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International rules for trade in natural resources

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Abstract

This paper investigates the scope for international rules to address market failures in trade in natural resources and the associated international transactions of prospecting and investment in resource exploitation. We argue that several market failures are likely to have substantial costs. However, due to the distinctive features of natural resources, the market failures are particular to them. The *ad hoc* approaches which have attempted to address them to date leave scope for a more systematic and comprehensive approach by the WTO, but the distinctive features of natural resources imply that this could not simply be an application of the rules appropriate for other forms of trade.

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1. Introduction

Non-renewable natural resources – oil, gas, minerals and ores – account for some 15% of world trade. These flows are critical to the functioning of the world economy, as evidenced by the effects of oil crises of the 1970s and the recent oil and commodity price spike. A very high proportion of the output of the sector is traded internationally; more than half of oil output is traded as crude, rising to two-thirds including refined products. Many resource producers are almost totally dependent on resource exports for their foreign exchange; for over 20 countries non-renewable natural resource exports provide more than three-quarters of export earnings (average 2000-05, IMF 2007). Trade rules shape the economic and political environment in producing economies and influence investors' decisions to seek and develop new resource deposits. Increasingly, discoveries will be made in international territories (deep sea and polar regions) and international legal frameworks will set the conditions under which such developments operate.

How should international rules be set to govern this sector? It is an area to which the GATT and WTO have previously paid little attention, but where there are a number of inefficiencies arising in the course of international trade and investment. Countries (and firms and individuals) seek to increase their share of resource rents through a variety of measures. These lead to inefficiencies in the market for resources and also in the market for long run rights to develop and extract resources. In the resource market there is a wide international dispersion of prices (up to a 10:1 in fuel prices). In the allocation of exploration and production rights there are inefficient allocation processes, excessive risks, and likely sub-optimal levels of exploration and development. The objective of this paper is to develop the economics of these issues and draw out a series of policy proposals. The starting point is an overview of the particular features of the economics of natural resources.

2. Why are natural resources different?

What is special about the natural resource sector?¹ We argue that there are distinctive features

¹ We focus on non-renewables. Renewables – such as fish and forests – raise further issues to do with open access and the tragedy of the commons, and with threshold effects in sustainable population sizes.

that give rise to non-standard arguments for trade policy and for the design of international rules. These features include the fixed location of resource endowments, the presence of resource rents, the fact that resource stocks are finite, issues to do with the long run discovery and development of resources, and the fact that resources are a predominant share of economic activity in some producing countries. We start with a review of these features and their implications for policy.

Immobility

Standard analysis of trade policy identifies two sources of inefficiency and welfare loss created by trade taxes. Production losses arise as protection induces countries without comparative advantage to produce a good, sheltered from international competition. Consumption losses arise as border taxes create international differences in user prices.²

Since deposits of a particular resource are generally concentrated in relatively few locations and are immobile there is little scope for trade policy to relocate production with its attendant production losses. Whereas in other sectors trade policy may seek to induce (or prevent) the relocation of production between countries, in resource sectors countries that happen not to be endowed with a resource have no local firms or workers to protect and cannot use tariffs to attract production; for these countries user taxes are equivalent to import tariffs. Similarly for resource producers, a resource export tax is equivalent to a subsidy on domestic consumption.³ The essence of a trade tax is that it is differentiated according to where the good is produced but, so long as a country is not both producing and importing a particular natural resource, this discrimination cannot occur. This argument is relaxed somewhat if domestic production of a close substitute for an imported resource is possible. For example, tariffs could be used to promote use or development of a domestic energy source to replace imported fuels. Nevertheless, there is a fundamental sense in which immobility of resource endowments reduces the likelihood of trade policy induced production losses.

While production losses are likely to be relatively unimportant, consumption losses are not. National tax policies support a wide international dispersion of user prices, particularly in the energy sector where importers typically have high fuel duties and exporters may have fuel

² We use the term ‘user prices’ to refer to prices faced by final consumers and by domestic firms that use the resource as an input to production.

³ They are identical if the government captures 100% of resource rent. There is also an equivalence of export taxes and import tariffs (Lerner symmetry). This and other issues of tariff policy for resource rich economies are explored in Collier and Venables (2009).

subsidies or export taxes that depress domestic prices. Whilst the appropriate level of energy prices depends on many factors, it is clear that this price dispersion is a source of inefficiency, and that subsidising domestic consumption through export taxes or other dual pricing schemes is wasteful. Furthermore, whilst not a source of production inefficiency in the resource producing sector, this price dispersion is a source of inefficiency in resource using sectors. For example, export taxes or other dual pricing mechanisms can have the effect of attracting resource using sectors to countries where the sector production would otherwise not be profitable and against underlying comparative advantage.

Rents

Resource deposits typically carry rents – the value of output is well in excess of the cost of production.⁴ This is in contrast to most other goods and services, which can (subject to productivity differences) be produced in many different countries, and where rent is bid away by expanding production. We take the view that rents properly belong to the country in which the resource endowment is located. However, investing firms and consumer countries employ a variety of policy measures in an attempt to increase their share of these rents. The policy game is therefore primarily about getting rents rather than about relocating production. Manipulation of supply or demand can change the price of the resource, and this is one of the motives for importer countries to use resource taxes, creating the inefficiency we noted in the previous paragraph. However, to understand the effects of supply and demand changes we also need to understand the intertemporal issues raised by depletion of a finite resource.

Depletability

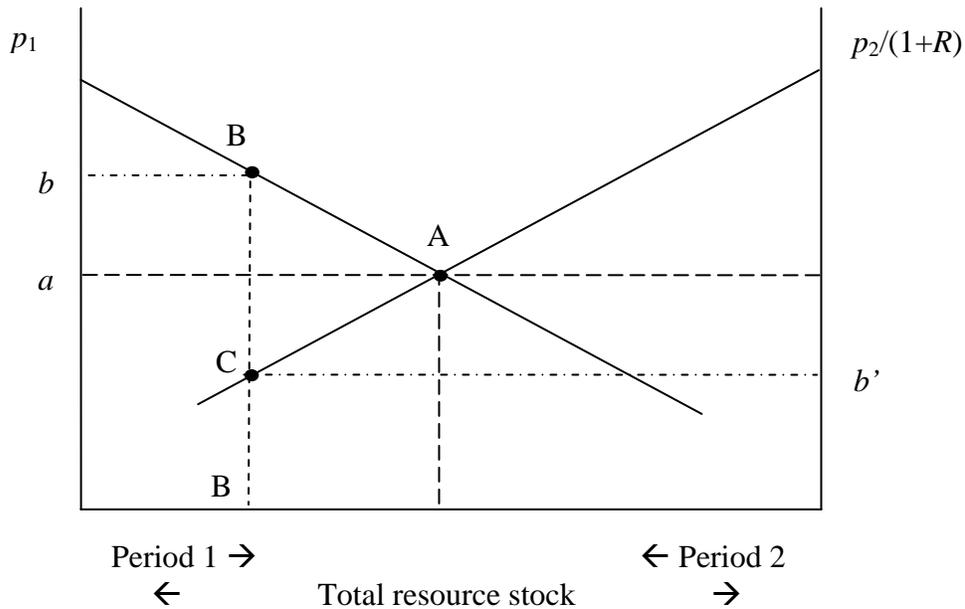
Depletion of a non-renewable resource involves an inter-temporal trade-off; if a resource is consumed today, it cannot be consumed tomorrow. If the total supply of the resource is fixed, then policy actions that change the rate of extraction in one period must also have an effect (generally the opposite one) in another period. This fact changes fundamentally the effects of any policy to influence the terms of trade. We discuss this in the context of cartel behaviour by

⁴ For hydrocarbons fiscal revenues average around 70% of the value of resource exports, while for most minerals the average is much lower (IMF 2007).

producers, but the argument applies equally to importer country attempts to change the terms of trade by taxing consumption.

Points can be made using a two-period example, in which the expected stock of the resource is fixed. This is illustrated in figure 1, in which the fixed length of the horizontal axis is the stock of the resource, and consumption in period 1 is measured from the left hand axis and in period 2 from the right. The vertical axis is price, and demand curves in each period are illustrated by the downward sloping lines. Notice that the right hand axis is the present value of the future price, where R is the appropriate discount rate. Equilibrium is where a producer is indifferent between selling a marginal unit of the resource in the first period or in the second, so $p_1 = p_2/(1+R)$, and where demand in each period fully exhausts the stock. This is point A, with associated first period price a .

Figure 1: Cartel behaviour with a fixed resource stock



What is the effect of a period 1 supply restriction, for example by a producer cartel? If first period extraction is restricted to only produce the quantity associated with vertical line BB then first period price jumps up to b and second period price falls to b' . The price difference between

periods implies that there is real income loss, given by the area ABC. This loss might be large, including macro-economic disruption associated with price spikes as well as micro-economic inefficiencies to do with inter-temporal price differentials.

The figure also makes clear the effect of the supply restriction on the cartel itself. Its first period terms of trade gain is offset by second period terms of trade loss, so the total gain to the cartel is small (and possibly negative, as illustrated in the figure). Thus, while a cartel can *potentially* be a source of price spikes and inter-temporal misallocation, there is no reason to think that a cartel will in fact want to cause such spikes, knowing that higher current prices will be associated with lower future prices. A cartel can enforce a *permanently* higher price only by leaving some of the resource in the ground, permanently unexploited. But such a policy is hard to sustain because it is time inconsistent. Today, the cartel might want to threaten that some of the resource will be left unexploited, but far enough in the future producers will surely want to extract the resource; the threat to not deplete is therefore not credible.

The two period model illustrated in the figure corresponds to the standard multi-period model in which resource depletion occurs according to the Hotelling rule. This says that in a competitive market the equilibrium price of the resource (net of any extraction costs) must rise at the rate of interest; if it were to rise more slowly, producers would deplete more now, bank the proceeds and earn the rate of interest; if it were to rise faster producers would extract less now, preferring the capital gain on stocks in the ground. While the rate of interest sets the *change* in the price, the initial level of the price path is such that cumulative demand for the resource leads to its eventual complete depletion. Replacing competition by monopoly in the supply of the resource means that, in this argument, price is replaced by marginal revenue. But in the simplest case marginal revenue is a constant proportion of price, so the monopoly extraction path is identical to the perfectly competitive one. Cartel power, optimally used, induces no inefficiencies or misallocation whatsoever.⁵

These arguments become less clear cut when other factors – the discovery of new sources of supply, the development of substitutes, the divergent interests of cartel members – are factored into the analysis. But there remains the fundamental point that a limited total supply of a

⁵ See for example Dasgupta and Heal (1979). Marginal revenue is a fixed proportion of price if the demand curve for the resource is iso-elastic.

resource sets the long-run average price, so attempts to manipulate the price can only have a small impact on long run average prices.

Discovery and development

Natural resource projects are also distinctive as investors enter a long term relationship with the host country government. The relationship is based on contracts signed when the licenses to explore and extract are granted, and on the accompanying fiscal regime under which investors operate. This relationship means that trade policy is not just about the market for the resource, but is also about the market for licenses – their terms and their allocation. These arrangements determine the distribution of rent between parties⁶ and also shape the incentives for depletion and for future exploration and development. We argue that it is likely that the most important inefficiencies in the resource sector arise in this area, rather than in the market for the resource itself.

The design of contractual and fiscal regimes and the allocation of licenses is complex because they have to meet multiple objectives. One is to capture rent for the government, and another is to leave incentives for efficient extraction and for investment in exploration and the development of new fields. This is an environment of very long term projects with high initial costs; a mine may easily last for 50 years or more, and up front capital costs are truly sunk, having little or no alternative use value. Furthermore, it is an environment of great uncertainty about future price paths and about geology, and also asymmetric information, with the investor better informed about geology and technology than is government. Contracts typically take the form of an initial payment for the license and then operation subject to a royalty (or production sharing agreement) and corporate profits taxation, possibly at a sector specific premium rate.

The government is likely to be concerned not just with the expected present value of rent, but also with the time-profile of payments and with the wider benefits that the development brings to the economy. Resource projects dominate many economies – there are some 20 countries where natural resources account for more than three-quarters of foreign exchange earnings and more than half of government revenue. This dominant position means that the resource sector is central to the nation's development strategy. Since actions in this sector have non-marginal effects on virtually all aspects of the economy, they are quite properly in the realm

⁶ Given the price of the resource, they determine how rents are shared between investors and the host government.

of public policy. Government will therefore seek to retain control of the rate of extraction. Governments with imperfect access to international capital markets will care about the time-profile of payments, not just their present value. And governments will seek to take some part of the rent in terms of local participation, labour training, domestic content requirements and development of local supply. While governments might be well advised to use commercial criteria in their decision taking, simple 'leave it to the market' arguments are not valid once the dominant role of the sector is recognised.

Once the structure of the fiscal regime and contract has been decided, licenses have to be allocated. Methods used range from auctions, through to closed and corrupt deals. Auctions have the advantage of being transparent and securing a high return to the government, although their success is dependent on there being a high degree of participation. Absent this, or in a situation where one bidder has a significant advantage over others (perhaps because of incumbency) negotiation with the preferred bidder may be preferable to an open auction.

What are the main sources of inefficiency that are created in the design of fiscal regimes and contracts, and in their allocation? The most important one is that incentives to prospect and to develop new sources of supply can be undermined by the *process* of allocating and enforcing contracts. Flawed processes can have adverse consequences on both producers and consumers, and supra-national rules may be able to mitigate these problems.

Contracts of the sort outlined above leave parties open to an acute 'hold-up' problem; government is unable to commit not to renegotiate the terms of a contract that is struck, and investors are likely to be deterred by the consequent risk. Since these changes are most likely to occur if outcomes are better than expected, they have the effect of reducing the expected returns to investment. The extreme case is expropriation, and milder cases are readjustment of production shares, royalty rates or the corporate tax regime. This has several effects; government will receive a lower payment in the initial auction of licences. This further increases the incentive for the government to renege on the terms of the contract and so compounds uncertainty. And in response to the uncertain status of any contract firms are likely to invest less in the project, and also to distort the extraction rate, depleting faster than would otherwise be efficient. Arguably then, at least in some regions of the world, there is systematic bias towards under- exploration and development, and perhaps also over-rapid depletion.

Inefficiency in the prospecting process also arises because many extraction rights are sold

through secret bilateral negotiation rather than by means of conventional international market processes. Because each prospecting right is unique, it is not possible to benchmark transactions with reference to an international market price. The standard institutional mechanisms for dealing with uniqueness are to create a market by means of competitive tendering and auctioning. However, the mutual advantages to the parties participating in secret bilateral negotiations may lead them to be chosen in preference to competitive auctions. Secret bilateral negotiation can give rise to social inefficiency due both to the agency problem and to asymmetric information. The agency problem is that secret bilateral negotiations are prone to bribery, while the asymmetric information problem is that resource extraction companies have better information than governments. In conjunction they enable the private capture of rents that should accrue socially, and award contracts to companies on criteria other than efficiency.

While not directly within the ambit of traditional trade policy, these deficiencies in the way in which international contracts are awarded and enforced result in market failures which could potentially be corrected by international rules. Attempts to completely prevent ex post changes in the contractual or fiscal terms are unlikely to succeed and are undesirable; however well designed the contract there may be unforeseen developments that make changes in terms necessary. However, it may be possible to place some bounds on the magnitude and form of changes, either through agreed codes of practice or by binding dispute resolution mechanisms. Similarly, while an element of bilateral negotiation is inevitable in finalizing the terms of a resource extraction contract, it might be possible to limit the bounds of such negotiations through agreed codes of practice on a preceding phase of open competition.

In summary then, we have argued that there are important differences between natural resources and other goods that are replicable through production. Rents are crucial, and many of the effects of trade policy are to do with shifting rents rather than moving production. International dispersion of user prices is a major source of static welfare loss. Inefficiencies to do with price spikes have a serious negative impact on real income. Cartels may have little influence over the long run price of resources and gain little from causing short run price peaks. The dominant role of resources in many economies mean that government has a central role to play, so resource contracts should take into account wider social interest rather than simply being financial transactions. However, fundamental problems with the design and implementation of resource contracts can create market failure and a role for supra-national intervention in the

process through which contracts are allocated and through which breaches are handled. With these points in mind, we now turn to an evaluation of international rules.

3. International Rules and Exporting Country Interests

In almost all countries the ownership of natural assets is vested in government. Since many aspects of exploitation are often more efficiently undertaken by international firms than by the government or national oil companies, the efficient social appropriation of rents depends upon solving complex principal-agent problems in both exploration and exploitation. Further, since depletable natural assets can only be used once, their exploitation raises issues of inter-temporal justice somewhat analogous to climate change. Across widely different societies governments recognize some obligation towards future generations: for example, both Norway and Kuwait have future generation funds into which revenues from the depletion of natural assets are paid. International rules of trade have the potential both to impair and to enhance the ability of governments to appropriate rents and to distribute them equitably between generations.

3.1 Inappropriate extensions of international rules

Unless the distinctiveness of natural resources is recognized, the application of international rules that are appropriate for other types of trade could potentially inhibit the ability of resource exporting countries to fulfil these responsibilities.

Rules against cartels

One such inappropriate extension would be if international rules were to limit producer cartels. While international competition is not currently part of the WTO mandate it has been the subject of extensive discussion (eg Hoekman and Kostecki 2001) and there have been calls (some from the US senate) for WTO action against OPEC. In respect of trade in products such as manufactures and services, cartels are rightly discouraged because they are designed to generate rents at the expense of consumers. However, in contrast to rents on manufactures or services, the rents on depleting natural assets are intrinsic to the scarcity of global natural endowments. Collective producer decisions to limit the quantity of current extraction do not generate further

rents but reassign them between consumers and producers in the present and in the future. The governments of exporting countries, as the rightful owners of these rents, have the responsibility of deciding the phasing of extraction that maximizes their value to citizens, present and future.

Rules against domestic sourcing of ancillary activities

A second inappropriate extension of international rules would be to curtail the choices of producing governments as to how rents best accrue and are spent. For example, governments may wish to spend some of the rents on encouraging domestic production of the goods and services that are ancillary to resource extraction. While international regulations such as that of those of the WTO's General Agreement on Trade in Services (GATS) and the Agreement on Government Procurement (GPA) can provide welcome openness and transparency, it would be inappropriate to extend them in a way which curtailed the use of resource rents for the development of local suppliers.⁷ As noted above, in many low-income countries the natural resource sector is so substantial relative to the economy that denying the government the right to influence links other industries would unreasonably limit its scope to offset detrimental effects of such dominance on other activities. As the economy becomes heavily reliant upon a single export activity, other more labour-intensive export activities can suffer. Governments concerned about the structure of the economy have various options for encouraging employment and diversification, one of which is to foster ancillary activities. This was, for example, an explicit and highly successful strategy of the Norwegian government. Often in low-income countries support for ancillary industries by means of sourcing restrictions will not be the most cost-effective way of diversifying the economy: for example, lowering the cost base for labour-intensive export activities may be a superior approach. But such choices of strategy should be a matter for the judgment of the governments of resource exporting countries.

3.2 Specific opportunities for international rules

⁷ The GPA is a plurilateral agreement of the WTO, so not binding on all members. The GATS seeks to open service provision to international competition while providing flexibility for developing countries to protect national policy objectives and development needs. See Hoekman and Kostecki (2001).

While some of the distinctive features of natural resources imply that exporting countries could be adversely affected by the inappropriate extension of rules that are desirable for other forms of trade, other distinctive features create opportunities for rules to be useful.

Commitment technologies

Sovereignty creates difficulties in making credible commitments. In recognition of the problem governments have created a variety of national and international institutions that enable them to bind specific aspects of their behaviour. They have empowered the WTO to provide commitment technologies in respect of tariffs, through tariff bindings with an associated dispute resolution and enforcement mechanism for breaches of undertakings. As discussed above, although such an arrangement is largely irrelevant for tariffs on resource extraction, the governments of resource-rich countries do face distinctive needs for commitment technologies.

Since both prospecting and extraction require large, irreversible investments on the part of resource extraction companies, sovereign governments have difficulty in credibly committing to any particular schedule of future taxation of resource revenues. This exposes companies to the risk that once the irreversible investment has been made the tax regime will be changed so as to capture not just the rents on resource extraction but the returns on the investment. As in any such time-consistency problem, *the ultimate loser is the government*. Companies recognize the problem in advance, and so discount the value of any extraction rights that the government is attempting to sell. As a result the government can only sell the extraction rights for less than they would be worth were it able to commit to the terms that it offers. In many cases the consequences of the hold-up problem are so severe that no deal can be reached: the resources remain under-exploited.

Bauxite mining in Guinea has been one such example of the hold-up problem. Over several decades the aluminium company ALCOA repeatedly decided not to invest \$1bn to refine the bauxite in Guinea, preferring the considerably more expensive option of shipping out the ore. The board of ALCOA took this decision because of the risk of hold-up once the investment was made. In this instance the government of Guinea was the victim of its inability to make a credible commitment. However, the government of Guinea is itself at the other end of the commitment problem. A discovery of iron ore in the interior of Guinea required a route to the coast. The closest port, with an existing rail connection, was Buchanan. However, because Buchanan is in

Liberia the government of Guinea was concerned that were export to be dependent upon this route the investment needed for extraction would be subject to hold-up by the government of Liberia. To avoid the problem the government decided to construct a new railway and a new port within Guinea, adding \$4bn to the cost of the project.

These are not isolated examples. An indication of its scale is the radical difference in natural resource prospecting between the OECD and Africa. African governments have far less scope for credible national-level commitment technologies that OECD governments. As a result there has been far less prospecting in Africa than in the OECD. As of the year 2000 some \$114,000 of sub-soil assets were known to lie beneath the average square kilometre of the OECD. The equivalent figure for Africa was a mere \$23,000.

Reflecting the need for commitment technologies for resource extraction, the internationalization of contract enforcement through ad hoc approaches such as foreign courts and arbitration arrangements is already common. However, they are often mistrusted by the governments of low-income countries, while lacking enforcement mechanisms that reassure investors. There may be scope for the WTO to extend its role in the enforcement of agreements between sovereign governments to enable governments to commit themselves to resource extraction agreements. Sometimes these would be between a government and a company, as with ALCOA, and sometimes they would be intergovernmental, as with Guinea and Liberia.

Technologies for Commitment and Technologies for Contingencies

The ability of the WTO to enforce commitments is itself limited by the relative weakness of the permitted penalties for breaches. For reputational purposes the WTO should clearly avoid attempting to enforce commitments which could only be enforced by penalties beyond the feasible range. For this reason, it is important to qualify the provision of a commitment technology to enforce resource extraction contracts. Both the process by which a contract is awarded and the detailed design of the contract affect the risk that it will become highly disadvantageous to one party.

The extreme volatility of commodity prices periodically pushes any contract that does not allow for contingent events into such a range. Yet historically tax regimes have not been well-designed to withstand volatility, so that when prices are at the extremes of the range previously agreed contracts come under stress for renegotiation. To reduce the risk of such problems the

major contingencies such as price variation should be built into the design of the tax system. For example, if royalties are used, since rents increase more than proportionately with world prices, so should the rate of royalty. While the WTO clearly cannot require any particular tax regime, it can reasonably require that agreements brought under its commitment technology are robust to observable contingencies.

Processes for selling extraction rights

The Most Favoured Nation clause, which is a core principle of the WTO, has its rationale in both efficiency and equity. It is concerned to avoid tariff wedges that would segment markets, and so be both distorting and discriminatory. Markets depend upon supporting institutions and where resource extraction rights are sold through secret and bilateral negotiations the preconditions for a market do not exist. Because there is no market, secret and bilateral deals do not constitute a breach of the letter of the Most Favoured Nation Clause, although they certainly breach its spirit. Through such negotiations a government can advertently or inadvertently offer privileged terms to a particular extraction company. The analogue of the MFN clause would be a rule requiring or encouraging an open process for allocating resource extraction rights, such as provided in auctions.⁸ Auctions provide equity among bidders, and also overcome the asymmetric information and agency problems noted above.

The agency problem is widely recognized, but to date has been addressed by a variety of *ad hoc* international initiatives. One such is the Extractive Industries Transparency Initiative, started in 2003 and now with over thirty signatories among the governments of resource-rich countries, indicating recognition of concern for the problem. It aims to counter corruption in contracts by requiring companies engaged in resource extraction to report all their payments, country-by-country, forcing illicit payments into the open. Another initiative has been the pan-OECD anti-bribery legislation which has made it a criminal offense for an OECD-based company to bribe government officials anywhere in the world in order to win a contract. One consequence of this OECD legislation has been the rapid emergence of a two-stage system of negotiations for the rights to resource extraction. In the first stage a company which is either too small to face scrutiny, or not OECD based, negotiates with government. In the second stage, this

⁸ The Agreement on Government Procurement (GPA noted above) provides rules for government purchases, and this proposal would extend it to government sales.

company on-sells the rights to a major OECD company that has the technology and finance to undertake exploitation. A third and related international initiative has been to coordinate the laws relating to money laundering. A final initiative has been the Kimberley Process which has curtailed illegal international transactions in diamonds through certification of the source of origin. President Yar Adua of Nigeria has recently requested that an equivalent system of certification be put into place to curtail the large-scale theft of crude oil from the Nigerian Delta.

Given the impediments to *ad hoc* international cooperative initiatives, this plethora of international responses is evidence of the need for a more systematic international approach. These initiatives could potentially be subsumed and made more effective by bringing corruption in resource extraction contracts under the clear remit of the WTO. For example, the anti-bribery legislation that the OECD now requires of its membership could be a requirement of WTO membership. The emergence of major resource extraction companies based outside the OECD has made the WTO the more appropriate institution for international cooperation on this matter. Countering corruption in international contracts faces an acute weakest link problem. While ever some companies are in jurisdictions where bribery is permitted these companies will tend to win the contracts. Knowing this, individual governments will be reluctant to act in isolation.

4. International Rules and Importer Country Interests

The countries that import natural resources have two overarching legitimate concerns, both highly current. One is the fear that resources are going to run out before technology finds adequate substitutes: this fear is exemplified by the current debate on the concept of ‘peak oil’: the hypothesis that known reserves of oil will henceforth diminish. The other is the fear that the international trading system is going to be bypassed by secretly negotiated bilateral deals between importing and exporting governments that withdraw huge blocks of the earth’s surface from the international market. This fear is exemplified by the current Japanese concern, expressed at the 2009 G8, about mega-purchases of agricultural land. We take these in turn.

Countering the threat of ‘peak oil’

The danger of ‘peak oil’ is essentially due to under-investment in discovery. The figures above showing the radical under-investment in discovery of all forms of sub-soil assets in African

territory apply more generally to low-income countries. Were known reserves increased in these territories to the OECD average, world reserves would increase by around one quarter. Evidently, the key obstacles to discovery in these territories have been political rather than technical. As a near-global organization the WTO has the authorizing space in which to codify rules and standards that might mitigate these political impediments to investment.

Countering the threat of bilateral bypass of international markets during price spikes

The threat of bypass of international markets arises during spikes in world prices. The key recent instance is the response to the global food crisis of 2008, during which exporting governments imposed export bans. In response to the export bans, some commodity importers have sought to negotiate very long term leases on huge tracts of territory in poor, land-abundant countries for the exclusive exploitation of natural assets. Such a trend indeed risks becoming a vicious circle in which, as an increasing proportion of world supply is pre-empted, the residual international market becomes more volatile and so less reliable, inducing further bypass.

Pre-emptive bilateral mega-deals themselves face a time-consistency problem since, in time of high prices countries may renege on the deal. However, as in many coordination problems, the world trading system does not necessarily have a unique equilibrium. If confidence in the functioning of the market were to be sufficiently undermined then beliefs could become self-fulfilling. While there is a good case for encouraging foreign commercial investment into the exploitation of many types of natural asset in low-income countries, this international commercialization of production is distinct from lock-in deals for marketing the output of these enterprises. Deals that lock in privileged access to exports are a breach of the spirit of the MFN clause. The breach is clearer than that implied by non-transparent sales of extraction rights because, whereas extraction rights are not standardized, the output of the extractive industries is highly standardized and so routinely transacted through dense international markets. There is a reasonable basis for the WTO to require that future sales of the *rights to extraction* and related exploitation of natural assets should not lock-in the *sale of output* to particular markets. The sale of output can be detached from the exploitation of the resource, and conducted according to normal commercial practices for the sale of products.

5. International Rules for Assigning Ownership of Natural Assets

Natural assets have no natural owners. However, by near-universal consensus, ownership is vested in the national governments of the territories in which they are found. National governments can, and occasionally do, pass on their rights to sub-national governments or local communities, but fundamental rights are lodged at the national rather than the local level.

This principle has a powerful rationale in that nations and their governments have a long history of being fundamental legal entities and also fundamental aspects of personal identity. However, because the rights to natural assets are valuable, they can give rise to rent-seeking behaviour in which nationality ceases to be a historic fundamental, but becomes an instrument to be manipulated for the capture of rents. As with any form of rent-seeking this is a source of social inefficiency and so there is a case for rules to curtail it. Abuses take two symmetrical forms. One, noted above, is for the localities in which natural assets are located, to secede, thereby excluding other citizens from their rightful share of the rents. The other is for nations which are proximate to natural assets that are in international territory, to attempt to extend their borders. These two types of action have in common that borders become endogenous to the location of natural assets. Their objective is to reassign the ownership of natural assets from other people and so, inadvertently, the principle that natural assets should belong to the citizens of the nation in which they are found, generates a form of behaviour which seeks to reshape nations. A potential regulation which might curtail these pressures would be to qualify the rights of nationality by the provision that any changes to nationality in which actual or anticipated natural assets might reasonably be seen as playing a role, should not affect the rights of preceding national configurations. Thus, were Greenland to secede from Denmark, the rule would permit Denmark to maintain any prior rights to natural resources discovered in Greenland. Similarly, were the countries bordering on the Arctic to claim sovereignty over the entire Arctic region, this would not alter the rights of other countries to a share in the resources discovered in the Arctic.

What might those rights of other countries be? The question is already important: it is now believed that some 90 billion barrels of oil may be beneath the Arctic. But the principle extends far more broadly. Over half of the Earth's surface is not currently under the jurisdiction of any nation. To date the challenging geologies of extreme cold and the ocean-bed have largely

precluded exploitation of natural assets, the major exception being some \$12bn of fish caught annually in international waters. As technology rapidly improves, the legal position of these natural assets will become critical, as will the supporting enforcement systems. For example, gold mining is already being extended to offshore operations analogous to oil.

Because natural assets have no natural owners, the assignment of rights to those assets that are in international territory is intrinsically arbitrary. In default of any clear principle there are competing claims for a variety of criteria: proximity, need, and equity being the most apparent. On the principle of proximity, rights would accrue to the countries closest to the international territory. However, to date the application of the principle of proximity to the ownership of natural assets has not been in the form of a continuum implied by geographic distance. Rather, it has been a series of cliffs determined by legal structures. Thus, within a nation proximity is usually trumped by nationality: citizens closer to the asset do not usually have larger rights than citizens who are more distant. Beyond the land borders of the nation, rights also extend in the form of cliffs. The rights to fish extend to 12 miles as sovereign territory, to 200 miles with lesser rights that amount to custodianship in which non-nationals can share, but completely cease beyond the 200 mile limit. Further, were geographic proximity to be applied to ownership, it would be inequitable. Landlocked countries would receive nothing, small island states would become extremely rich, and large nations with spatially concentrated resources would face stronger pressures for secession. If proximity is to be resisted, the alternatives are some blend of equity and need. However, an advantage of proximity is that often this would provide the most effective enforcement. Rights assigned on a basis that could not be enforced would risk a highly inefficient outcome in which the rents on natural assets were dissipated in excessive exploitation analogous to monopolistic competition, with too many firms each unable to reach an efficient scale of operation. Currently no international agency has a clear mandate to negotiate these issues of the assignment of rights. However, they are evidently going to become important for the future exploitation of natural resources given the likely development of deep sea and polar resources.

6. Harmonization of user taxes and subsidies on natural resources

As noted above, for natural resources import duties and export taxes are equivalent to consumer taxes and subsidies. These taxes and subsidies have two substantial effects, shifting rents between importing and exporting countries, and generating overall efficiency losses. By far the most important instance of these taxes and subsidies is petroleum. Heavy permanent taxes in most importing countries reduce world demand for oil and hence lower the world price, thereby shifting the rents from producers to consumers. In producer countries consumer subsidies or export taxes have an analogous opposing effect, raising demand and tending to increase the world price.

Analogous to tariff wars, the attempt to shift rents is not a zero sum game. As substantial price wedges open up between petrol in different national markets, the efficiency losses from low-value marginal consumption in producing countries and forgone high-value marginal consumption in consuming countries are likely to be massive.⁹ However, because the efficiency losses arise from differences in domestic prices, whereas the shifting of rents arises from the effect on the world price of taxation in some countries and subsidy in others, it is potentially possible to reach a mutually beneficial deal in which the distribution of rents is unaffected while the efficiency losses are eliminated. Reaching such a deal, in which world prices were gradually harmonized, would be entirely analogous to the mutual de-escalation of tariff wars which has been the core function of the WTO since its foundation.¹⁰ Clearly, the adverse effects of carbon dioxide emissions would need to inform the eventual common tax rate on petroleum. However, the path to a common global price for carbon emissions from petroleum may be more feasible if conceptualized as a standard trade negotiation, and conducted through the mechanisms of the WTO, than as part of wide-ranging and *ad hoc* negotiations on countering climate change.

7. Conclusion

The international trade in natural resources, and its associated international transactions of prospecting and investment in exploitation, are a major component of international economic

⁹ Some price differential is (second best) efficient if it is in response to local externalities such as road congestion.

¹⁰ It would require action by both importers and exporters. Action to curtail export taxes would be a major extension of WTO practise.

activity. In the past decade these international transactions have increasingly come under a variety of ad hoc international regulation, but to date this has bypassed the WTO. The WTO has already substantially broadened its remit from the narrow focus of the GATT on trade in manufactures to include agriculture and services, and there seems no reason in principle not to include natural resources. However, we have shown that the distinctive features of natural resources imply that to be useful regulation should itself be distinctive rather than a mere extension of existing practices.

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