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ABSTRACT

International trade in natural resources: Practice and policy*

Natural resources account for 20% of world trade, and dominate the exports of many countries. Policy is used to manipulate both international and domestic prices of resources, yet this policy is largely outside the disciplines of the WTO. The instruments used include export taxes, price controls, production quotas, and domestic producer and consumer taxes (equivalent to trade taxes if no domestic production is possible). We review the literature, and argue that the policy equilibrium is inefficient. This inefficiency is exacerbated by market failure in long run contracts for exploration and development of natural resources. Properly coordinated policy reforms offer an avenue to resource exporting and importing countries to overcome these inefficiencies and obtain mutual gains.

JEL Classification: F1, F13 and Q3
Keywords: export tax, natural resources, OPEC, tariff escalation, terms of trade, trade, WTO

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Submitted 09 March 2012

1. Introduction

Around one-fifth of global merchandise trade is in natural resources.[1] Fuels, of which two-thirds of world output is traded across international borders, are the largest element. This trade is particularly important for many producing countries whose exports are undiversified: 21 countries have more than 80% of their exports in natural resources, and for 9 of these countries resource exports are more than 50% of GDP.[2] It is also crucial for importers who may have no local supply, and for whom resources are an essential input to their economies. For the world economy as a whole resource price variations are both a barometer and a determinant of macro-economic performance.

Trade in natural resources has a number of features that make it distinctive and which bear on policy in the sector. Uneven geographical distribution of resources means that some countries are dominated by resource production, while others have none; more than 90% of proven oil reserves are in just 15 countries. Resource supplies are immobile, so incentives to use policy to relocate production are largely absent. Exhaustible resources may carry large rents, and the division of these rents between producers and consumers is contentious. Trade often occurs on organised commodity exchanges and involves both spot and futures transactions. Prices that come out of these exchanges are volatile, a major source of disruption in the world economy. Subsoil assets are typically state-owned, and their extraction incurs sunk costs in long-lived projects subject to high levels of uncertainty arising from price volatility, geological uncertainties, and political risk. Often projects are financed by foreign direct investment involving a variety of types of contract between foreign investors and domestic government. All these factors create complex incentives for policy, yet at the same time most of the trade policy instruments used are outside the disciplines of the World Trade Organisation (WTO). We suggest in this paper that this has led to an inefficient outcome and that attention needs to be paid to extending trade and investment disciplines into this area.

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[1] Data presented will define natural resources as non-renewables (minerals and fossil fuels) plus forest products and fisheries. Our discussion will focus on non-renewables although, where issues overlap, we extend discussion to forests, fisheries, and agricultural products.

[2] IMF (2007).

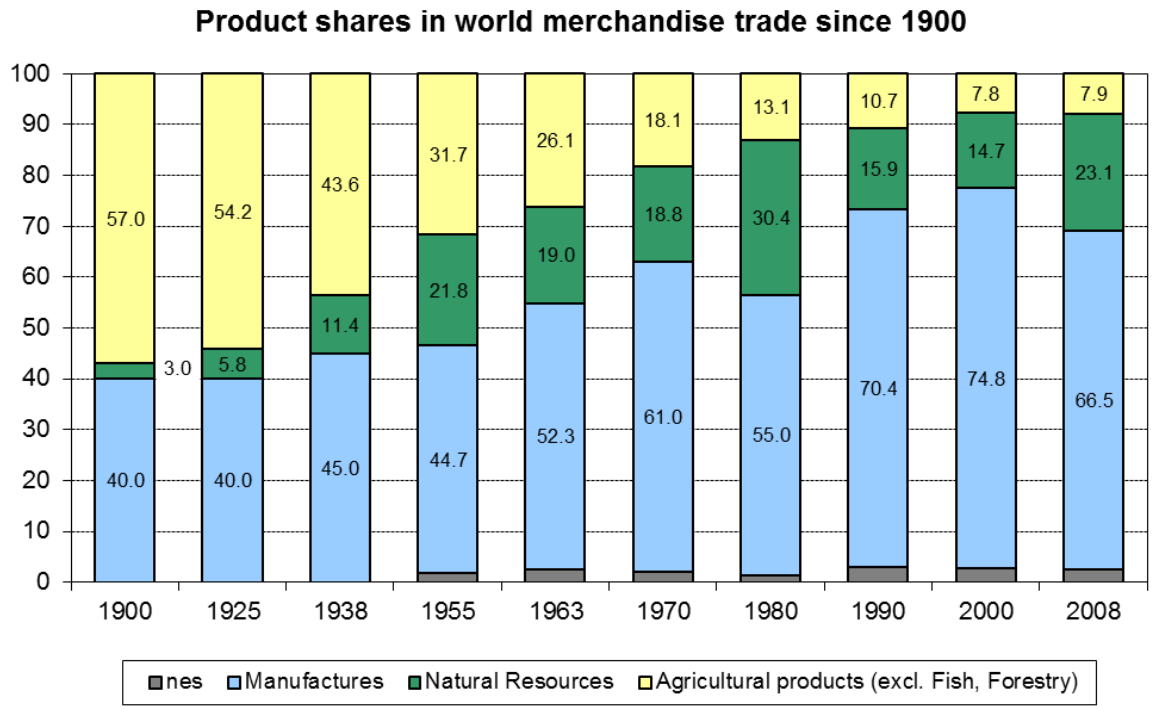
This paper provides both a survey of the issues and development of this argument. First, (in section 2) we outline some facts about trade in natural resource, discussing both trade patterns and price movements. Then (in section 3), we turn to policy, looking first at trade rules and then at the motives for resource exporters and importers to use trade policy measures. We suggest that, given the rather weak WTO disciplines in place, the ensuing trade policy equilibrium is inefficient. Section 4 turns to long run issues of exploration, development, and foreign investment in the sector, suggesting that there are major market failures and inefficiencies that could be addressed through the international system.

2. Trade in resources

2.1 Trade and production

The share of natural resources in world trade increased dramatically between 1900 and 1955 and then declined for several decades before increasing again (Figure 1). A number of factors contributed to the long run expansion of resources trade, including industrialization, population growth and falling transportation costs. Some of the variation comes from the fact that natural resources may be exported in their raw form or embodied in manufactured goods (so not included in this data). The former proportion probably increased dramatically through the 20th century with the rise of new oil producing countries. However, much of the variation, in particular from the 1970s on, is accounted for by fluctuations in commodity prices, especially of oil. In the ten years that preceded the global financial crisis, the dollar value of world exports of natural resources increased more than six fold, reaching 3.7 trillion US dollars in 2008, before falling back. Fuels represent the lion's share of total world resource exports, reaching 2.9 trillion US dollars in 2008. In the same year trade in other extractive resources, such as ores and other minerals and non-ferrous metals, was 360 billion US dollars. The value of trade of other resources such as fish and forestry, while more limited, has also increased over time, reaching respectively 98 and 106 billion US dollars in 2008.

Figure 1: Product shares in world merchandise trade from 1900 to 2008



Source: World Trade Report 2010

On the supply side, the volume of oil produced doubled between 1965 and 1980, and then increased a further 30% by 2010. The ratio of reserves to annual production now stands at 46, up from 30 in 1980. The share of oil production traded internationally increased from 51% in 1980 to 66% in 2010.[3] On the demand side, the main changes have been the surge in import demand from emerging economies. Between 2000 and 2008 the value of natural resources imported increased at an annual average rate of 30% in China, 25% in India, 22% in Singapore and 17% in Korea (Table 1). The total value of oil consumed in the Asia-Pacific region overtook that consumed in North America in 2006. As will be discussed below, the balance between changing world demand and an inelastic supply of natural resources has important implications for price volatility in these sectors.

[3] BP (2011), IEA (2009)

Table 1: Leading importers of natural resources, 2008 (billion dollars and percentages)

	Value	Share in world	Share in total merchandise	Annual percentage change		
				2000-08	2007	2008
World	**3345.6**	**100.0**	**27.5**	**17.9**	**14.2**	**33.0**
European Union (27)	766.6	22.9	33.6	18.1	11.0	31.9
United States	583.4	17.4	27.0	15.0	6.9	27.9
Japan	350.2	10.5	45.9	13.9	9.2	40.6
China	330.3	9.9	29.2	30.0	32.5	43.0
Korea, Rep. of	182.0	5.4	41.8	17.3	13.4	37.0
India	135.4	4.0	42.9	25.1	20.8	52.5
Singapore	95.1	2.8	29.7	22.3	16.0	60.0
Chinese Taipei	83.1	2.5	34.5	18.6	18.1	29.3
Canada	67.3	2.0	16.5	15.2	10.1	30.1
Turkey	50.7	1.5	25.1	22.3	22.5	33.4
Thailand	49.9	1.5	27.9	20.9	5.1	37.4
Brazil	42.8	1.3	24.7	19.1	29.3	47.5
Mexico	40.5	1.2	13.1	19.4	22.7	35.1
Indonesia	37.7	1.1	29.1	20.5	16.3	44.6
Australia	34.8	1.0	18.2	20.5	17.1	43.8
Above 15	2849.8	85.2	-	-	-	-

Source: World Trade Report 2010

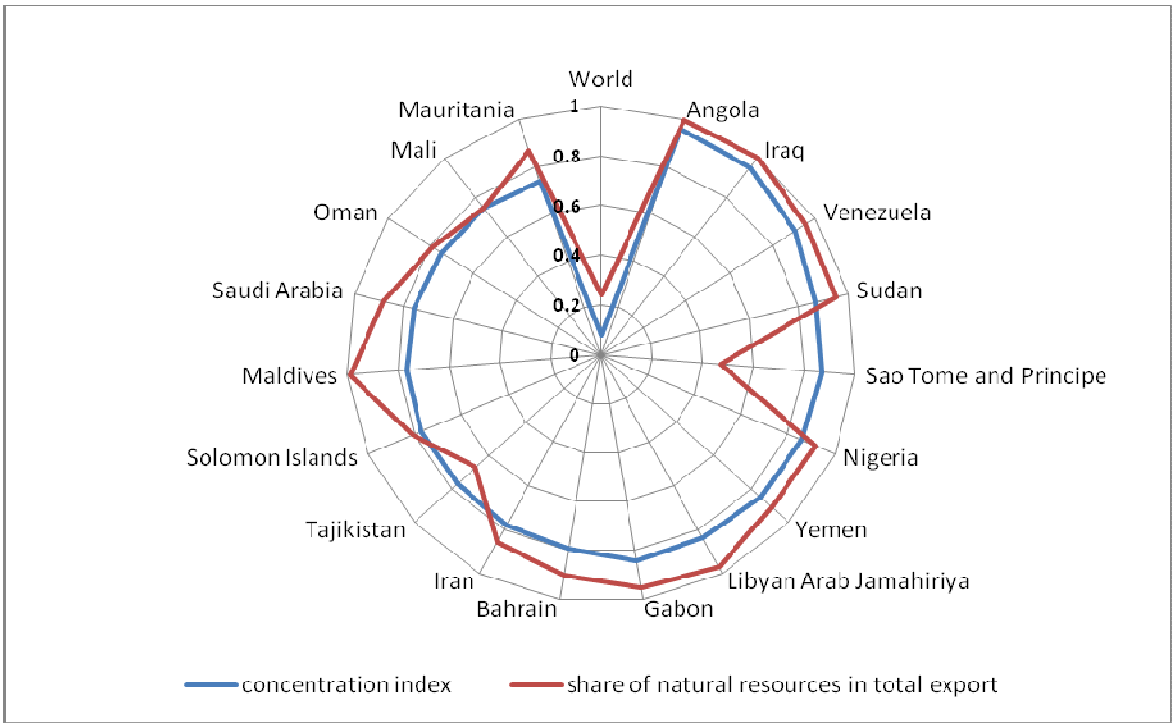
Table 2: Leading exporters of natural resources, 2008 (billion dollars and percentages)

	Value	Share in world	Share in total merchandise	Annual percentage change		
				2000-08	2007	2008
World	**3247.3**	**100.0**	**27.7**	**18.5**	**15.3**	**32.8**
Russian Federation	341.2	10.5	72.9	23.1	16.2	34.1
Saudi Arabia	282.0	8.7	90.0	18.8	9.9	35.7
Canada	177.7	5.5	39.0	13.0	13.6	24.9
European Union (27)	176.6	5.4	9.2	18.5	16.8	28.2
United States	142.5	4.4	11.0	17.3	17.5	42.4
Norway	130.6	4.0	77.8	14.0	8.4	23.7
Australia	114.3	3.5	61.1	19.3	13.6	54.3
United Arab Emirates	109.4	3.4	52.1	17.6	8.9	33.5
Iran	95.5	2.9	84.2	18.0	38.4	27.1
Kuwait	82.9	2.6	95.2	20.9	11.5	39.7
Venezuela	79.8	2.5	95.8	14.1	7.4	27.8
Algeria	78.4	2.4	98.8	17.4	10.3	31.7
Nigeria	75.4	2.3	92.2	13.7	-12.5	48.2
Singapore	67.7	2.1	20.0	23.8	17.6	44.2
Angola	67.1	2.1	100.0	..	..	..
Above 15	2021.0	62.2	-	-	-	-

Source: World Trade Report 2010

The leading exporters of natural resources are reported in table 2. While this group includes both advanced economies such as Canada and the US and less developed economies such as Saudi Arabia or Venezuela, there is a distinctive feature that separates advanced and developing exporters. Within the latter group, resource sectors often have a dominant position. For the Middle East, Africa, the Commonwealth of Independent States (CIS) resources represent a share of total merchandise exports of 74, 73 and 70% respectively, while for North America, Asia and Europe this proportion is below 20%. Figure 2 shows the share of resources in exports for the sample of countries with the least diversified exports (i.e. highest concentration of exports[4]). The high correlations between these two variables can be easily detected: with very few exceptions, countries with the least diversified exports are resource exporters.

Figure 2: Dominance of natural resource exports



Source: World Trade Report 2010

[4] The concentration index is the share of the products in the standard international trade classification (SITC) at the 3-digit level that exceeds 0.3% of a given country's exports (values closer to 1 indicate greater concentration of exports).

These disparities in natural endowments play an important part in explaining international trade.[5] As traditional trade theories emphasize, trade improves economic efficiency by allowing natural resources to move from areas of excess supply to areas of excess demand. These "static" effects, however, need to be evaluated against the dynamic effects that trade has on the exhaustibility of natural resources.

There is a substantial literature on the dynamic effects of international trade in renewable resources such as forestry or fish. Several studies point out that, when resources suffer from open access problems that result from weak property rights, trade may exacerbate the depletion of the resource (Chichilnisky, 1994, Brander and Taylor, 1997, 1998, Karp et al. 2001).[6] However, Copeland and Taylor (2009) argue that trade pessimism may be overstated. The strength of the property rights regime depends on a variety of factors, including the ability of a government to monitor supplies, the technology for harvesting and for regulating, and the economic benefits from poaching the resource. An increase in the price of the natural resource brought about by trade affects each of these factors in different ways. It may lead to increased monitoring effort or higher penalties for poaching, both of which would strengthen the property rights regime and limit resource depletion.

The literature on trade in non-renewable resources, such as fuels and minerals, is more fragmented and reaches less clear-cut conclusions. A first set of studies, summarized in Kemp and Long (1984), look at whether the predictions of the Heckscher-Ohlin theory are sustained in a setting à la Hotelling (1931) where producers take into account the opportunity cost of depleting the resource. This approach, however, neglects some salient features of markets for finite resources, such as their imperfectly competitive nature (Davis, 2010). A second set of studies abstracts from the determinants of international trade and focuses more narrowly on the exporters' optimal extraction path under imperfect competition. As this is essentially a policy choice, we return to it in section 3.2.

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[5] This is an obvious implication of the Heckscher-Ohlin model. Leamer (1984) and Trefler (1995) find results consistent with the predictions of this theory. More recently, variables such as education, infrastructure and institutions have also been observed to affect sectoral patterns of natural resources trade (Lederman and Xu 2007). Hence, natural resource endowments are best seen as a necessary but not sufficient condition for the production and export of resources.

[6] An example of how the combination of open trade and weak property rights can lead to resource depletion in the exporting country is the near extinction of the Great Plains buffalos in the US in the 19th century (Taylor, 2007).

A large body of economic literature has dealt with the problems associated with the high concentration of resource exports and lack of diversification. An expansion of the natural resource sector can have negative effects on the ability of a resource rich economy to export in other sectors by raising the real exchange rate ("Dutch disease"). A number of studies have shown that this tendency can have negative effects when the sectors that are crowded out by resource exports could have positive spillovers, such as learning by doing or economies of scale, on the rest of the economy (van Wijnbergen, 1984, Krugman, 1987, Sachs and Warner, 1995). While later studies have shown that the real exchange rate may not necessarily increase in response to an expansion of the natural resource sector (e.g. Corden and Neary, 1982, Torvik, 2001), the empirical literature is generally supportive of the predictions of the Dutch disease hypothesis. Sachs and Werner (1995) find that resource rich economies have slower growth in manufacturing exports; Stijns (2003) shows that the price-led energy booms tend to systematically hurt energy exporters' real manufacturing trade.[7]

It is also important to note that trade in resources is often not just spot-trade in the commodity, but also involves longer-term international contracts. Historically, these included long-term contracts between producer and consumer countries in energy commodities, such as oil and natural gas, and in metals, such as copper, aluminium and iron ore. Over time, these bilateral supply contracts have been complemented and sometimes replaced by trading on organized markets, as exemplified by the evolution of the market for crude oil (Stroupe 2006). The preponderant form of these longer term contracts are now exploration and production contracts between resource extraction companies and host governments. These are a form of foreign direct investment (FDI), but are quite distinctive in so far as the government is the ultimate owner of the resource that is extracted and long term arrangements – royalties, taxes, and possibly production sharing arrangements – are put in place before contracts are signed. These long term contracts are the subject of section 4, and in this and the next section we concentrate on the flow trades in the resources themselves.

[7] An appreciation of the real exchange rate is not the only channel through which a "resource curse" can materialize. The literature has identified other mechanisms, not directly related to natural resource trade, including the impact of resource abundance on rent seeking/institutions and on civil conflict. For a recent survey, see van der Ploeg (2011).

2.2 Prices and volatility

Natural resource trade has taken place at prices which have undergone long periods of secular decline, followed by abrupt spikes and periods of high volatility. Reasons for the long run decline were discussed in the Prebisch-Singer debates of the 1950s and 60s, and focused on low income elasticities for some commodities, food in particular. The picture is now very different, with growing demand from emerging markets reversing earlier price falls.

Volatility has reached new highs across fuels, minerals, and agricultural commodities. For instance, fuel prices jumped 234% during 2003-08, while mining products and food rose 178 and 120% respectively. While the causes of volatility are not necessarily international, its consequences are particularly severe because of the asymmetric impact of price fluctuations on different countries. Oil price shocks were one of the major drivers of recessions in the US (Hamilton 2009), although there is evidence that their impact is diminishing; a 10% increase in the price of oil was estimated to reduce US GDP by 0.7% over a 2-3 period prior to 1984, but just 0.25% after 1984 (Blanchard and Gali 2007), a number consistent with recent cross-country work by Rasmussen and Roitman (2011). For resource exporters, particularly developing countries, price instability has been one of the major factors leading to the 'resource curse'. Poelhekke and van der Ploeg (2009) test the direct impact of natural resource abundance on economic growth and its indirect effects through volatility of unanticipated output growth. They find that, although the direct effect can be positive, it can be swamped by the negative impact resulting from volatility.

Much research has gone into investigating the causes of price volatility, particularly for oil. One fundamental reason for large price swings is low price elasticities. Estimates of the elasticity of demand for oil are extremely low, with short run price elasticities estimated in the range 0.05 – 0.3 and long run elasticities 0.2 – 0.9 (Hamilton 2008, 2009). Supply into the spot market has also been estimated to have low price elasticity, for example the US Energy Information Agency (EIA) use a short run elasticity of 0.02 and long run 0.1 (see Smith 2009). Clearly, with such low elasticities, relatively small supply or demand shocks translate into large price changes.[8]

[8] See Smith (2009) for some examples.

However, the supply side of the market is complicated by many factors including suppliers' monopoly power, and the fact that oil and other natural resources are non-renewable assets. Price contains a large element of rent, and is not anchored by unit production costs. Supply decisions depend partly on the technology of installed capacity – how much can be mined or pumped given the capital stock of the sector – and also on asset holding decisions. Long run decisions on depletion rates lead to the Hotelling rule, that in competitive equilibrium the rent element of price will rise at the rate of interest; the level of the price is such that cumulative demand leads to its eventual complete depletion. Short-run decisions depend on the extent to which the asset which can be stored underground or in above-ground inventories, and on the relationship between current prices and future prices. This in turn is a relationship between trade on the spot market (trade in the physical good) and in futures markets (trade in financial assets).

A frequently heard claim is that speculation in futures markets has been a factor in destabilising the spot market. The trade is dominated by two exchanges, the New York Mercantile Exchange (NYMEX) and Inter-Continental Exchange (particularly ICE Futures Europe) on which oil trading volumes have gone from 1.51 times annual oil consumption to 8.45 times between 1994 and 2009.[9] There are three broad classes of traders. Producers of resources sell short, typically with rather short contracts (six months to one year), as a way of purchasing insurance on the price of future output. This is particularly true in agricultural products, but also applies to minerals and fuels. Index traders are on the other side of the market. These are investors who seek to hold commodities as part of a diversified portfolio and do so (without holding physical commodities) by buying futures contracts; the volume of this trade is large, but most of it is accounted for by rolling over the relatively short contracts on offer. The third class of investors are active traders or speculators who are engaged in 'price discovery'.

The role of futures trades, speculators in particular, in generating volatility has been hotly debated, with one side claiming that speculation has been a factor in destabilising the spot price. However, a price increase in the futures market will raise price in the spot market only if the quantity supplied to the spot market is reduced; this operates through an increase in inventories, as the commodity is held back for future rather than current delivery. There is no evidence that

[9] Turner, Farrimond and Hill (2011). Of course, oil is only consumed once but trades can take place multiple times in a year.

inventories increased during the price spikes of recent years, this suggesting that pure speculation was not a force. However, given a very low elasticity of demand, the required scale of inventory change is correspondingly small.

A more complete understanding of the interaction between markets comes from thinking about the expectations of traders. Dvir and Rogoff (2009) look at the impact of different demand shocks and show how the asset (and inventory holding) side of the market may increase volatility. If there is a positive shock to the level of demand which is transient (largest in the current period and decaying over time) then inventories will act to reduce the variance of prices: they are run down in the first period as physical supply is moved to the period with the largest demand shock. However, if a positive shock to demand is interpreted as being indicative of a shock to the rate of growth of demand (so its effect is persistent and possibly increasing) then inventory adjustment will amplify the first period impact of the shock; despite an increase in current demand, supply will be moved from the present to the future. Dvir and Rogoff make the empirical claim that this sort of behaviour characterised oil markets in the period 1861-1878, and again since 1972. These were both periods of relatively high prices and high volatility, and also periods in which there were supply restrictions (rail-road distribution monopoly in the US prior to 1878 and OPEC post 1972) and changing expectations about long run growth (the transformation of the US economy in the 19th century and the Asian economy in the late 20th and 21st centuries). This line of argument is consistent with others. Kilian (2011) suggests that increasing demand explains the 2003-08 oil price shock. Allsopp and Fattouh (2011) point to increased uncertainty about future non-OECD demand, as well as supply factors, meaning that the long-run price 'anchor' has disappeared.

In summary then, while understanding of resource price behaviour remains incomplete, the emerging consensus is that changes are driven by fundamentals. Low demand and supply elasticities (the latter not increased by asset holding behaviour) combined with shocks to the fundamentals are sufficient to explain the levels of volatility observed in recent years.

3. Trade policy: motives and outcomes

Given these background facts, we now turn to policy, looking at policy instruments, motives for their use, and the ensuing policy equilibrium.

3.1 Instruments and rules

The WTO now consists of 153 countries and provides an institutional framework to reduce obstacles to international trade and prevent the prisoners' dilemma of trade protection. The main instruments are the prohibition of quantitative trade restrictions and the downwards negotiation of import tariffs, coupled with the dispute settlement mechanism, and with agreements regulating trade in services and intellectual property. Since its inception (and that of its predecessor, GATT) tariff rates have fallen dramatically and trade volumes have risen much faster than income. Progress has been fastest for trade in manufactures, with agriculture lagging behind and trade in natural resources almost entirely outside the effective reach and disciplines of the organisation. There are a number of reasons for this.

First, the focus of the WTO is on trade policy towards imports, not exports. This derives from the fact that trade in manufactures has generally not faced restrictive export policy, and the bulk of trade restrictions that were in place were targeted at imports.[10] Thus, while import tariffs cannot be set at a rate higher than the 'bound' rate agreed in countries' schedules of commitments, exports face no such binding. Article XI of the GATT specifies that exports should not be subject to quantitative restriction (with some exceptions[11]) but places no restriction on the levels of export taxes that can be used, except for some new members that accepted them as part of their accession protocol (e.g. China, Mongolia, Saudi Arabia, Ukraine, Vietnam).

[10] Export promotion measures, namely export subsidies, are an obvious exception as historically they have been widely used (WTO, 2006). Over time this policy has come under more stringent regulation in the GATT/WTO system. As it is well known, however, there is an asymmetry in the treatment of export subsidies on agricultural and manufacturing products that persists to the present day. While the latter are prohibited by the Subsidy and Countervailing Measures (SCM) Agreement, the Agreement on Agriculture envisages reduction commitments (but not the elimination) of export subsidies to agricultural products.

[11] Exceptions include measures "relating to the conservation of exhaustible natural resources" and "to ensure essential quantities of such materials to a domestic processing industry during periods when the domestic price of such materials is held below the world price as part of a governmental stabilization plan" although adds "provided that such restrictions shall not operate to increase the exports of or the protection afforded to such domestic industry" (Art. XX:(i)).

However, trade policy in natural resources has largely been policy by exporters, not by importers.

Second, the uneven geographical distribution of resource deposits means that many countries export a very high proportion of their output or, on the other side, import a very high proportion of their consumption. In this case trade policy and domestic policy are essentially equivalent. For example, while quantitative restrictions on exports are prohibited, government can set production quotas. And on the import side, governments may have bound import tariffs (e.g. on fuel), but face no WTO discipline on the level of (non-discriminatory) domestic tax that they can impose. Paradoxically then, the very fact that such a high proportion of natural resource output is traded, serves to put it outside the disciplines of the WTO. Furthermore, while the WTO membership now covers 153 countries, several of the largest resource exporters, including Iraq and Iran, remain outside.[12]

3.2 Trade policy for resource exporters

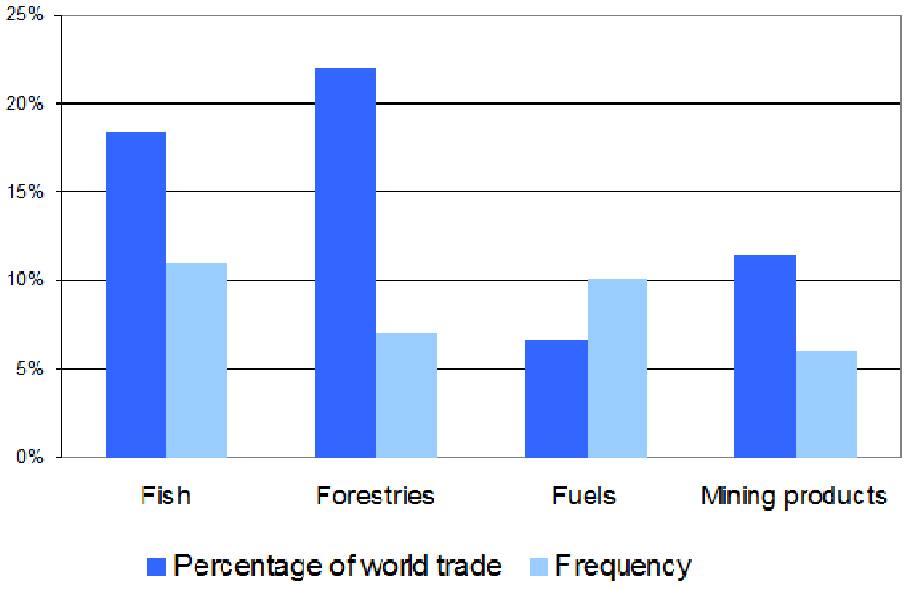
Resource exporting countries can, potentially, control both the quantity of the resource exported and the overall quantity produced. In some circumstances the two instruments may be very similar but we separate them, looking first at export policy. The most direct instrument is an export tax (the use of which, as noted above, is not restricted by the WTO), although there are other instruments of dual pricing including discriminatory sales by state owned enterprises and domestic price ceilings. The effect of an export tax is to reduce the domestic price of the resource, since producers adjust supply until they are indifferent between exporting and selling in the domestic market. Given the world price, this transfers revenue from the resource producer to government (in the form of export tax revenue) and to domestic users (through the lower domestic price). It also creates the usual distortionary 'wedges' as the marginal value of exports comes to exceed the price (and marginal valuations) in the domestic economy.

The frequency of use of export taxes is illustrated in Figure 3. More than one-third of all notified export restrictions are in resource sectors, according to the WTO's Trade Policy Reviews. Specifically, export taxes on natural resources appear twice as likely as export taxes in

[12] Russia's WTO accession was approved in December 2010. Russia will have to ratify the deal before official entry into the WTO.

other sectors, with 11% of world trade in natural resources covered by export taxes, compared to 5% of world trade as a whole. Focusing on specific resource sectors, shares of 5 to 10% of world trade in fuels and mining are covered by export taxes, while for fish and forestry these shares are higher. The fact that the frequency of these measures is generally lower than the share of trade covered suggests that large exporters of natural resources use these measures to a greater extent.[13] What motivates governments to use such a policy?

Figure 3: Export taxes by natural resource sector



Source: World Trade Report 2010

Government revenue.

While resource export taxes appear to raise revenue for government, their impact has to be evaluated taking into account other taxes and sources of public revenue. Most obviously, if government is the producer of the resource and all output is exported, then an export tax raises no (net) revenue; it is simply one part of government taxing another part of government. More

[13] In addition to export taxes, a number of quantitative export restrictions are often applied to resource sectors, including prohibitions, quotas, automatic and non-automatic licensing. Similarly to export taxes, these measures are more frequently used in natural resource sectors. Specifically, around 35% of total notified export restrictions are applied to natural resources.

generally, the export tax will raise government revenue only if the domestic private sector as a whole is a net seller of the resource (its share of resource rents is greater than its purchases of the resource, so a fall in the domestic price is a transfer from the private sector to government). In situations where government 'take' from resource rents is high, it is possible that the government loses revenue from an export tax, as any apparent revenue raised by an export tax is more than offset in losses on government sales of the resource in the domestic economy.

This proposition has implications for policy towards imports, as well as exports. Import tariffs are equivalent to export taxes by 'Lerner symmetry' since, in equilibrium, a reduction in imports will always be matched by a reduction in exports. It therefore follows that in the situation described above in which export taxes raise no revenue, neither would import tariffs. A general equilibrium formulation of conditions under which this holds is given in Collier and Venables (2010). Intuition can be seen by considering a special case in which all foreign exchange earnings come from a perfectly inelastic supply of resource exports and accrue to government; demand for foreign exchange depends on the domestic price of imports relative to the price of domestic output. An import tariff that raises the domestic price of imports must therefore cause an equi-proportionate increase in the price of domestic output, in order to hold demand for foreign exchange equal to the fixed supply. In this special case an import tariff does not change relative prices, and therefore has no real effect on the economy whatsoever. The tariff raises revenue for government but leads to an increase in the price of domestic output that erodes the real value of resource revenues by an equal amount.

Governments of resource dependent economies are often urged to diversify their revenue base by developing alternative tax bases, including trade taxes. However, the argument above suggests that this may be a misdirected policy and that, in resource exporting economies, the revenue argument for trade taxes may be weak. Trade tax revenues are illusory, as they merely shift real revenues between government accounts. Furthermore, trade taxes may have the usual adverse effects of causing distortions and deadweight loss. The most extreme of this has arisen in agriculture, where export taxes have been widely employed, in part to provide funds for governments. The distortionary effect has been massive, as exemplified by the experience of the African marketing boards (Jones 1987).

Transfers to households.

A second motive for using export taxes arises as they reduce the domestic price of the resource to domestic consumers. The clearest example is export taxes on fuel, equivalent to fuel subsidies, reducing the domestic price relative to the world price. The political economy case for oil exporters to use such policies can be strong, particularly in societies where citizens see no other benefit from their resource wealth. The scale of such subsidies on petroleum has been estimated to be running at some $250 billion pa (Coady et al. 2010). Coady et al. suggest that 'tax-inclusive subsidies', calculated as the subsidy relative to a situation where a 30c per litre gasoline tax is imposed, are running at $720bn pa or 1.0% of global GDP.[14]

Export restrictions, including export taxes, prohibitions, quotas, have also been widely used in food sectors in recent times (Anderson and Martin, 2011; Bouet and Laborde, 2010; Headey, 2011; among others). In the period 2008-10 approximately 87 new restrictions were implemented in these sectors, covering a share of world trade in food staples such as wheat and rice that reached 14% and 35% respectively (Giordani et al. 2011). While the intent of governments may well be to offset consumers' losses in the face of high and increasing world food prices, export restrictions are often ineffective in insulating domestic markets (Ivanic et al. 2011) and exacerbate volatility of world food prices, an issue that we discuss further below.

Downstream production.

The benefits of lower prices accrue not only to households, but also to downstream users or processors of the resource. An export tax, similarly to other forms of export restrictions or dual pricing schemes, effectively subsidizes downstream industries because it allows them to source inputs at a lower price than otherwise prevailing in the international market. Therefore, an export tax on raw materials can increase the competitiveness of domestic producers in international markets. While resource production itself is not mobile, resource using sectors may be, so there is an incentive to use export taxes to attract such sectors. This creates a 'production relocation' effect of export policy, similar to the one identified by literature on the effects of import tariffs. Even though 'second best' arguments such as infant industry protection or the need for export diversification of a resource rich economy can justify the use of export restrictions to promote

[14] Coady et al. select 30c per litre as a representative estimate of optimal gasoline taxes, based in revenue considerations and externalities related to congestion, accidents, and pollution.

domestic downstream production, this strategy has a number of drawbacks (Piermartini, 2004). First, export taxes, as other forms of subsidisation, may encourage the development of inefficient industries that will depend on government subsidies to survive in the market. Second, while often justified as a tool to improve resource sustainability, export restrictions may have negative environmental effects as they replace foreign demand with higher demand by the domestic processing sector.

These trade-offs are exemplified by the experience of the tropical lumber industry. A number of WTO trade policy reviews and World Bank studies have documented how export restrictions on logs have played an important role in Indonesia's industrial policy in the 1980s and 1990s when the country expanded its plywood manufacturing and furniture industries. For instance, in 1992 Indonesia replaced a ban on exports of logs with a 200% export duty, which was decreased to 30% only in 1998 (World Bank, 2000). These measures, which collectively resulted in domestic prices well below the international price, contributed to over-logging and a wastage ratio above the international average, having a negative impact on forestry conservation in Indonesia. These considerations are reflected in a recent decision by a WTO Panel in the case involving export measures imposed by China on several raw materials:

> "The Panel is also concerned with the possibility that export restrictions may have long-term negative effects on conservation due to the increased demand from the downstream sector. An export restriction on an exhaustible natural resource, by reducing the domestic price of the materials, works in effect as a subsidy to the downstream sector, with the likely result that the downstream sector will demand over time more of these resources than it would have absent the export restriction. This could offset the reduction in extraction determined by the export restriction." (WTO, 2011, paragraph 7.430, page 124)

Rent and the terms of trade.

The arguments developed above work through the impact of trade policy on domestic prices. But for a large enough producer – or producer cartel – export taxes or equivalent quantity restrictions may increase the world price of the good and thereby redistribute rent towards the producer country. This terms of trade manipulation has been attempted by many primary commodity

cartels, most of which have been unsuccessful (see Teece et al. 1993, Radetzki 2008). An important cartel is OPEC, which regulates the overall quantity produced by member countries.

For exhaustible resources, changes in the international terms of trade are likely to be accompanied by changes in the inter-temporal terms of trade. Since the resource is exhaustible extracting less today means extracting more at some later date.[15] The benchmark model for thinking about this is that of Hotelling (1931), in which the equilibrium of price-taking producers has unit rent (price minus unit extraction cost) rising at the rate of interest. 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 a cartel with market power in resource supply means that, in this argument, price is replaced by marginal revenue. If demand is iso-elastic and the power of the cartel is constant, then marginal revenue is a constant proportion of price, so the cartel extraction path is identical to the perfectly competitive one. The optimal use of cartel power is therefore to do nothing. If the ratio of marginal revenue to price changes, then it is profit maximising for the cartel to restrict supply in periods where the demand elasticity is relatively low, such as when the cartel is taking a large share of the market, or when there are few substitutes available. This leads to a presumption that a newly formed cartel will raise the price, shifting production to the future. [16]

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 resource sets the level of the price path, so attempts to manipulate the price can have short run effects, but are likely to have a relatively small impact on long run average prices.

3.3 Trade policy for resource importers

Import tariffs on natural resources are generally extremely low. Developed country tariffs range from 2.2% on fisheries to 0.5% on fuels. Tariff rates are higher for developing countries, ranging from 15.1% to 6.0%, but they are still well below tariff protection for merchandise trade as a

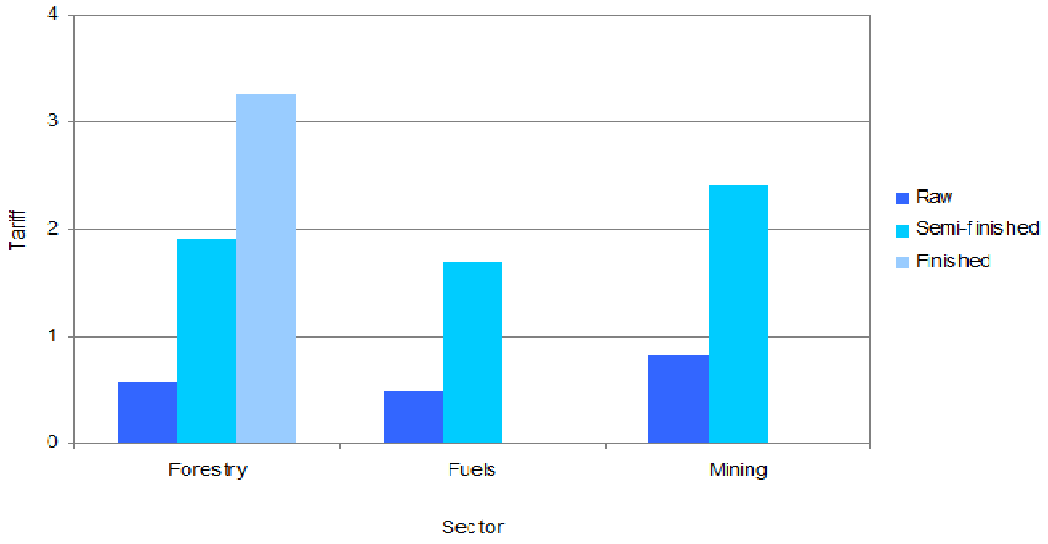
[15] It may be profitable, but not time-consistent, to choose to leave some of the resource in the ground indefinitely.
[16] See for example Dasgupta and Heal (1979). Marginal revenue is a fixed proportion of price if the demand curve for the resource is iso-elastic. For a nice survey of the issues see Gaudet (2007).

whole. However, it does not follow from this that importers are policy inactive. Two sorts of policies are in place: tariff escalation and domestic taxation.

Tariff escalation

Just as resource exporters may seek to attract downstream activities by using resource export taxes, so resource importers may seek to attract these activities by offering tariff protection. The phenomenon of offering higher protection for processed resources than for raw ones is known as tariff escalation, and its extent is indicated in Figure 4 that documents the structure of developed countries' tariff protection by stage of processing in forestry, fuels and mining sectors. All three sectors show tariff escalation. Notice that although nominal tariff rates are low, rates on processed products are more than twice as high as rates on raw materials. For example, raw forestry products face an average rate of 0.57 % when entering developed countries, while their processed counterparts are taxed at a rate of 1.91%. Furthermore, sectors where tariff escalation is sizable are typically activities that have a high share of resource inputs (and low share of value added) in gross output, so that effective protection rates are high even if nominal rates are low. There are several reasons why tariff escalation in developed countries matters. First, as Corden (1966) put it, "an escalated structure biases trade in favor of raw materials against processed products" (Corden, 1966, page 229). Second, advanced economies represent the biggest market for developing resource rich countries. Hence, tariff escalation lowers the ability of the latter to diversify their export base. Furthermore, one reason often advanced by resource rich countries to motivate the use of export taxes is to redress the tariff escalation that they face in export markets, an issue that we will discuss in more detail in the next section.

Figure 4: Tariff protection by stage of processing



Source: World Trade Report 2010

Domestic tax instruments

For an importing country which does not (and cannot) have any domestic production of a resource, an import tariff is identical to a domestic consumption tax.[17] This means that trade policy objectives can be met without recourse to import tariffs, and consequently without falling under WTO disciplines.

Once again, fuels and hydrocarbons are the key sector, and domestic taxation is often very high, vastly in excess of domestic tax plus import tariffs in other tradable sectors. In many European countries more than 50% of the retail price of gasoline is taxation (2009 data, Allsopp and Fatouh 2011). Of course, there are many reasons for this, including congestion and environmental externalities and fuel's importance as a source of revenue, deriving from ease of tax collection and the low price elasticity of demand. However, the terms of trade argument may be one factor underlying these high rates. Given the low elasticity of supply of hydrocarbons, a concerted tax increase by oil importers would be almost entirely borne by oil producers. The

[17] More generally, an import tariff is identical to a combination of a domestic consumption tax and a resource specific tax, such as a royalty on production. This is true in any sector; however, resource sectors are distinctive as many countries have zero production, and as (for countries with some production) sector specific tax instruments (royalties, production sharing agreements or sector specific corporate income tax rates) are widespread.

distribution of rents is determined by importers' control of demand, as well as by exporters' control of supply.

3.4 Policy equilibrium

We suggested above that both importers and exporters have instruments – which are outside WTO disciplines -- which they can use to manipulate trade flows and prices in order to meet domestic objectives. Furthermore, they have motives to use them (although we have questioned the extent to which the revenue argument is applicable for resource exporters, and pointed to the trade-off between current and future terms of trade for exhaustible resource exporters). The use of these instruments results in an inefficient policy equilibrium (Latina *et al* 2011). Trade measures (a tariff on the downstream sector or an export tax on the resource) and domestic measures (a tax on resource consumption in the importing country or a production quota in the exporting economy) have a negative impact on the welfare of trading partners. This may trigger a response in kind and leads to an equilibrium where trade in both the resource and the processed good is inefficiently low (e.g. an export tax can be a countermeasure to an escalating tariff structure; higher domestic taxes can be a response to a production quota). In this situation, no country will unilaterally find it convenient to alter its measure unless the trading partner simultaneously adjusts its policy.

Is there any evidence that use of such policies has had a quantitatively important impact on the equilibrium and lead to this adverse outcome? We address this first by reviewing literature on the effectiveness of OPEC, then by investigating the impact of policy on volatility, and finally by looking at the microeconomic efficiency losses that non-cooperative policy implies.

The most studied resource cartel is OPEC, but little consensus has emerged on its impact. There are numerous econometric studies, but these are hampered by the difficulties in understanding oil prices that we discussed above, the fact that OPEC's influence is likely to have varied through time, and lack of data on key variables such as cost. Econometric studies fall into two types, one estimating the impact of OPEC on price, and others looking for other aspects of cartel behaviour. Early price studies found evidence of collusive behaviour, particularly for the period up to 1983 (see Griffin 1985), although little effect for later periods. A recent study

(Almoguera *et al* 2011) identifies periods in which OPEC behaviour is and is not collusive (using both a measure based on comparison of quota and actual output, and one using estimated break points). Collusion holds for about one-third of the period, and during collusive periods prices are significantly higher (predicted increase of 69% over non-collusion) and OPEC production lower (by 11%). Behaviour is estimated to be consistent with Cournot competition with a competitive fringe, so is much less collusive than a full cartel. The alternative econometric approach looks at other aspects of behaviour, such as whether or not output changes by different countries are correlated, an indicator of collusion. Smith (2005) concludes that 'OPEC is much more than a non-cooperative oligopoly, but less than a frictionless cartel (i.e. multi-plant monopoly)'.

Econometric studies need to be assessed in conjunction with commentary by industry experts. In the view of Smith (2009) OPEC has failed to cut production from existing oil wells, except in the period 1973-75 (and, unintentionally, following the Iranian revolution in 1979). But it has succeeded in restricting the growth of capacity and development of new fields, this contributing to current high prices and a situation where high extraction cost non-OPEC oil is coming to replace low extraction cost oil from undeveloped OPEC reserves.

The effect of non-cooperative trade policy on price volatility is perhaps most visible (and dramatic for its implications) in food markets. When shocks increase the global price of food, exporters face incentives to set export restrictions to insulate domestic consumers. But precisely because exporting countries impose restrictions, the world price of food increases, which makes the initial policy response inadequate and induces further restrictions as governments strive to maintain a stable domestic price. Differently from the initial policy response, subsequent increases in restrictions are only a reaction to the restrictions imposed by the other exporters. Giordani et al. (2011) provide a formal analysis of this mechanism and find that each 1% increase in the share of food trade covered by export restrictions has increased the world price of food by 1.1% on average in the period 2008-10. In addition, importing countries are likely to respond to changes in international prices. The interaction between exporting countries on the one hand and importers on the other may amplify situations of stress in world food markets. Specifically, if world food prices are high, both exporters and importers set trade policy to shield the domestic market from developments in the international market. However, the joint

imposition of higher export taxes and lower import tariffs (or higher import subsidies) contracts world supply and expands world demand, thus resulting in even higher international food prices. Anderson and Martin (2011) and Bouet and Laborde (2010) provide evidence of this effect.

Finally, what is the scale of the microeconomic inefficiency induced by tariff and tax policies? Cross-country variation in consumers' marginal valuations of gasoline are more than 2:1 within the OECD (over $2 per litre in much of Europe, 95c in the US, IEA Sept 2011) extending to 4:1 once some oil producers are included (Malaysia, 61c, Indonesia 51c). These price variations dwarf those for other traded goods, although their implication for deadweight loss depends on elasticities of demand and an estimate of the true marginal cost of fuel. While elasticities are very low in the short run, the longer run estimates we noted above suggest a range of -0.2 – 0.9. Simple calculations then suggest that the dispersion in fuel prices generates a deadweight loss which could rise to more than 20% of the value of consumption. Welfare calculations should also include environmental damage, both local and global. Since CO2 emissions have a global effect on climate change, the shadow price of emissions should be the same in all countries. The quantitative impact of moving to an equal price is demonstrated in Sterner (2007), and IEA (2009) estimates that simply reducing tax-inclusive subsidies by 50% would reduce total greenhouse gas emissions by 14-17% by 2050.

We also argued that policy had been used to relocate downstream production, through use of export taxes and importers' tariff escalation. We know of no studies that attempt to quantify this in aggregate, although there are numerous examples of inefficiencies, particularly in downstream processing (e.g. petrochemicals) in some resource producing countries.

3.5 Policy reform

The previous subsection described a series of inefficiencies that characterize the current policy equilibrium. Here we highlight policy reforms - some of which have been discussed in the literature - that can improve upon the *status quo*. A key economic rationale of WTO rules is to promote co-operation among trading partners in areas where they can harm each other by acting unilaterally. Policies that aim at international rent shifting or the location of downstream production have a beggar-thy-neighbour effect and induce reactions by trading partners. As

outlined above, beggar-thy-neighbour measures include traditional trade policy actions (e.g. tariff escalation, export restrictions) and domestic instruments (e.g. resource taxes, production quotas, and dual pricing schemes).

Consider, for illustrative purposes, the case of trade in 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 and restrictions have an analogous opposing effect, raising domestic demand, reducing export supply 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 the price of gasoline 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 substantial.[18] 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. However, achieving this deal would require action by both importers and exporters (Collier and Venables, 2010).[19]

The asymmetries that characterize WTO rules, between export and import policy and between domestic and trade measures, limit the ability of countries to escape these inefficiencies. As shown by Bagwell and Staiger (1999) in the case of a terms-of-trade externality and by Ossa (2011) for a production relocation externality, the fundamental GATT/WTO principles of reciprocity and non-discrimination help governments internalize the negative cross-border effects that they impose on each other. Essentially, these principles ensure that joint reductions in restrictions to trade neutralize the beggar-thy-neighbour effect of the policy while allowing trade to grow. However, a prerequisite for such mutual exchanges is that countries are able to secure

[18] Some price differential is (second best) efficient if it is in response to local externalities such as road congestion.
[19] 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.

negotiated policy concessions by eliminating incentives to reverse them in the future. The very fact that significant measures that affect resources trade are outside the scope of the WTO, therefore, makes it difficult to eliminate these inefficiencies within the current system (Latina et al. 2011).

These considerations have important implications in the context of the Doha negotiations and of the broader discussion on the future agenda of the WTO. In the current trade talks, countries have moved towards the possible application of the so-called Swiss formula to cut import tariffs, which implies a reduction of tariff escalation.[20] On the export side, however, taxes are not under negotiation. To the extent that a trade agreement is motivated by the need to eliminate beggar-thy-neighbour effects of trade policies, this asymmetry between import and export policy is incoherent from the perspective of economic analysis and may limit the ability of countries to achieve meaningful gains in trade in natural resources and resource based products. In terms of the broader, long-run, agenda of the WTO an increasingly debated issue is the proper regulation of domestic measures. As argued above, in natural resource sectors, a number of trade and domestic instruments can be close substitutes: a production quota is equivalent to an export quota for countries that export the quasi-totality of their resource production, and a tax at the border has the same effect as a domestic tax where countries importing the resource do not produce it. In these cases, regulating only one of the equivalent measures is insufficient to achieve undistorted trade in natural resources.

In the discussion on policy reform so far, we emphasized the symmetric incentives of exporting and importing countries to use beggar-thy-neighbour policy that affect resource trade. As discussed in Section 2.1, however, exporters of natural resources are different in one important respect as their economy is often dominated by these sectors, with attendant problems of exposure to price volatility and of the Dutch disease. This creates a legitimate policy objective of diversifying the economy, and raises the question of the best mix of policies to achieve this. Existing international trade rules may induce exporters to use inefficient, but less regulated, policy instruments rather than first-best tools. Restrictive export measures, such as export taxes or dual pricing regimes may be highly inefficient ways encouraging local production. An issue that warrants further consideration is, therefore, the extent to which the

[20] Algebraically the Swiss Formula can be written as $t_1=at_0/(a+t_0)$ where t_0 is the original tariff rate, t_1 the new reduced tariff rate, and a is a coefficient. The formula implies that high tariffs are reduced more than low tariffs.

Subsidies and Countervailing Measures (SCM) Agreement leaves sufficient scope to resource rich governments to pursue export diversification objectives, that are recognized by Part IV of the GATT, through less distortive policy instruments.

4. Long run contracts:

We have so far concentrated on trade in the resource itself, but there is a further important international dimension. Extraction of natural resources frequently takes place under long term contracts between government and the private sector, often foreign firms. These contracts vary widely, ranging from service contracts (the investor is paid a fee per unit for resource extracted), through production sharing arrangements (output is shared between government and the investor) to royalty and income tax regimes, in which taxes are paid on output (a royalty per unit, or per unit value) and on corporate profits, perhaps at a sector specific rate. These are international contracts, and can be thought of as a form of foreign direct investment (FDI). However, the particular context of natural resource exploration, development and production creates very significant differences from other sorts of FDI and, we suggest, inefficiencies in outcomes. One inefficiency concerns the incentives to investors to undertake exploration and development, and another surrounds the allocation of licences to explore and to produce.

4.1 Inefficiencies

A country with tracts of land (or sea) that are expected to contain subsoil assets (in particular hydrocarbons) typically goes through a process of allocating blocks for exploration and development. On one side is government, and on the other investors with the expertise to undertake exploration and development. Both sides are likely to face a great deal of uncertainty, about the geological prospects and technical difficulties that will be encountered, about future prices of the resource, and current and future political risk.

In order to bid for a licence, investors have to formulate a view about the long run return to the project. This is particularly true since capital expenditure will be sunk; unlike other forms of FDI, a mine or oil well cannot be dismantled and moved to another location in the event of the

project failing. A key determinant of the long run return is the contractual and fiscal regime under which the project operates. The combination of sunk costs and high and potentially variable tax rates creates a severe hold-up problem. Once investments are sunk government has an incentive (and perhaps faces domestic political pressure) to increase tax rates and, knowing this, investors are unwilling to participate. All parties could be better off if government had a commitment technology, which restricted its freedom to alter fiscal or contractual terms. It has been suggested that the efficiency loss associated with this market failure is significant. Collier (2010) suggests that the value of sub-soil assets per square kilometre discovered in Sub-Saharan Africa is just one-fifth the value of sub-soil assets remaining in OECD countries. This is unlikely to be geological bad luck, and is much more likely to indicate the scale to which exploration and development in African has been deterred by these concerns.

If investors are willing to participate, there remains the issue of how contracts and licences are allocated. This can take alternative forms, ranging from open and transparent auction in which investors bid for rights, through to closed door deals with risk of corruption. Auctions have the great advantage that bidders reveal their willingness to pay, government can in principle extract the full value of the resource, and they can be open and transparent. However, they work only if there are sufficiently many bidders, and no one bidder has a dominant position. In the latter case, since the winning bidder generally pays only the value of the second bidder, negotiation may be preferred to auction.[21] Furthermore, high degrees of uncertainty may mean that risk averse investors' willingness to pay is low, thus lowering the price received by government. Geological uncertainty can be reduced by survey work, but knowledge generated is a public good. The public sector can undertake prior survey work, but private sector provision will not be efficient; if results are made public there is no return to doing the survey, and if they are kept secret then there will be inefficient duplication. In practise, allocations have often been done through non-transparent discretionary processes, failing to secure that the most efficient investor is awarded the contract, failing to secure maximum benefit for the state, and frequently being vulnerable to corruption.

[21] Vickrey's Revenue Equivalence Theorem establishes conditions under which the value for the seller is equal to the second highest valuation independently of the auction type.

4.2 Policy reform

We have pointed to features that make resource contracts different from other forms of FDI, and prone to market failure and inefficiency. Such contracts are typically international, and as the international system could offer solutions to some of the problems identified.

The hold-up problem is mitigated if countries have access to a commitment technology. This is, of course, exactly what the WTO offers with respect to tariff policy, through tariff bindings and associated dispute procedures. Reflecting the need for commitment technologies for resource extraction, the internationalization of contract enforcement is occurring through a number of approaches including Bilateral Investment Treaties (BITs) and the use of foreign courts and arbitration arrangements. While these arrangements have certain advantages (foreign investors can obtain monetary reparation for damages suffered) they face two shortcomings. First, differences in bargaining power can be large in bilateral arrangements. Such differences skew the distribution of rent in favour of the stronger party. This is often seen as lowering the gains that resource rich governments can achieve by signing a BIT (Guzman, 1998). Second, the extent to which the hold-up problem is effectively solved depends on the credibility of the arbitration system offered by the specific arrangement. A suggestion to address these problems is to extend the role of the WTO in the enforcement of resource extraction agreements, thereby giving governments a way of committing themselves to fiscal and contractual terms (Collier and Venables, 2010).

Efficient allocation of contracts requires a process analogous to the Most Favoured Nation (MFN) principle of the WTO. This principle is concerned to avoid discriminatory tariff wedges that disadvantage some suppliers relative to others. Because there is no market, secret and bilateral resource deals do not constitute a breach of the letter of the Most Favoured Nation clause, although they certainly breach its spirit. Through such deals 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. Essentially, what this proposal is about is not dissimilar from what a number of WTO members have committed to with the Agreement on Government Procurement (GPA). This plurilateral agreement is based on the

principles of openness, transparency and non-discrimination, which apply to parties' procurement, and includes specific rules implementing those principles. The proposal would extend these practices beyond purchases to government sales.

Countering corruption in international contracts faces an acute weakest link problem. As long as 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. This corruption problem is widely recognized and 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. A number of OECD countries have taken or are taking measures to increase transparency. Pan-OECD anti-bribery legislation 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. In the US the Frank-Dodd Act increases disclosure requirements for companies operating in resources sectors, and the EU is proposing similar measures. 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.[22] 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.

[22] In some sense, this has been already the case for the Kimberley Process Certification Scheme (KPCS) that seeks to stem the flow of "conflict diamonds". In 2003, the WTO General Council approved a request by 11 members of the KPCS to waive the application of certain GATT rules with respect to measures taken to prevent the export of conflict diamonds in accordance with the KPCS. In December 2006, the so called Kimberley waiver has been extended until 2012 (WTO, 2010).

5. Concluding comments.

The geography of natural resource endowments means that resources are, more than almost any other products, internationally traded. The technology of extraction means that FDI is crucial to their production. Yet resource sectors raise issues that are distinctive from those covered in most of the literature on international trade and FDI. These include exhaustibility, price volatility, cartel behaviour, and the political economy of contracting with government. We have reviewed literature on these issues, and argued that there appear to be major inefficiencies in the equilibrium we observe, with many of the key policy variables being outside the disciplines that apply to other sorts of trade. While national interests conflict on some of the issues, the inefficiencies are such that properly coordinated policy measures (on export taxes, fuel prices, contract stability, and revenue transparency) offer the potential of gains for all.

References

Allsopp C, Fattouh B. 2011. Oil and international energy. *Oxford Review of Economic Policy*. 27:33-67

Almoguera P, Douglas C, Herrera A. 2011. Testing for the cartel in OPEC; non-cooperative collusion or just non-cooperative? *Oxford Review of Economic Policy*, 27:33-67

Anderson K, Martin W. 2011. *Export Restrictions and Price Insulation during Commodity Price Booms*. World Bank Policy Research Working Paper No. 5645.

Bagwell K, Staiger RW. 1999. An Economic Theory of GATT. *The American Economic Review*, 89:215-248

Blanchard OJ, Galí J. 2007. The Macroeconomic Effects of Oil Price Shocks: Why are the 2000s so different from the 1970s? NBER Working Paper No. 13368, National Bureau of Economic Research.

Bouet A, Laborde G. 2010. Economics of Export Taxation in the Context of food Crisis: A Theoretical and CGE Approach Contribution. International Food Policy Research Institute, Discussion Paper No. 00994.

BP. 2011. *BP Statistical Review of World Energy* 2011, London

Brander J, Taylor MS. 1997. International Trade and Open Access Renewable Resources: The Small Open Economy Case. *Canadian Journal of Economics*, 30:526-552

Brander J, Taylor MS, 1998. Open Access Renewable Resources: Trade and Trade Policy in a Two-Country Model. *Journal of International Economics*, 44:181-209

Coady D, Gillingham R, Ossowski R, Piotrowski J, Tareq S, Tyson J. 2010. *Petroleum product subsidies; costly, inequitable and rising.* IMF SPN/10/05, Washington DC

Chichilnisky G. 1994. North-South Trade and the Global Environment. *American Economic Review*. 84:851-74

Collier P. 2010. *The Plundered Planet; why we must--and how we can--manage nature for global prosperity*. OUP, Oxford.

Collier P, Venables AJ. 2010. International rules for trade in natural resources. *Journal of Globalization and Development*. vol 1, issue 1.

Collier P, Venables AJ. 2011. Illusory revenues; import tariffs in resource-rich and aid-rich economies. *Journal of Development Economics*. 94:202-6

Copeland BR, Taylor MS. 2009. Trade, Tragedy and the Commons. *American Economic Review*. 99:725-49

Corden WM. 1966. The Structure of Tariff System and the Effective Rate of Protection. *Journal of Political Economy*,.74:221-237

Corden WM, Neary JP. 1982. Booming sector and de-industrialisation in a small open economy. *Economic Journal*. 92:825-848.

Dasgupta PS, Heal GM. 1979. *Economic theory and exhaustible resources*. CUP Cambridge.

Davis G. 2010. Trade in mineral resources. WTO Working Paper ERSD-2010-01.

Dvir H, Rogoff K. 2009. The three epochs of oil. NBER Working Paper No. 14927.

Gaudet G. 2007. Natural resource economics under the rule of Hotelling. *Canadian Journal of Economics*. 40:1033–1059

Giordani P, Rocha N, Ruta M. 2012. Export policy and food price escalation. Mimeo, World Trade Organization.

Guzman A. 1998. Why LDCs sign treaties that hurt them: explaining the popularity of Bilateral Investment Treaties. *Virginia Journal of International Law*, 38:639-688

Hamilton JD. 2008. Understanding crude oil prices. Working paper, UCSD.

Hamilton JD. 2009. Causes and Consequences of the Oil Shock of 2007-08. *Brookings Papers on Economic Activity*, Spring, 215-259.

Headey D. 2011. Rethinking the Global Food Crisis: The Role of Trade Shocks. *Food Policy*. 36: 136-46

Hotelling H. 1931. The economics of exhaustible resources. *Journal of Political Economy*. 39:137-175

International Energy Agency (IEA) 2009. *Energy Prices and Taxes*. Vienna: IEA. http://www.iea.org/stats/surveys/mps.pdf

International Monetary Fund 2007. *Guide on Resource Revenue Transparency*. Washington DC

Ivanic M, Martin W, Mattoo A. 2011. *Welfare and Price Impacts of Price Insulating Policies*. Mimeo, World Bank.

Jones WO. 1987. Food-Crop Marketing Boards in Tropical Africa. *The Journal of Modern African Studies*. 25:375-402

Karp L, Sacheti S, Zhao J. 2001. Common ground between free-traders and environmentalists. *International Economic Review*. 42:617-647

Kemp MC, Long NV. 1984. The Role of Natural Resources in Trade Models. *In Handbook of International Economics*. vol. I. ed. Jones RW, Kenen PB. (Amsterdam: North-Holland).

Kilian L, Murphy D. 2011. The role of inventories and speculative trading in the global market for oil. mimeo, University of Michigan.

Krugman P. 1987. The narrow moving band, the Dutch disease, and the competitive consequences of Mrs. Thatcher: Notes on trade in the presence of dynamic scale economies. *Journal of Development Economics*. 27: 41-55

Latina J, Piermartini R, Ruta M. 2011. Natural resources and non-cooperative trade policy. *International Economic Policy*. 8:177–196

Leamer E. 1984. *Source of International Comparative Advantage: Theory and Evidence.* Cambridge, MA: MIT Press.

Lederman D, Colin X. 2007. Comparative advantage and trade intensity: Are traditional endowments destiny? in Lederman D, Colin X. (eds.), *Natural Resources: Neither Curse nor Destiny*, Washington DC, World Bank.

Ossa R. 2011. A "New Trade" Theory of GATT/WTO Negotiations. *Journal of Political Economy* 119:122-152

Piermartini R. 2004. The Role of Export Taxes in the Field of Primary Commodities. WTO Discussion Papers No. 4.

Radetzki M. 2008. Producer cartels in international commodity markets. in Radetzki, M. (ed) *A Handbook of Primary Commodities in the Global Economy*, [8] New York: Cambridge University Press: 144-165.

Rasmussen T, Roitman A. 2011. Oil shocks in a global perspective: are they really that bad? IMF Working paper no. 11/194.

Sachs JD, Warner AM. 1995. Natural resource abundance and economic growth, National Bureau of Economic Research Working Paper no. 5398.

Smith J L. 2005. Inscrutable OPEC: behavioral tests of the cartel hypothesis. *The Energy Journal*. 26:51-82

Smith JL. 2009. World oil: Market or mayhem? *Journal of Economic Perspectives.* 23:145-164

Sterner T. 2007. Fuel taxes: An important instrument for climate policy. *Energy Policy*, 35:3194-3202.

Stijns J.-P. 2003. An empirical test of the Dutch disease hypothesis using a gravity model of trade. EconWPA, International Trade Series no. 0305001.

Stroupe WJ. 2006. The New World Oil Order: Russian Attacks the West's Achilles' Heel. *Asia Times*.

Teece D, Sunding D, Mosakowski E. 1993. Natural resource cartels. in Kneese AV, Sweeney JL. (eds) , *Handbook of Natural Resource and Energy Economics Vol III*, Elsevier: 1131-1166.

Torvik R. 2001. Learning by doing and the Dutch disease. *European Economic Review.* 45:285-306

Turner A, Farrimond J, Hill J. 2011. The oil trading markets, 2003-10: analysis of market behaviour and possible policy responses. *Oxford Review of Economic Policy*. 27:33-67

van der Ploeg F. 2011. Natural Resources: Curse or Blessing? *Journal of Economic Literature*, 49:366–420.

van der Ploeg F, Poelhekke S. 2009. Volatility and the natural resource curse. *Oxford Economic Papers*. 61:727-760

van Wijnbergen SJG. 1984. The 'Dutch disease': A disease after All? *Economic Journal*. 94:41-55

World Bank. 2000. Indonesia, the Challenges of World Bank Involvement in Forests. Evaluation Country Case Study Series. Washington DC, World Bank.

World Trade Organization, 2006. *World Trade Report 2006: Subsidies, Trade and the WTO.* Geneva, WTO.

World Trade Organization, 2010. *World Trade Report 2010: Trade in Natural Resources*. Geneva, WTO.

World Trade Organization, 2011. Panel Report on "China - Measures Related to the Exploitation of Several Raw Materials". Geneva, WTO.