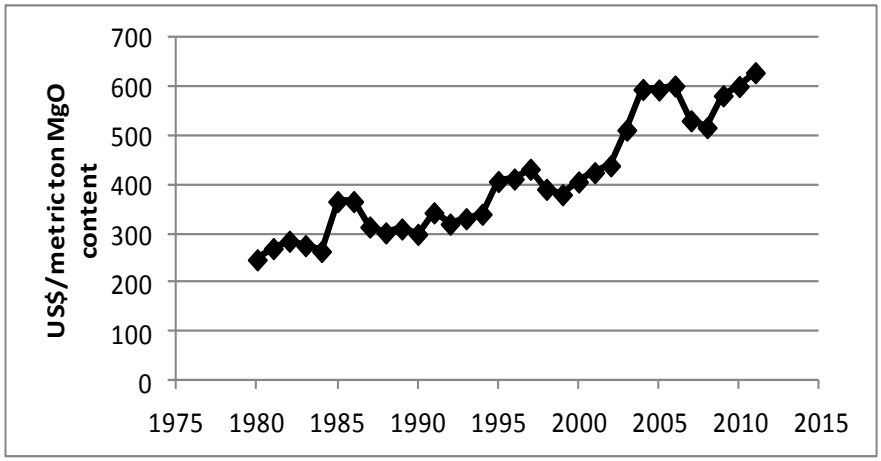
[76] Magnesium metal is used as a structural metal in applications where light weight and low density are valued. Magnesium compounds are used in a variety of applications including water treatment, fertilizers, and products to control road dust and ice.

[77] U.S. Geological Survey, *Mineral Commodity Summaries 2013*, *Minerals Yearbook 2012*, minerals.usgs.gov, accessed February 16, 2014.

Magnesium metal and various magnesium alloys and compounds all have their own prices. Chapter IV discusses sources of information on magnesium prices in greater detail.

Prices for magnesium compounds, as reported by the U.S. Geological Survey, generally trended upward between 1980 and 2011: Appendix Figure 1.3).

Appendix Figure 1.3. Magnesium Compound Prices, 1980–2011



Note: Unit value, US$/metric ton MgO content.
Source: U.S. Geological Survey, minerals.usgs.gov, accessed February 23, 2014.

Phosphate Rock[78]

Israel accounted for 1.5 percent of world phosphate rock production in 2012. Those with larger shares were China (42 percent), the United States (14 percent), Morocco and Western Sahara (13 percent), Russia (5 percent), Jordan (3 percent), and Brazil (3 percent).[79]

Rotem Amfert Negev, a wholly owned subsidiary of ICL, accounts for all of Israel's production of phosphate rock. Rotem Amfert Negev sells products to unrelated parties at various points in the fertilizer supply chain: phosphate rock, phosphoric acid that it produces with its own phosphate rock, and various fertilizers and other manufactured intermediate and finished products that it produces with its own phosphate rock and phosphoric acid. ICL has production facilities in Israel for phosphate rock, sulfuric acid, phosphoric acid and fertilizers. It also has plants for phosphate and speciality compound fertilizers in Belgium,

[78] Most phosphate rock is used as an input to the production of phosphoric acid, which in turn is used primarily in various types of fertilizer. To a large degree, production of phosphate rock and phosphoric acid occur within vertically integrated companies.

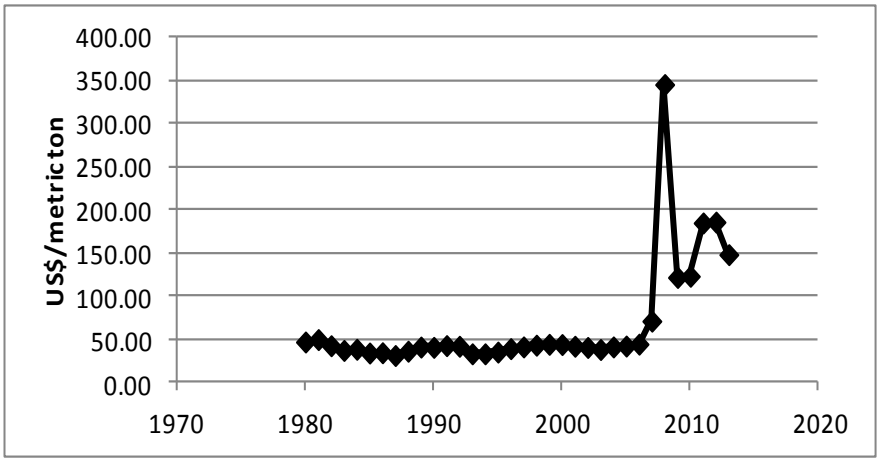
[79] U.S. Geological Survey, Mineral Commodity Summaries 2013, minerals.usgs.gov, accessed February 17, 2014.

Germany, India, the Netherlands, Spain, and the United States. In 2012 and 2013, ICL used 71-72 percent of its phosphate-rock output internally to produce phosphoric acid and fertilizers.[80]

Several trade publications and consulting groups publish reference prices for phosphate rock, phosphoric acid, and fertilizers of various forms. Chapter IV provides detail.

Phosphate-rock prices spiked strongly around 2008, subsiding since (Appendix Figure 1.4). In January 2014, the potash price averaged US$102 per ton.

Appendix Figure 1.4. Phosphate Rock Prices, 1980–2013



Note: Annual average, Morocco, 70 percent BPL, contract, free aboard ship, Casablanca.
Source: World Bank, http://econ.worldbank.org, accessed February 23, 2014.

There is the possibility of greenfield investment in phosphate rock mining in the next few years, which conceivably could be split between two companies.

Other

A number of quarries produce construction aggregates—several tens of quarries, most of which are owned and operated by three companies.

[80] ICL 2012 *Annual Report*, http://repo.icl-group.com/Lists/ReportsManagement/Financial%20Reports/2012/Annual%20Report%202012.pdf.pdf, and *Preliminary Publication of Consolidated Financial Data, December 31, 2013*, http://repo.icl-group.com/Lists/ReportsManagement/Financial%20Reports/2013/Early%20Publication%20of%202013%20Financial%20Results.pdf, accessed February 23, 2014.

A Mexican company, Altos Hornos S.A. (AHMSA) plans to mine and then refine copper through solvent extraction and electrowinning. It received permission in 2011 to operate the mine and build the plant in the Negev Desert near Eliat.[81]

Israel also polishes diamonds from raw diamonds produced elsewhere and recycles nonferrous metal. These activities are outside the scope of this report.

[81] AHMSA, *Annual Report 2012*, http://www.ahmsa.com/Acero/Empresa/Financieros/ahmsa_annual%20_report2011.pdf, accessed February 23, 2014; USGS MY 2011, http://minerals.usgs.gov/minerals/pubs/country/2011/myb3-2011-is.pdf, accessed February 23, 2014.

References

Boadway, Robin and Michael Keen, 2010,"Theoretical perspectives on resource tax design," pp. 14-74 in Philip Daniel, Michael Keen and Charles McPherson (eds) *The Taxation of Petroleum and Minerals: Principles, Practices and Problems* (Routledge: Abingdon).

Boadway, Robin and Michael Keen, 2013, "Rent taxes and royalties in designing fiscal regimes for non-renewable resources," forthcoming in David Layton and Robert Halvorsen, (eds), *Handbook on the Economics of Natural Resources* (Edward Elgar: London)

Bond, Stephen R., and Michael P. Devereux, 1995, "On the design of a neutral business tax under uncertainty," *Journal of Public Economics* 58, pp. 57–71.

Brown, E. Cary (1948), "Business-income taxation and investment incentives," in *Income, Employment and Public Policy: Essay in Honor of Alvin H. Hansen*, New York: Norton.

Calder, Jack, 2010a, "Resource tax administration: The implications of different policy choices," pp. 319-339 in Philip Daniel, Michael Keen and Charles McPherson (eds) *The Taxation of Petroleum and Minerals: Principles, Practices and Problems* (Routledge: Abingdon).

Calder, Jack, 2010b, Resource tax administration: Functions, procedures and institutions," pp. 340-377 in Philip Daniel, Michael Keen and Charles McPherson (eds) *The Taxation of Petroleum and Minerals: Principles, Practices and Problems* (Routledge: Abingdon).

Chen , Duanje and Jack Mintz, 2013, "Fixing Saskatchewan's potash royalty mess: A new approach for economic efficiency and Simplicity," School of Public Policy University of Calgary.

Daniel, Philip, 1995, "Evaluating state participation in mineral projects: Equity, infrastructure and taxation," pp. 165-187 in James Otto (ed.), *The Taxation of Mineral Enterprises* (Graham: London).

Daniel, Philip and Emil Sunley, 2010, "Contractual assurances of fiscal stability," pp. inPhilip Daniel, Michael Keen and Charles McPherson (eds) *The Taxation of Petroleum and Minerals: Principles, Practices and Problems* (Routledge: Abingdon).

Daniel, Philip, Michael Keen, and Charles McPherson (eds), 2010, *The Taxation of Petroleum and Minerals: Principles, Problems and Practice*, (Abingdon: Routledge).

Daniel, Philip, Brenton Goldsworthy, Wojciech Maliszewski, Diego Mesa Puyo and Alastair Watson, 2010, "Evaluating fiscal regimes for resource projects: An example from oil development,:" pp. 187-240 in Philip Daniel, Michael Keen and Charles McPherson (eds) *The Taxation of Petroleum and Minerals: Principles, Practices and Problems* (Routledge: Abingdon).

De Mooij, Ruud, 2011,"Tax biases to debt finance: Assessing the problem, finding solutions," International Monetary Fund Staff Discussion Note11//11.

FTI Consulting, 2013, "Submission to the second Sheshinski committee on mining royalty and tax regime issues."

Kleinbard, Edward, 2007, "Designing an income tax on capital," in *Taxing Capital Income*, ed. by H.J. Aaron, L. Burman, and E. Steuerle (Washington: Urban Institute Press).

Klemm, Alexander, 2007, "Allowances for Corporate Equity in Practice," *CESifo Economic Studies*, Vol. 53, pp. 229–62.

International Monetary Fund, 2012, "Fiscal regimes for extractive Industries: Design and implementation," at http://www.imf.org/external/np/pp/eng/2012/081512.pdf

International Monetary Fund, 2013, "Template to collect data on government revenues from natural resources," at http://www.imf.org/external/pubs/ft/gfs/manual/comp.htm

Mullins, Peter, 2010, "International tax issues for the resources sector," pp. 378-402 in Philip Daniel, Michael Keen and Charles McPherson (eds) *The Taxation of Petroleum and Minerals: Principles, Practices and Problems* (Routledge: Abingdon).

Otto, James, 2013, "Expert opinion on mine taxation," submission to the Sheshinski Committee II for the review of policy with respect to royalties on natural resources,"

Otto, James, Craig Andrews, Fred Cawood, Michael Doggett, Pietro Guj, Frank Stermole, John Stermole, and John Tilton, 2006, *Mining Royalties* (Washington: World Bank).

'Sheshinski I,' 2013, *Conclusions of the Committee for the Examination of the Fiscal Policy with Respect to Oil and Gas Resources in Israel*, State of Israel.