D. Trade policy and natural resources

This section looks at the ways government policy responds to the unique features of natural resources. It examines how the unequal distribution of natural resources give importing and exporting countries incentives to use restrictive trade and domestic measures to "capture" monopoly rents. It analyzes how governments can use trade restrictions and domestic measures to strengthen property rights or reduce the exploitation of the natural resource. Where the consumption or extraction of a natural resource affects the environment, it considers the steps governments could take to make producers and consumers take account of the social costs of their activities. However, the use of trade and domestic policies will have consequences for trade partners through changes to their terms of trade. In some instances, the availability of large resource rents may make government policies hostage to vested interests involved in the extraction and trade of natural resources. Finally, this section will consider how regional trade cooperation can assist in mitigating or resolving these potential frictions in natural resources.

Contents

This section is divided into two parts. The first part reports data on trade policy and other relevant domestic measures employed in natural resource sectors. The second part focuses on the effects of such trade and domestic policies. These measures can shift rents internationally or change the terms of trade (i.e. the price of exports relative to imports). However, trade and domestic policies may also affect the conservation of natural resources and the environmental externalities associated with their extraction and use. Addressing these different effects separately can be useful for analytical reasons. Clearly, governments may use these policies for diverse reasons.

1. Trade and other policy instruments in the natural resource sectors

There is a wide array of policy measures that impact on natural resources trade, including export taxes, quotas and prohibitions, applied and bound most-favoured nation (MFN) tariffs, non-tariff measures as well as national consumption taxes and subsidies. What makes the picture more complex is that the distinction between trade and domestic policies can be especially blurred in the case of natural resource markets.

Some countries have such an abundance of natural resources – and their domestic markets are so small – that nearly all production ends up being exported. Other countries have such a scarcity of natural resources that they have to depend on imports for all, or nearly all, of their supply. In this context, economic theory suggests that domestic measures that restrict production in the exporting country – or, alternatively, restrict consumption in the importing country – have a disproportionate impact on exports or imports and become *de facto* trade instruments.

(a) Import tariffs

The following section examines the prevalence of restrictions placed on natural resource imports. First, it looks at the level of tariff protection on natural resources, and whether it is higher than on other merchandise trade. Second, it examines the pattern of bound tariff rates in the natural resources sector. And third it looks at the extent of tariff escalation on processed and semi-processed natural resource products.

(i) Level of tariff protection

To measure the level of tariff protection in the natural resources sector, recent data (year 2007) on applied MFN tariffs in fisheries, forestry, fuels and mining were obtained from the WTO's Integrated Database (IDB) and the International Trade Centre for 146 countries. The calculations include *ad valorem* equivalents of non-*ad valorem* duties. Based on this information, (simple) average tariff rates were calculated for all countries, and for two further groupings, developed and developing countries.[1]

The results, which are summarized in Table 7, show that tariff protection in the natural resources sector is generally lower than for overall merchandise trade (the detailed information by sector and by country appears in Annex Table 1). This conclusion applies to both developed and developing countries. The only possible exception is fisheries where, for developing countries, the rate of tariff protection is higher than for all merchandise imports. In terms of specific natural resource sectors, tariff protection is lowest in mining and fuels and highest in fisheries.

Table 8 summarizes available information on bound tariff rates in the natural resource sectors for a smaller group of 119 countries (detailed information on bound rates and binding coverage for these natural resource sectors by country are also included in Annex Table 1). Bound rates – the agreed upper limit for a tariff – are typically higher than the rates actually applied by countries, with the amount of "water" between the two being greater for developing countries than developed. Fisheries has the highest average bound rate while the fuels sector has the lowest. Binding coverage – the proportion of tariff lines bound – is highest in forestry and lowest in fisheries. With the possible exception of fuels, binding coverage is almost universal for developed countries.

Table 7: **Simple average applied tariff rates in natural resource sectors, 2007**

Sector	Developed countries	Developing and least-developed countries	All countries
Fishery	2.2	15.1	14.2
Forestry	0.6	6.5	6.1
Fuels	0.5	6.2	5.8
Mining	0.8	6.0	5.7
All merchandize imports	5.4	10.7	10.3

Source: WTO Integrated Database and International Trade Centre.

Table 8: **Bound rates in natural resource sectors, 2007**

	Average Bound Rate				Binding Coverage			
	Fishery	Forestry	Mining	Fuels	Fishery	Forestry	Mining	Fuels
All	31.4	26.5	28.6	25.3	65.0	74.0	72.6	68.9
Developed	2.5	1.2	1.6	1.5	98.3	98.6	99.9	90.1
Developing and least-developed	34.2	28.9	30.9	27.5	62.4	72.1	70.5	67.2

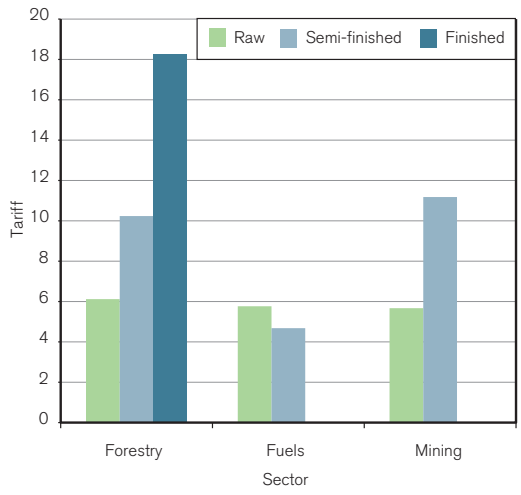
Source: WTO Integrated Database and International Trade Centre.

(ii) Tariff escalation

One suggested reason why resource-rich countries apply export taxes is to redress the structure of protection they face in export markets, where tariff rates tend to rise with the stage of processing. This issue has been examined in previous WTO reports in terms of its application to manufactured goods (World Trade Organization (WTO), 2001) and to non-oil commodities. In the case of non-oil commodities, although tariff protection was found to rise with the degree of processing, the degree of escalation differed, sometimes markedly, across countries (World Trade Organization (WTO), 2003). Tariff escalation was also found in manufactured goods although it differed greatly across countries. Moreover, certain product categories, such as textiles and clothing, and leather and leather products, were characterized by a higher degree of tariff escalation than other industrial sectors (World Trade Organization (WTO), 2001).

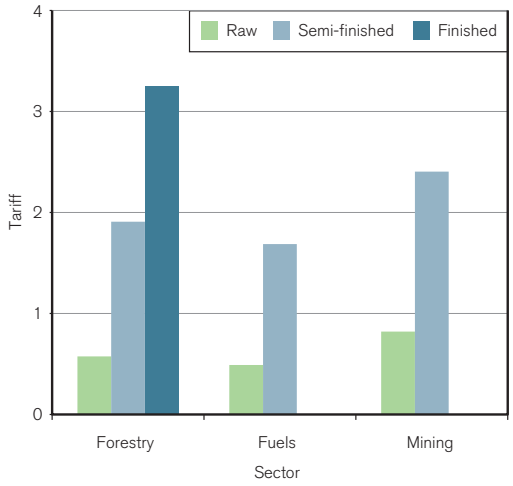
The pattern of tariff protection for natural resources in their raw state and in their more finished or processed state is shown in Figure 26 (more detailed information is available in Annex Table 2).[2] Tariff escalation appears to be present in some natural resources, such as forestry and mining, but not in others, such as fuels. For instance, in their raw state, the average tariff on forestry products is 6.1 per cent. But in their more processed form, it rises to 10.2 per cent in the case of cork, wood and paper products,

Figure 26: **Structure of tariff protection, by stage of processing**



Source: WTO Integrated Database and International Trade Centre.

Figure 27: **Structure of tariff protection in developed countries, by stage of processing**



Source: WTO Integrated Database and International Trade Centre.

and to 18.3 per cent in the case of wooden furniture. However, no escalation is discernible in fuels; in fact, there may even be de-escalation in that sector given that the average tariff rate on petrochemicals is less than the rate on fuels.

Further insight into the issue can perhaps be gleaned if one focuses on the structure of tariff protection in developed countries. The results shown in Figure 27 show that tariff escalation is now present in all three sectors – which is particularly significant given that developed countries remain the biggest markets for developing country exporters of natural resources.

(b) Non-tariff measures

The non-tariff measures that are examined include para-tariff measures, price control measures, finance measures, automatic licensing measures, quantity control measures, monopolistic measures and technical measures (see Box 14 for a discussion of the limitations of this data). They correspond to UNCTAD's classification of trade control measures.[3]

An analysis of these measures in the fisheries, forestry and fuels sectors leads to two main conclusions (see Table 9). First, the frequency of such measures is greater on fisheries imports than in either the imports of forestry or fuels – a finding which is consistent with the relatively high level of tariff protection in fisheries noted above. Second, the type of non-tariff measures

Box 14: Data limitations – non-tariff measures

Data on non-tariff measures were obtained from UNCTAD's TRAINS (Trade Analysis and Information System) database. There are several features of the non-tariff measures (NTMs) data worth noting. First, a large part of the NTM data is dated – for example, only 15 countries have data for 2008 – so it has been necessary to include data from various periods to build a large enough sample. If countries with information no earlier than 2000 are included, a total of 58 countries are available for analysis. However, the number of countries reporting NTMs in a specific natural resources sector is generally less than 58 (45 for fisheries, 37 for forestry and 44 for fuels).

Second, the NTM database reports all tariff lines covered by a particular non-tariff measure. However, the level at which the tariff lines are reported is not uniform – some are reported at the two-digit, others at the four-digit, six-digit and still others at the national tariff line level.

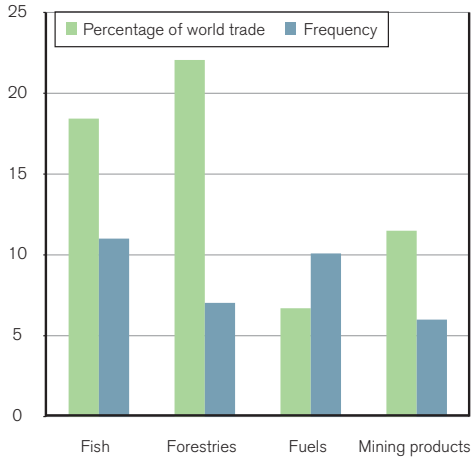
Third, while the count of tariff lines covered by NTMs provides valuable information about the extent of non-tariff measures and the types of measures applied, this approach does not allow us to determine the restrictiveness of the various measures. So a natural resources sector could have a large number of lines where non-tariff measures are applied, but the measures may have only limited effects on trade. On the other hand, another sector could have only a small number of tariff lines affected by non-tariff measures, but those measures may impose far more significant costs on producers or exporters.

employed appear to be similar across the three sectors – i.e. (i) technical regulations (product characteristic requirements, labelling requirements, testing, inspection and quarantine requirements, etc.); (ii) non-automatic licensing (licence combined with or replaced by special import authorization, prior authorization for sensitive product categories, etc.); and (iii) import prohibitions.

(c) Export taxes

Available evidence suggests that there is a strong incidence of export taxes on natural resources relative to other sectors. According to the WTO's Trade Policy Reviews (TPRs), export taxes on natural resources appear twice as likely as export taxes in other sectors. In fact, natural resource sectors account for fully one-third of all export taxes – although they represent less than a quarter of total tradable sectors. In terms of the percentage of trade covered, estimations based on Harmonized System (HS) two-digit information (see Box 15 for a description of the data limitations) suggests that 11 per cent of world trade in natural resources is

Figure 28: **Export taxes by natural resource – upper bound estimates** (frequency and percentage of world trade)



Note: Authors' calculations are based on HS two-digit data. Frequencies are calculated as the ratio of the number of export taxes/(number of HS two-digit sectors*number of countries).
Source: Trade data are from Comtrade, year 2007; information on export taxes is derived from TPRs (1995-2009).

Table 9: **Number of tariff lines affected by non-tariff measures, by type**

NTM Code	Description	Fishery	Forestry	Fuels
2400	Decreed customs valuation	5	1	0
3100	Administrative pricing	2	2	26
3300	Variable charges	0	0	2
3400	Anti-dumping measures	24	11	7
3500	Countervailing measures	1	0	0
4100	Advance payment requirements	0	3	0
4300	Restrictive official foreign exchange allocation	0	0	1
4500	Regulations concerning terms of payment for imports	210	62	1
5100	Automatic licence	0	66	0
5200	Import monitoring	4	1	2
6100	Non-automatic licensing	2,361	1,435	472
6200	Quotas	0	16	3
6300	Prohibitions	208	178	113
7100	Single channel for imports	2	0	273
8100	Technical regulations	5,954	1,393	400
8200	Pre-shipment inspection	1	0	0
8300	Special customs formalities	130	20	77
	TOTAL	8,902	3,188	1,377

Source: UNCTAD TRAINS.

Box 15: Data limitations - export taxes and quantitative restrictions

Information on export taxes has been collected from the WTO's Trade Policy Reviews (TPRs) published between 1995 and 2009. This is the only source of information that allows, at least to a certain extent, a cross-country comparison of the incidence of export taxes. However, two main limitations related to the use of TPRs should be kept in mind. The first one is that available information for different countries may refer to different time periods. This is because the frequency at which WTO members are reviewed depends on their shares in world trade,[4] meaning that some countries and customs territories are reviewed more often than others. In order to get the widest possible coverage of export taxes information, the latest TPRs available for each WTO member have been used.

The second limitation is that at the product level, data are highly aggregated. The degree of detail at which information on product level export taxes is reported in TPRs varies significantly across countries. In order to allow for a comparison across products and WTO members without losing too much information, we collected data at the HS 2002 two-digit classification level. This enabled us to analyse the intensity of use of export taxes and to provide estimates of the trade coverage of export taxes. It is important, however, to note that these statistics are likely to represent upper bound estimates,[5] because any time an export tax on a certain product was reported, including when the information was available at the six-digit level, the whole two-digit sector was considered to be covered by an export tax.

TPRs also provide information on other forms of export restrictions. Using this information, recent work by the OECD (2009c) highlights the tendency of countries to adopt quantitative restrictions mainly for conserving exhaustible resources, protecting the environment and controlling weapon and arms trade. The study also reports that export restrictions for forestry, fisheries, mineral products, metals and precious stones tend to be used to maintain adequate supplies of essential products or to promote downstream industry.

An additional source of information for quantitative restrictions is WTO notifications. A decision by the Council for Trade in Goods on 1 December 1995 (G/L/59) creates a procedure for WTO members to submit biannual notifications of their export quantitative restrictions.[6] However, from 1996 to 2006 only ten WTO members have notified quantitative restrictions on their exports.

covered by export taxes, while just 5 per cent of total world trade is covered by export taxes. One consequence of the extensive use of export taxes and other export restrictions in natural resources is the use of FDI as a way to circumvent the measures. A discussion of "export restriction-jumping" FDI is provided in Box 16.

The extent to which trade in natural resources is affected by export taxes varies by sector. As shown in Figure 28, between 15 to 25 per cent of world trade in fish and forestry, and between 5 to 10 per cent of world trade in fuels and mining, is estimated to be covered by export taxes. The figure also shows that the share of

Box 16: Investments in natural resources – a case of "export restriction-jumping" FDI?

The use of export restrictions on natural resources can lead importing countries to take alternative measures to try and secure access to scarce supplies.

A first way to "jump" export restrictions is through acquisition of or mergers with foreign firms involved in the natural resources sector (oil firms, mining firms, etc.). Specifically, firms in importing countries may choose to invest in the natural resource sector in the exporting country – for instance by relocating some parts of the down-stream production process – as a way to avoid (or "jump") the export restrictions on the natural resource.

Direct investments in natural resources, such as land, in foreign countries may – in part – have similar motivations. This phenomenon has attracted significant attention recently. These investments frequently take the form of long-term leases, outright purchases, or contract farming. In many cases, the acquired land is to be devoted to raising crops for food or for biofuel. Investors tend to be from countries where arable land and water is particularly scarce or from economies with a growing demand for food, energy and raw materials (von Braun and Meinzen-Dick, 2009). The investments are frequently made in countries in Africa (such as Ethiopia, Mozambique, Sudan) and in South East Asia (Cambodia, Indonesia, Philippines), but also in more developed resource-rich countries such as Ukraine and Russia.[7]

There is some available information on the amount of these investments. The value of cross-border mergers and acquisitions in the natural resources sector (mining, quarrying and petroleum) reached more than US$ 83 billion in 2008, representing about one-eighth of the total value of cross-border mergers and acquisitions that year (United Nations Conference on Trade and Development (UNCTAD), 2009).[8] If one uses flows of foreign direct investment (FDI) to agricultural production in developing countries as a proxy for investments in land, this amount tripled to about US$ 3 billion annually between 1990 and 2007 (United Nations Conference on Trade and Development (UNCTAD), 2009).

There are benefits and risks involved in both types of investments.

Because of the capital-intensive nature of the natural resources sector, mergers and acquisitions provide a way of financing the large outlays required for operations. Since exploration for natural resources can be very risky, mergers and acquisitions provide an opportunity for sharing risk. Finally, this form of investment can benefit the firms involved by allowing them to share technologies and reduce their costs through rationalization of their business operations (e.g. eliminating duplicate operations). However, there are also important challenges posed by these types of investments to governments which have jurisdiction over the firms. One is the possibility that the acquisition or the merger results in a combined firm with significant market power. A second challenge involves the case where the acquiring firm may be partly or wholly state-owned or is a sovereign fund. This can raise concerns about the possible blurring of the lines between the commercial and political interests of the acquiring firm.

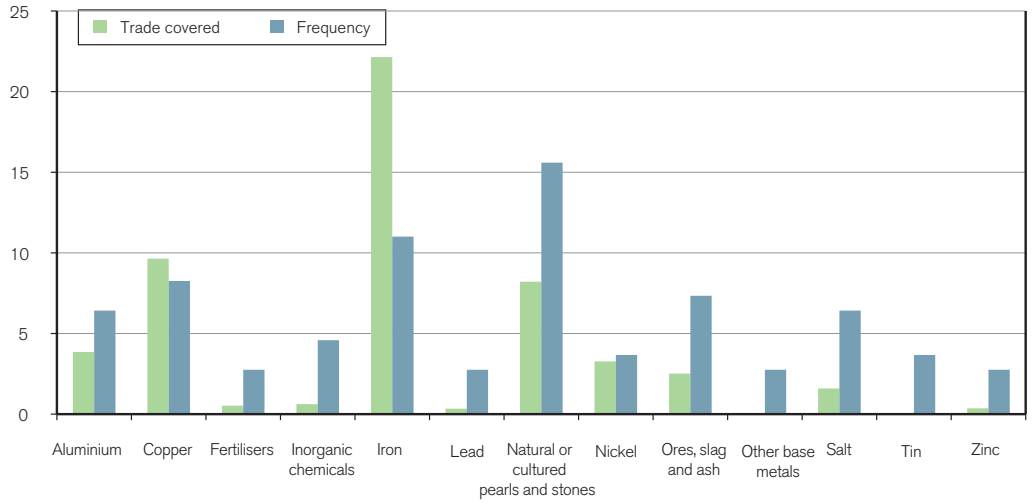
Foreign investments in land can increase land productivity, particularly if the investments are accompanied by new technology and expenditures on complementary inputs, such as irrigation, drainage and even roads. Foreign investment can also help to expand the global supply of natural resources by expanding land use, extraction and production. Furthermore, foreign investment can create other benefits that can be "captured" by the local economy in the form of increased rural employment and economic activity. However, such investments also involve costs. The investment may displace local inhabitants who initially had access to the land. Since the destination of these investments is usually poor countries, property rights may not be well defined. The owners may either not have formal rights to the land or they may be unable to have their rights recognized. In the face of a large investor, they can easily be displaced. Other costs that have been raised in the context of these investments include adverse effects on the ecological sustainability of land and water resources.

A significant share of these investments in the natural resources area have been made because growing global demand has pushed countries and firms to take whatever measures were needed to secure hard-to-get supplies. However, it is likely that some of these investments have also been prompted by export restrictions imposed by major producers when natural resource and food prices were high ("export-restriction jumping investments"). These export restrictions may exacerbate conditions of already stretched supplies and lower the confidence in the functioning of international markets, encouraging countries short in land, water and other natural resources to find alternative means of securing supplies. In this sense, the investments can be seen as "second-best" responses – efforts by consuming countries to get around trade restrictions – that would otherwise not have been made if markets provided greater certainty of access. What is more, there may be no assurance that host-country governments will automatically allow the outputs from the investments to be freely exported if a serious crisis were to erupt.

world trade in natural resources covered by export taxes tends to be higher than the percentage of lines covered by export taxes, thus suggesting that export taxes tend to be used by major exporters of the commodity.

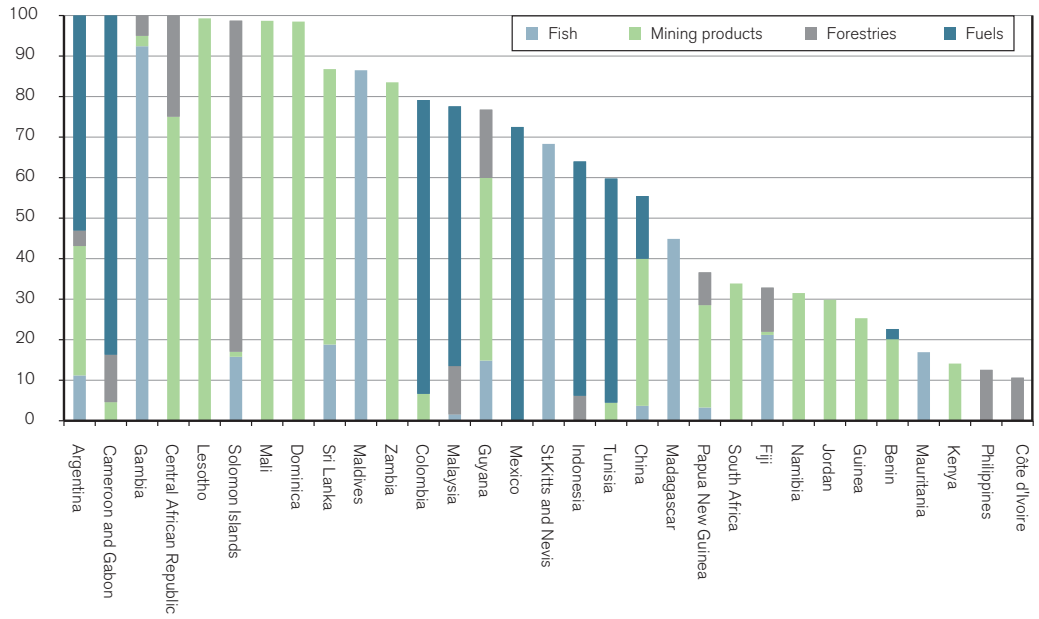
A closer look at the use of export taxes in the mining sector shows that the incidence of these taxes varies significantly across product sub-headings, with iron, copper, natural or cultured pearls and stones being most frequently subject to export taxes (see Figure 29). Data for forestry show that export taxes are mainly on wood products, rather than cork or pulp wood.

Figure 29: **Export taxes on mining products by subheading – upper bound estimates** (frequency and percentage of world trade)



Note: Authors' calculations are based on HS two-digit data. Frequencies are calculated as the ratio of the number of export taxes/(number of HS two-digit sectors*number of countries).
Source: Trade data are from UN Comtrade, year 2007; information on export taxes is derived from TPRs (1995-2009).

Figure 30: **Natural resources exports covered by export taxes – upper bound estimates for selected countries** (frequency and percentage of world trade)



Note: Author's calculations are based on HS two-digit data. Frequencies are calculated as the ration of the number of export taxes/(number of HS two-digit sectors*number of countries).
Source: Trade data are from UN Comtrade database, year 2007; information on export taxes is derived from TPRs (1995-2009).

Unfortunately, given the high level of aggregation of the database, it is impossible to distinguish across different types of fuel, fish or wood.

The analysis of export data at the country level reveals that for some countries, export taxes on natural resources cover a large percentage of their total exports in natural resources. Figure 30 shows some of the main users of export taxes in terms of the share of natural resource exports covered by export taxes. Notwithstanding the limitations regarding the cross-country comparability data (see Box 15),[9] the figure shows that for some countries export taxes cover a large share of their exports in natural resources.

(d) Other export restrictions

There appears to be a strong incidence of quantitative export restriction (prohibitions, quotas, automatic and non-automatic licensing, etc.) applied to natural resources relative to other sectors – as outlined in Table 10, which summarizes available information on such restrictions on natural resource sectors notified to the WTO.[10] Clearly, export restrictions on natural resource products represented a large share of notified export restrictions – some 2,577 entries out of a total of 7,328. These restrictions fall fairly equally under Article XI and under Article XX[11] of GATT; there is also an equal propensity to use either non automatic-licensing or quota-type restrictions across sectors. Unfortunately, the entries identified in the notifications on quantitative restrictions are at different levels of disaggregation (some at chapter level, others at eight-digit level), making it impossible to draw inferences on the relative degree of restrictiveness of such quantitative measures across sectors.[12]

(e) Consumption taxes

According to the theory, the uneven geographical distribution of natural resources – resulting in resource-abundant countries exporting most of their production and resource-scarce countries importing most of their consumption needs – means that domestic measures, such as consumption taxes, can function as *de facto*

Table 10: **Export restrictions on natural resources notified to the WTO**

Natural Resource Sector	Countries (Number) [a]	Measures (Number of entries)				Justification by the Member imposing the measure		
		Automatic Licensing	Non Automatic Licensing	Quota	Prohibition	GATT Art. XI	GATT Art. XX	Other
Fish	2	0	10	0	8	0	18	0
Forestry	6	0	173	122	18	107	165	0
Fuels	2	0	201	236	7	172	172	74
Mining products	7	94	1,001	746	60	618	823	353
TOTAL	10	94	1,385	1,104	93	897	1,178	427

[a] Total number of countries may not correspond to the sum obtained across sub-sectors because the same may appear in different sub-groupings.
Note: Other justifications denotes notifications made under Art. III, Art. XVII or Art. XXI of the GATT or Protocol of Accession.
Source: Authors' calculations based on WTO Secretariat data.

Table 11: **Taxes on fuels in OECD countries, 2008** (per cent)

Countries	Percentage of taxes in low sulphur fuel oil prices in industry	Percentage of taxes in automotive diesel prices for commercial use	Percentage of taxes in automotive diesel prices for non-commercial use	Percentage of taxes in premium unleaded (95 ron) gasoline prices	Percentage of taxes in natural gas prices in households	Percentage of taxes in light fuel oil prices in industry	Percentage of taxes in heavy fuel oil for electricity generation
Australia	..	..	33.0	34.6	..	..	..
Austria	14.7	44.9	47.8	56.8	26.6	16.6	3.4
Belgium	3.5	30.7	42.7	58.6	..	2.9	..
Canada	..	21.5	..	27.6	..	8.5	..
Czech Republic	5.4	37.3	47.3	55.0	16.0	4.2	6.3
Denmark	11.5	36.0	48.8	59.8	..	4.2	..
Finland	14.5	35.1	46.8	62.1	24.2	12.6	..
France	4.6	40.3	50.1	61.1	15.0	8.7	..
Germany	6.2	42.0	51.3	62.6	..	9.6	6.4
Greece	4.3	28.9	40.3	47.5	8.3	18.2	..
Hungary	6.4	34.2	45.2	53.0	16.7	..	..
Ireland	..	35.0	46.3	54.8	11.9	6.8	3.8
Italy	7.1	37.7	48.1	57.5	..	37.2	..
Japan	4.8	30.9	27.0	..	..	7.2	..
Korea	11.7	..	38.8	..	19.5	16.6	..
Luxembourg	..	..	..	..	..	..	..
Mexico	..	-	13.0	13.0	13.0	-	..
Netherlands	8.1	38.2	48.1	61.3	37.8	..	..
New Zealand	..	0.3	11.4	38.6	..	-	..
Norway	..	39.7	51.8	60.9	x	19.5	..
Poland	3.9	33.1	45.2	56.4	18.0	10.0	5.1
Portugal	2.8	40.6	45.5	59.0	4.8	..	..
Slovak Republic	-	41.4	50.8	56.0	16.0	-	..
Spain	3.4	31.0	40.5	49.5	13.8	12.1	..
Sweden	48.5	38.9	51.1	62.0	..	10.3	..
Switzerland	6.0	44.0	45.3	48.6	9.8	3.4	..
Turkey	..	46.0	46.0	59.7	15.3	..	31.7
United Kingdom	..	50.5	57.9	61.9	4.8	..	47.9
United States	..	13.8	13.8	15.0	..	4.9	4.7

Legend: x – not applicable; .. - not available; - - nil.
Note: Taxes refer to excise tax, consumption tax, goods and service tax (GST), and VAT.
Source: International Energy Agency (IEA) (2009).

trade instruments in importing countries. Gathering information on domestic measures that restrict consumption is, therefore, important as these measures are likely to have an impact on the volume of imports and on the terms of trade. One major drawback to this information-gathering exercise is that only consumption taxes on fuels are available.

Nevertheless, an analysis of these data shows that consumption taxes are high when compared with the rate of tariff protection on fuels. In the case of OECD countries, for example, import tariffs on fuels averaged only about 5.8 per cent (see Table 7), whereas the tax on gasoline and diesel for motor vehicles ranges between 30 and 60 per cent, dwarfing the size of import tariffs. Consumption taxes on fuel used by industry appear to be lower while fuel for electricity generation seems to be taxed the least (roughly in the same order of magnitude as import tariffs).

Information on fuel taxes for non-OECD countries is available from a relatively old study by Mahler (1994). It reveals a pattern consistent with that seen in OECD countries – namely, domestic taxes on fuels are several orders of magnitude greater than the tariffs on fuels (see Table 12). One important point to note about the data in the Mahler paper is that only those taxes that are explicitly levied on petroleum products, expressed

Table 12: **Fuel taxes in non-OECD countries, 1991** (per cent)

Regions	Premium gasoline	Regular gasoline	Automotive diesel	Heavy fuel oil
Africa	79	86	53	48
Asia	37	53	21	4
Eastern Europe	115	125	82	n. a.
Middle East	23	23	6	1
Western Hemisphere	70	62	36	25

Source: Mahler (1994).

Box 17: Data limitations – subsidies

The 2006 *World Trade Report* conducted a comprehensive examination of the type, amount and incidence of subsidies provided by WTO members (World Trade Organization (WTO), 2006). One conclusion was that comprehensive information on subsidies is hard to obtain, either because governments do not systematically provide the information or because multiple data sources use different definitions and classification systems. National subsidy reports provide quantitative information that may be detailed but do not guarantee cross-country comparability. Data from international sources, including from the WTO, allow for cross-country comparisons but only exist at a highly aggregated level, or are available for a limited number of sectors.

as a percentage of before tax petroleum prices, are used. However, some countries will have many implicit tax rates or subsidies which will affect the price level. These will ultimately increase (decrease) the tax rates.

(f) Subsidies

Several natural resource sectors – mining, coal, forestry and fisheries – figure very prominently in the notifications made by WTO members under the Agreement on Subsidies and Countervailing Measures (SCM). While the SCM notifications serve as an important means of informing other WTO members that subsidies are being provided, they are less useful for quantifying the subsidies involved. Members frequently indicate that no information on the value of the subsidy is available, or if values are provided, the notifications are often unclear about the measurements that have been used. For these reasons, the following discussion focuses on other studies (besides WTO notifications) of fisheries subsidies where more information is available (see Box 17) for a short discussion of the data limitations on subsidies). Note, however, that the figures reported in these studies may not always correspond to the term "subsidies" as used in the SCM Agreement.

(i) Fisheries subsidies

Probably one of the first attempts to estimate fisheries subsidies was carried out by the UN Food and Agriculture Organization (FAO) (1992). Employing 1989 data, the FAO study estimated an annual deficit of US$ 54 billion between global fishing revenues and costs, suggesting that the difference might be made up by subsidies. Using the definition of subsidy underlying the SCM Agreement, a subsequent study by Milazzo (1998) came up with a somewhat lower estimate of US$ 14 to 20 billion a year in global fisheries subsidies, with the subsidies constituting between 30 and 35 per cent of the value of the catch.[13] The most recent work on this issue is by Sumaila et al. (2009) which suggests that global fisheries subsidies for 2003 were between US$ 25 and 29 billion. All told, these various studies suggest that global fisheries subsidies are in the order of tens of billions of dollars annually and make up a substantial portion of the value of the fish catch.

Beyond these studies, there is also data from the OECD on government financial transfers (GFTs) to the fisheries sector, defined as "the monetary value of government interventions associated with fisheries policies" and covering all transfers from central, regional and local governments in OECD countries.[14] From 1996 to 2006, these transfers averaged about US$ 6.1 billion annually, ranging from a low of US$ 4.2 billion in 1998 to a peak of over US$ 7 billion in 2006.[15] Japan and the United States were the two biggest spenders, contributing 28 and 30 per cent respectively of total OECD transfers in 2006 (see Table 13). The OECD estimates that over the past decade, the transfers represented around 18 per cent of the value of the total catch of OECD countries from capture fisheries (Organization for Economic Co-operation and Development (OECD), 2009b). Capture fisheries refers to the sum (or range) of all activities to harvest a given fish resource.

Data on developing countries' fisheries subsidies is more difficult to obtain and tends to be scattered across different studies or reports. However, based on the study by Sumaila et al. (2009) cited above, 32 per cent of total fisheries subsidies were accounted for by developing countries in 2003. The estimates by country are shown in Table 14.

Table 13: **Government financial transfers by OECD countries to fisheries, 2006** (USD millions)

Country	Amount	Country	Amount
Australia	90.0	Korea, Rep. of	752.2
Belgium	7.8	Mexico	89.1
Canada	591.0	Netherlands	21.3
Denmark	113.2	New Zealand	38.6
Finland	23.4	Norway	159.5
France	113.8	Portugal	29.3
Germany	30.7	Spain	425.4
Greece	79.6	Sweden	41.5
Iceland	52.4	Turkey	133.9
Ireland	29.4	United Kingdom	114.7
Italy	119.2	United States	2,128.8
Japan	1,985.1	**OECD**	**7,169.9**

Source: Organization for Economic Co-operation and Development (OECD), 2009b.

Table 14: **Fisheries subsidies in year 2003: developing countries and customs territories** (USD millions)

Country	Total Amount	Country	Total Amount
Albania	1.3	Libya	5.1
Algeria	6.7	Madagascar	12.9
Angola	74.5	Malaysia	317.2
Antigua and Barbuda	4.1	Maldives	65.2
Argentina	366.8	Marshall Islands	72.1
Bahamas	14.3	Mauritania	26.0
Bahrain	11.9	Mauritius	2.2
Bangladesh	62.8	Micronesia	170.1
Barbados	0.9	Morocco	91.7
Belize	7.9	Mozambique	21.5
Benin	6.6	Myanmar	157.8
Brazil	413.4	Namibia	122.5
Brunei Darussalam	0.8	Nauru	0.2
Cambodia	7.4	Nicaragua	14.8
Cameroon	9.4	Nigeria	31.0
Cape Verde	11.2	Oman	79.5
Chile	93.7	Pakistan	136.7
China	4,139.5	Palau	1.5
Colombia	15.4	Panama	50.1
Comoros	0.7	Papua New Guinea	662.0
Congo	1.8	Peru	205.5
Costa Rica	17.1	Philippines	918.8
Cote d'Ivoire	12.3	Qatar	3.8
Cuba	13.9	Russian Federation	1,481.8
Cyprus	1.4	Saint Lucia	4.0
Djibouti	0.6	Samoa (Western)	7.3
Dominican Rep.	7.5	Sao Tome & Principe	0.7
Dominica	7.3	Saudi Arabia	33.3
Ecuador	47.4	Senegal	70.5
Egypt	15.8	Seychelles	28.6
El Salvador	9.5	Sierra Leone	13.7
Equatorial Guinea	0.3	Singapore	0.3
Eritrea	2.0	Solomon Islands	35.0
Fiji	39.8	Somalia	4.3
Gabon	12.6	South Africa	69.6
Gambia	12.1	Sri Lanka	132.4
Georgia	1.0	St. Kitts & Nevis	1.1
Ghana	32.9	St. Vincent & Grenadines	5.3
Grenada	5.4	Sudan	1.3
Guatemala	8.9	Suriname	15.8
Guinea-Bissau	4.4	Syria	0.8
Guinea	28.9	Taipei, Chinese	360.5
Guyana	54.5	Tanzania	10.0
Haiti	4.4	Thailand	552.6
Honduras	11.9	Togo	1.5
Hong Kong, China	8.6	Tonga	7.2
India	1,070.2	Trinidad & Tobago	11.5
Indonesia	989.7	Tunisia	26.5
Iran	243.1	Turkey	97.1
Israel	1.2	UAE	10.6
Jamaica	10.7	Ukraine	49.7
Jordan	0.1	Uruguay	11.1
Kenya	4.8	Vanuatu	144.0
Kiribati	23.5	Bolivarian Rep. of Venezuela	64.8
Korea, Rep. of	893.9	Vietnam	697.4
Kuwait	1.0	Yemen	117.6
Liberia	0.6		

Source: Sumaila et al. (2009).

Given that not all fisheries subsidies are intended to expand fishing capacity and some are intended to assist conservation efforts, an exclusive focus on the total amount of subsidies may give a false impression of the extent to which the payments exacerbate the exploitation of fisheries stocks or distort trade.

Kahn et al. (2006) have attempted to disentangle the effects of different subsidy programmes and to account for the amounts involved. They estimated that the amount of non-fuel subsidies that contributed to an increase in fishing capacity globally was about US$ 16 billion. Included under this category are: programmes on boat construction, renewal and modernization programmes; support for fishing port construction and renovation; marketing support, processing and storage infrastructure programmes and the like. To this category must be added the US$ 4.2 to 8.5 billion worth of fuel subsidies estimated by Sumaila et al. (2006).

In contrast to these subsidies, Kahn et al. (2006) estimated that US$ 7 billion of subsidies were devoted to fisheries management and conservation. In this category, they included expenditures on monitoring, control and surveillance; stock assessment and resource surveys; and fisheries research and development. Finally, they identified another US$ 3 billion of subsidies that, in their view, have the potential to lead to either investment or disinvestment in the fisheries resource.[16] Notable among the programmes that they classified under this heading are vessel buy-back programmes (see the discussion in Box 22).

Based on data for the last decade, the pattern of support in OECD countries appears to show a larger proportion of the Government financial transfers (GFTs) were devoted to fisheries management, research and enforcement (38 per cent of total GFTs in OECD countries). The remainder went to infrastructure expenditure (39 per cent), vessel decommissioning schemes (7 per cent), income support (5 per cent), access agreements (3 per cent), vessel construction and modernization (3 per cent) and other cost reducing transfers and direct payments general services (5 per cent).

2. Trade policy, resource distribution and exhaustibility

What are the trade and domestic policies that governments adopt to deal with the uneven geographical distribution of finite natural resources, and how do these policies affect other economies? Since natural resources are often concentrated in a few countries, producers and exporters of these resources benefit from market power and can earn large (at times monopoly) rents. These may provide both the importing and the exporting countries with an incentive to appropriate part or whole of these rents by imposing trade restrictions, such as import tariffs, export taxes and export quotas, or providing subsidies.

The following analysis will focus mainly on the "rent-shifting" effects of trade policy measures. However, a critical issue in the analysis of the impact of these policies when applied to finite natural resources is that they involve dynamic considerations. As discussed in Section C, optimal extraction of exhaustible natural resources is an inter-temporal decision involving calculations of optimal extraction paths over time. A government incentive to adopt certain trade policy measures may depend not just on market conditions today but on strategic considerations regarding the availability of – and demand for – the resources in the future. These dynamics introduce important complexities into economic models, including the issue of whether a government can credibly commit to a certain announced trade policy time path. For this reason, the existing economic literature has analysed these issues only in relation to specific circumstances and policy measures.

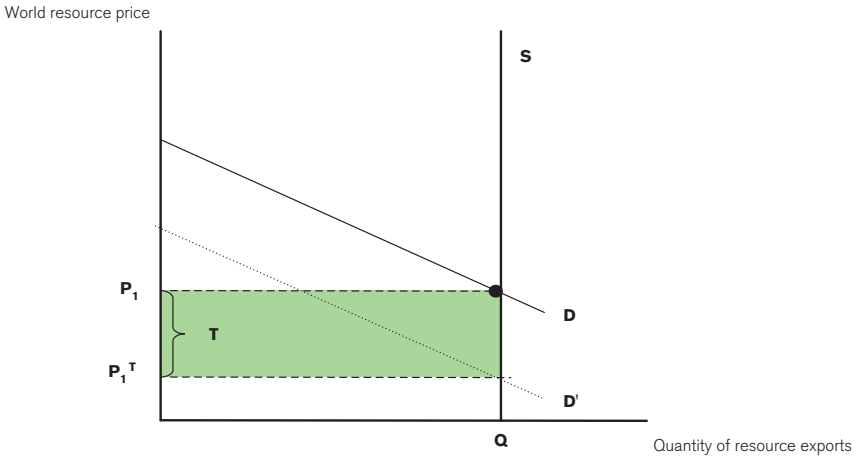
(a) Rent-shifting effect of tariffs (and consumption taxes)

Economists stress the importance of rent-shifting to explain the use of import tariffs on natural resources. In other words, tariffs are strategically set by resource-importing countries to extract rents from resource-exporting countries. This argument is particularly relevant in natural resources relative to other types of products for two reasons: first, because resource revenues largely consist of pure rents; and second, because import tariffs on natural resources cannot generally be justified as import substitution strategies. Since deposits of exhaustible natural resources, such as oil and minerals, tend to be concentrated in relatively few locations and cannot be relocated from one country to another, obviously the rationale for imposing import tariffs cannot be to increase domestic production.

Two other arguments have been advanced to justify the use of import tariffs. One is an insurance argument that relates to the fact that the supply of natural resources available is unknown and that as a consequence their supply may be subject to random interruptions. Several studies show that import tariffs can be optimal if supplies are subject to such interruptions. This is because the higher domestic price will reflect the premium that consumers pay for the vulnerability and uncertainty of imports (Nordhaus, 1974; Plummer, 1982). The other argument is a strategic one – that import tariffs can be optimal to counteract the monopoly power of the resource-rich country. Based on the evidence that the natural resource exporters may be monopolists and that importers may enjoy monopsony power, various studies have examined the optimality of import taxation (Bergstrom et al. 1981; Bergstrom, 1982; Newbery, 1984).[17]

Regardless of the motivations, the imposition of import tariffs will affect the geographical distribution of the rents associated with extraction. Consider the case of oil, which is available in a finite amount and costs relatively little to extract after the initial investment has been made. These high fixed and low variable costs mean that its supply curve is inelastic – that is, it is not

Figure 31: **The effect of a tariff on natural resources** (static model)



sensitive to price variations. In these circumstances, if the importing country introduces a tariff, the exporting country will have to lower the exporting price (by as much as the size of the tariff) in order to be able to sell the total amount of the resource. Therefore, the burden of the tariff will fall on the exporter.

Figure 31 provides a graphical representation of the impact of an import tariff on natural resources in a simple static model, where all available resource is exhausted in a given period. Suppose that Q is the total amount available of a certain natural resource, say oil, and S is its supply curve. Suppose also that the world consists of an importing and an exporting country and that all resource extracted is exported. In these circumstances, for a given demand curve D, the free trade price for the resource is P_1. Suppose then that the importing country imposes a tariff T. The demand curve shifts to D' and the new equilibrium will be at the export price P_1^T. Consumers will continue to pay the price P_1 – the price at which they demand the quantity Q- while the exporter will receive the price P_1^T. The shaded area in the figure represents the tariff revenue collected by the government of the importing country – with the difference between P_1 and P_1^T being the tariff T, and it also reflects the reduction in rent suffered by the exporting country.

Under the circumstances defined above, a consumption tax would have exactly the same effects as an import tariff. That is, in the same way that a tariff for a given export price increases domestic prices, so too does a consumption tax raise domestic prices. If supply is inelastic – and in the absence of a domestic industry consuming the resource – the exporting country will have to pay the burden of the tax. It is because of their similar effects that much of the economic literature on natural resources refers to consumption taxes or tariffs as equivalent measures.

How much of the exporter's rent can importers appropriate? The broad conclusion in the literature on rent-extracting tariffs (or the equivalent consumption taxes) is that the higher the tariff imposed by the importing country, the higher the share of the rent that it can appropriate. In fact, the entire rent can eventually be extracted by imposing a high enough tax or tariff rate. This argument also holds when the exporter is a monopolist (Bergstrom, 1982).

There are, however, a number of factors that determine the size of the rent that can be moved from the exporting to the importing country. One is the size of the importing country relative to the exporting country. The optimal tariff tends to be higher the larger the importing country – and it approaches a confiscatory level when the importing country is very large compared with the exporting country (Brander and Djajic, 1983). Another determining factor is the number of importing countries. In general, the share of the exporter's rent that can be appropriated decreases with the number of importing countries (Rubio, 2006).

Finally, the size of the rent that can be appropriated by the importer also depends on whether the resource-rich country faces a domestic demand for the resource, for example, from a local processing industry. If the supplying nation can transform the natural resource into final goods within its own economy, then it can respond to the imposition of the tariff by restricting exports. With consumption no longer taking place in the importing country alone, the amount of resource supplied to the importing country is no longer fixed, thus limiting the importing country's ability to reap the entire rent (Brander and Djajic, 1983).

A key issue determining the effects of an import tariff is its time pattern. When this is taken into account, a general result of natural resource economics is that the effect of a tariff on the price and output path chosen by the industry (be it a competitive industry or a cartel) will depend on whether the tariff remains constant, decreases or increases over time. In particular, economic theory shows that if a government can pre-commit and chooses a constant (in terms of its present value) tariff over time, the extraction path will be unaffected by the tariff (Bergstrom, 1982).[18]

Figure 32: **The effect of a tariff on natural resources** (two-period model)

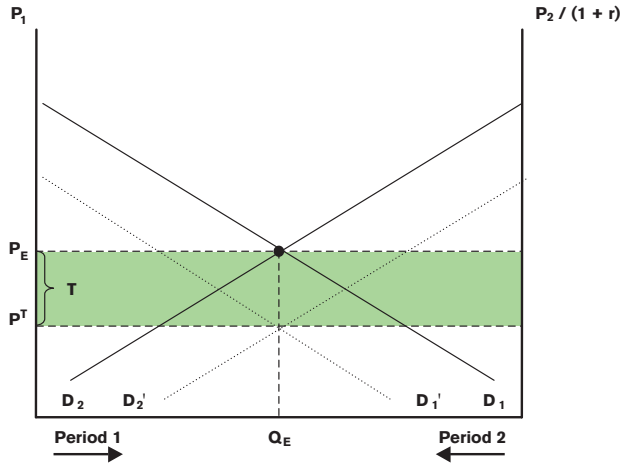


Figure 32 elucidates this case in a two-period framework.[19] In the figure, the curves D_1 and D_2 represent the demand curves in period 1 and period 2, respectively. Q_E is the quantity of resource exports at which the first-period price equals the discounted second-period price (that is, the exporting country is indifferent between extracting and selling the resource now or in the future), and P_E is therefore the equilibrium price. When the importing country imposes a tariff (constant in present value terms over the two periods), the demand curves shift downwards to D_1' and D_2' and the equilibrium shifts from E to E'. The quantities of the resource extracted in the two periods are unaffected by the policy. The world (export) price falls to P^T, but consumers in the importing country will continue to pay P_E (the export price augmented by the tariff). In other words, the government of the importing country will appropriate part of the rent of the exporter country (the shaded area in the graph) without affecting the output path.

Overall, the critical issue is whether countries can credibly commit themselves to a certain announced time path of import tariffs. Natural resource economics has shown that optimal tariff paths may be time inconsistent – i.e. some time in the future, as the tariff plan set at the beginning of the period unfolds, the importer will want to deviate from the original tariff path. This applies, for example, to a dominant oil importer facing a competitive supply of oil and other small, competitive buyers. In these circumstances the optimal tariff path would simply increase at the rate of interest, as this would maintain the price path consistent with the Hotelling rule (see Section C.1). At some date in the future, however, the domestic price in the dominant oil importer country will become so high that demand for oil falls to zero, while the oil price in the rest of the world, where oil is imported free of tariffs, will be lower. At this point, the dominant importer will find it attractive to deviate from the previous tariff plan, by reducing the tariff and importing more oil. The original tariff plan is thus dynamically inconsistent (Newbery, 1981).[20]

There are two broad solutions put forward to this time inconsistency problem. The first one involves reinforcing the credibility of certain trade policy announcements by binding them in international agreements such as the General Agreement on Tariffs and Trade (GATT) and other WTO agreements. The second involves the use of futures markets and the storage of resources (Maskin and Newbery, 1990).

(b) Export taxes

As noted above, one interesting feature of natural resources trade is the extensive use of export taxes.[21] The following discussion looks at the various motivations for export taxes, and the structure of markets that influence their operation and impacts.

To understand the effect of an export tax on exhaustible natural resources, it is important to distinguish between situations when there is a local demand for the resource and when there is not. Assume that the economy is characterized by three agents: the government, the oil-producing company and consumers. When all production is exported, an export tax imposed by the exporting country only has distributional effects: rents move from the extracting company to the government of the exporting country in the form of export tax revenue. There is no terms-of-trade effect in these cases. The reason for this is simple. Suppose that the initial conditions are those described in Figure 31. The supply curve of a certain resource – for example, oil – is fixed at a certain level and all production is exported.[22] In these conditions the export price will be determined by the level of the demand.

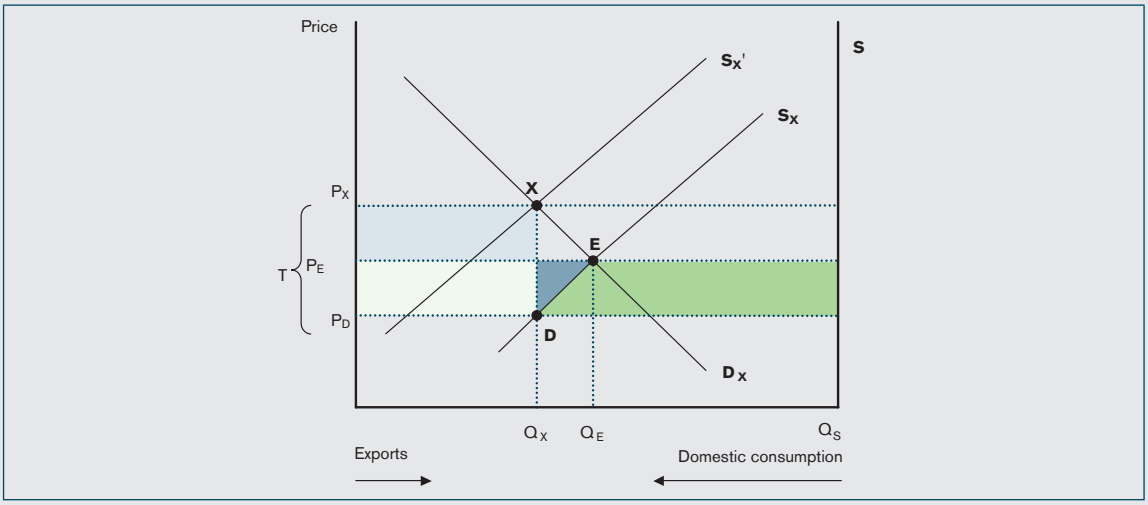
If the government of the exporting country introduces a tax on exports, the oil-producing company will not be able to pass the burden of the tax onto foreign consumers by increasing the export price, because at a higher price part of the resources remain unsold. Therefore, the export price will not change, while the net price received by the oil-producing company will be reduced by the amount of the tax, say T. For an export tax equal to T, the shaded area in Figure 31 will represent the rent loss of the oil-producing company and the export tax revenue of the government of the oil-rich country.

In contrast, when part of the natural resource production is consumed domestically, an export tax is equivalent to a subsidy on domestic consumption in terms of its price and quantity effects. Since natural resources are highly concentrated geographically, it is often the case that the trade policy of the resource-rich country is able to affect the world price of the resource. In economic terms, these conditions define a so-called "large" country. When a large exporting country applies an export tax on the natural resource, the domestic price will fall and the world price will rise. Part of the rent associated with production will shift from the producer company to the government and to the consumers in the exporting country.

In addition, there will be a terms-of-trade gain for the exporting country and a terms-of-trade loss for the importing country (see Box 18). Domestic consumers will consume too much of the resource, while foreign consumers will consume too little. In the exporting country, consumers' efficiency loss may be compensated by the terms-of-trade gain. Therefore, as for any other good, there is an optimal export tax for natural resources.[23] However, the exporting country will gain at the expense of the importing country and global welfare will be reduced.

In the long run, however, export taxes may not be effective in maintaining high export prices of natural resources. One reason is that sustained high world prices provide an incentive for importing countries to invest in new resource-saving technologies that reduce their natural resource requirements per unit of output. Sustained high prices may also make available additional resources for exploitation – by creating incentives to exploit resources that would not be economical to exploit at normal (free trade) prices or to undertake exploration for new reserves. All of this creates higher demand uncertainty for the exported natural resource, because the discovery of a new substitutable resource would suddenly shift demand away from the taxed commodity. In deciding whether or

Box 18: **Welfare effects of an export tax: the case of a large country**



Suppose that Q_S is the total amount of a certain resource – for example, oil – and that its overall supply curve S is inelastic. In the presence of a domestic demand for oil, the export supply will be a positively sloped line, indicated in the chart by S_X. Suppose as well that the curve D_X represents the export demand – i.e. the demand for the resource in the foreign country. At the equilibrium price P_E, the quantity Q_E is exported while the rest, Q_S - Q_E, is consumed domestically.[24] In free trade, export price and domestic price coincide.

If the government of the resource-rich country introduces an export tax, the export supply curve will shift upwards to S_X'. This is because for a certain price paid by the importing country, only a fraction is perceived by the producing company, because the amount T is paid to the domestic government. In particular, the export tax will create a wedge between the domestic and the foreign price of the commodity. In the new equilibrium, the foreign importers will pay P_X and will consume the quantity Q_X, while domestic consumers will pay P_D (equal to P_X –T) and will consume Q_S – Q_X. The shaded area below the price P_E is the producers' surplus loss, generated by the lower price (net of the tax) perceived by the producer. The area P_XP_DDX represents the tax revenue accruing to the government of the exporting country. Of this, the light blue area indicates the terms-of-trade gain enjoyed by the exporting country (or equivalently, the terms-of-trade loss suffered by the importing country) due to the higher export price for the resource. The green shaded area is the consumers' surplus gain occurring to domestic consumers, consequence of the reduction of the domestic price.

Finally, the dark-blue shaded area is the dead-weight loss. The export tax may be overall welfare improving for the exporting country if the dead-weight loss is more than offset by the terms-of-trade gain. Clearly, this occurs at the expense of the importing country that will suffer from a terms-of-trade loss and, because of the dead-weight-losses, the world as a whole will be worse off.

not to apply an export tax, natural resource-rich countries have to trade-off the short-run terms-of-trade gains against the possible negative long-run effects of higher demand uncertainty.

Furthermore, export taxes on natural resources also have distributional consequences within the exporting country. By reducing the domestic price of the resource, they implicitly subsidize the resource-consuming sector and reduce the income of the resource-producing sector. For this reason, they can be used for social or re-distributional objectives – for example, an export tax might be applied to natural gas products in response to government concerns about escalating heating costs for the poor. However, export taxes are a second-best policy response to distributional problems compared with a direct subsidy or an income tax.

Overall welfare considerations should also take into account the fact that export taxes may generate production inefficiencies in the resource-using sector. For example, they may distort investment incentives and encourage export-tax jumping FDI (see Box 16). In addition, because of the implicit subsidies, they may encourage the processing sector to produce a good for which it does not have a comparative advantage. In this respect, an export tax has an effect similar to that of a dual pricing scheme,[25] whereby prices in the export market are determined by market mechanisms while prices in the domestic market are fixed by a government at a lower price than abroad.

Besides terms-of-trade and income distribution motives, governments may also impose export taxes on natural resources for a variety of other economic objectives, including to smooth out the volatility of export earnings and to stabilize income, to promote export diversification and to respond to tariff escalation (see Box 19). Export taxes on natural resources have also often been used for non-economic reasons, such as conservation and environmental protection (Korinek and Kim, 2009)[26] – subjects that will be discussed in sub-section 4.

(c) Export quotas

In general, the exhaustibility of natural resources implies a trade-off between extraction today and extraction in the future. For a country that exports everything it produces, establishing an export quota will generally result in higher future rates of extraction.

Box 19: **Export taxes as a tool to address resource volatility, dominance and tariff escalation problems**

Export taxes as income stabilization policy

One distinguishing feature of natural resources trade is high price volatility. Another is that natural resources often represent a disproportionate share of resource-rich countries' GDP and exports. These two features together make some countries particularly prone to income stabilization problems. A recent study (Borensztein et al., 2009) shows that 40 countries characterized by a heavy dependence on the export of one single commodity experienced export income variability twice as large as non-commodity GDP variability between 2002 and 2007.[27]

Income stabilization, and in particular export revenue stabilization, is commonly viewed as an important policy goal. Stabilization schemes, international commodity agreements and buffer stocks are all examples of policies that have been aimed at reducing instability. Although neither economic theory nor empirical evidence provide clear conclusions about the relationship between export-earning instability and economic growth (see Section C.5), it seems likely that reduced income volatility is economically beneficial for countries because it leads to lower consumption volatility and higher welfare when consumers are risk averse.

Three motives justify the use of an export tax in these circumstances. First, it softens the impact of rapidly rising world prices in the domestic market (recall that the impact of an export tax is to lower domestic prices), thus protecting local consumers. Second, it increases government revenue, thus easing fiscal imbalances. Third, it taxes the windfall gains of exporters, thus promoting a fairer distribution of income.[28]

However, the use of an export tax to stabilize income is not without hazards. First, a flat export tax that did not differentiate between price rises and falls would not be effective in smoothing the transmission of world price shocks to the domestic economy. What is needed instead is a progressive export tax system – whereby a high tax rate is imposed when world commodity prices rise, but the tax rate is reduced or removed when prices fall. This would capture part of the gains from increasing commodity prices but avoid the adverse impact of falling prices on producers' incomes.

Second, a progressive export tax system can reduce the transmission of price fluctuations and act as an income stabilizer only if governments are willing to adjust their expenditure patterns accordingly in order to balance demand over time. Volatility of world prices can result in fluctuations in tax revenue. In order to stabilize income in the domestic economy, governments need to save during periods of high tax revenue and spend more during periods of low tax revenue. If government has a higher propensity than consumers to spend, then the income multiplier[29] will rise as the export tax rises, with the result that even a progressive export tax system would fail to stabilize the economy.

Third, political and social institutions need to be flexible enough to adjust to changing conditions. The external factors that first prompted an export tax can evaporate quickly, but many governments may lack the political and institutional flexibility needed to make rapid policy adjustments – leaving export taxes in place long after the underlying economic conditions have changed.

Finally, export taxes may trigger a self-reinforcing spiral of rising prices. When export taxes are introduced by several exporting countries or by a major exporter, the fall in the international supply of the commodity subject to export restrictions may further increase export prices (World Trade Organization (WTO), 2009).

In general, export taxes are a second-best option. Indeed, natural resource economists tend to argue that the development of efficient stock exchanges and financial markets is a more effective – and lower cost – way of addressing income instability problems. In particular, some economists urge governments to accumulate foreign assets in commodity stabilization funds as precautions against possible instability (Arrau and Claessens, 1992; Deaton, 1991; Durdu et al., 2009). However, this strategy may be less viable in countries characterized by weak governance, as the funds are vulnerable to misuse. Moreover, the accumulation of precautionary reserves comes at the cost of lower domestic consumption and welfare. Alternatively, commodity exporters may ensure against the risk of export income volatility by hedging the risk with derivative instruments (Borensztein et al., 2009; Caballero and Panageas, 2008).

Export taxes as export diversification policy

Concerns about the effects of resource price volatility run in two directions – on the one hand, fears of possible welfare losses associated with deteriorating terms-of-trade, and on the other hand, fears of de-industrialization associated with improving terms of trade (the so-called Dutch disease).[30] For example, Roemer (1985) notes that the most common response to rising mineral prices – and the threat of Dutch disease – is to tax the booming mineral export sector and to subsidize the lagging domestic manufacturing sector. By taxing exports, the government effectively redistributes income from the booming sector to the shrinking sector.[31]

As discussed in Section C.4, a natural resource boom need not lead to Dutch disease. The shrinkage of the non-competitive sector is the efficient response to the expansion (and increased earnings) of the competitive sector, in this case natural resources extraction, because it allows the country to enjoy higher wealth. Other factors are responsible for the Dutch disease, such as pre-existing distortions or positive spillovers associated with production in the manufacturing sector (van Wijnbergen, 1984; Sachs and Warner, 1995). In these cases, the first-best policy response would be the removal of the distortion or the provision of incentives to take account of the spillovers. Trade policy can only be justified as a second-best policy option (i.e. because it does not directly address the cause of the problem) when the first-best option is not viable.

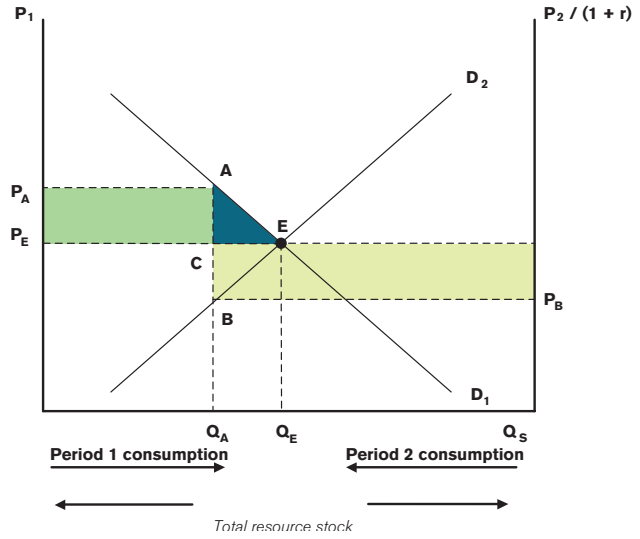
Export taxes have not only been used to avoid de-industrialization, but also to promote infant industries.[32] Since natural resources are used as inputs in most higher-value added industries, export taxes can work as an indirect subsidy to manufacturing by reducing the price of resource inputs. By shifting supply from the export to the domestic market, export taxes lower the domestic price of natural resources to below world market prices, thus giving the domestic downstream industry a competitive edge against foreign competition.

However, traditional economic models support infant-industry types of policies only in specific circumstances. According to many economists, the argument that new domestic industries may not be able to compete with well-established foreign firms because they lack sufficient experience – and that if protected, they may eventually acquire the experience and a comparative advantage – is not *per se* a sufficient argument to justify government intervention from an economic efficiency point of view. This is because well-functioning financial markets will recognize the potential comparative advantage of the new industry, and will lend it sufficient resources in the initial phase of its development, on the assumption that their investment will be repaid as soon as the industry develops its comparative advantage (Baldwin, 1969). Government intervention can only be justified in the presence of some form of market failure, such as imperfect financial markets. Trade-restrictive measures represent a second-best policy option (the first-best option would be to reform financial markets).

Export taxes as response to tariff escalation

While tariffs on natural resources tend to be very low, evidence suggests that tariff levels tend to increase as commodities become more processed.[33] To the extent that developed countries' imports are crucial to the growth of high value-added industries in developing countries, tariff escalation may increase poorer countries' reliance on unprocessed primary commodities and hinder their ability to diversify their economies and develop a domestic manufacturing sector. In this situation, the removal of tariff escalation would be the first-best policy (i.e. the least distortionary) to achieve diversification. However, export taxes would be a second-best policy – because by reducing the domestic price of a resource, they would favour the local processing industry and offset the distortionary effects of tariff escalation.

Figure 33: **The effect of a quota in period 1**



Consider a simple case where all available resources will be consumed in two periods (see Figure 33).[34] If an export quota is introduced in period 1 at the level denoted by Q_A, then the price in period 1 will increase and equal P_A. In period 2, the supply of the natural resource will be higher (equal to the segment Qs-Q_A) and the price will be lower, P_B, than in the absence of a first-period quota.

What are the welfare effects of an export quota? In the exporting country, the effect of an export quota is to shift rents from the second to the first period, and, in principle, the loss in the second period may even be larger than the gain in the first period. The figure below clarifies this point. If a quota Q_A is imposed, the price of the resource will increase and there will be a terms-of-trade gain in period 1 (the green area). However, since a larger amount of resources will be available in the second period, the price in period 2 will fall below the level that would have prevailed without the quota and there will be a terms-of-trade loss (the yellow area).

At the world level, the price wedge between the two periods implies a real income loss, given by the area ABE. Of this, the area ACE is the loss in consumer surplus caused by higher price in the first-period, which is not compensated by the terms-of-trade gain. The BCE is the second-period terms-of-trade loss that is not compensated by the gain in consumer surplus resulting from lower second-period price.

Two points are worth noting. First, the price of the resource can be kept higher over the two periods (and therefore a terms-of-trade argument for the imposition of a quota exists) only if a government can credibly commit that it will leave some of the resources unexploited in the ground. Second, when all resources are exported, an export quota is equivalent to a production quota. The trade-off between extraction today and extraction in the future also holds in this case.

Several reasons may justify the introduction of quantitative restrictions on the extraction rate of a resource relative to the optimal one that might otherwise be chosen by the competitive producer. In the case of natural resources, uncertainty about the future plays an important role in decisions about extraction, and this uncertainty may take different forms. There is uncertainty of supply, due to the fact that reserves of some natural resources are at least partially unknown. In addition, there is uncertainty on the demand side, as substitutes for resources may be developed and become available at some unknown point in the future. Risk-aversion plays an important role in determining the optimal extraction paths in this case. For example, if a government is more risk-adverse than the private producer and wants to avoid running out of a resource, it may consider it optimal to introduce a quota to move towards a more conservative extraction path (Devarajan and Fisher, 1981; Weinstein and Zeckhauser, 1975; Arrow and Chang, 1978; Hoel, 1978).

Another important reason for restricting production in one period relative to the future is the existence of externality – which will be discussed in more detail below. In addition, export quotas, like export taxes may be introduced as a second-best policy measure to further certain development objectives, as noted above.

Finally, export quotas can also be rationalized by a terms-of-trade argument. When there is domestic demand for the resource, an export quota (like an export tax) will create a wedge between domestic and foreign prices and work as a beggar-thy-neighbour policy. The resource-exporting country gains in terms of trade, but the policy generates overall efficiency losses.

(d) Subsidies

Although available information suggests that subsidies to natural resource sectors are significant (World Trade Organization (WTO), 2006), no comprehensive cross-country data exist to allow a comprehensive comparison

of subsidy policies across the main producers and consumers of non-renewable natural resources.[35]

A production subsidy in a resource-exporting country is essentially a simple transfer from the government to the producing company. Provided that supply is linked to available resource stocks (the situation described in Figure 31), a production subsidy will not affect consumer prices, but will simply increase the price per unit of output for the production company. From an economic perspective, production subsidies in an exporting country are justified when there is a market failure and when insufficient resources flow to the extraction activity. In the case of a natural resources sector that represents, or may potentially represent, a large share of a country's economy, one can imagine that the development of an extraction company could have positive externalities for the rest of the economy, and thus the case for public subsidies could exist.

A consumption subsidy acts like an export tax when provided by the natural resource-exporting country, and similar rationales apply. To the extent that the two measures differ, an export tax represents rent-shifting from the producing company to the government and consumers, whereas a consumption subsidy represents a transfer from government to consumers and the producing company.[36]

In contrast, a consumption subsidy provided by the importing country works in the opposite direction to an import tariff, in that it is a simple transfer to the exporting country – suggesting that there may be mainly an income distribution rationale behind it.

Production and exports can also be affected by exploration subsidies. Since available natural resource endowments are partially unknown, and companies must invest in exploration to discover new deposits, governments may choose to support this activity through exploration subsidies – that is, incentives for companies to invest in exploration. By increasing the amount of proven resources, more intensive exploration activity can increase production and exports of non-renewable resources. In the situation illustrated in Figure 31, this is equivalent to shifting the supply curve to the right.

The economic literature highlights a number of factors that may cause market failures in terms of exploration activity and hence justify public intervention.[37] One is the spillover of geological information. Because exploration is expensive and uncertain – and because producers can benefit from information that spills over from exploration attempts in adjacent territories – producers might have an incentive to wait for their neighbours to drill first, resulting in socially inefficient levels of exploration (Stiglitz, 1975; Peterson, 1975). A government subsidy to encourage exploration could result in the discovery of new resources that might otherwise have gone undeveloped.

Exploration by the government itself – or subsidies to encourage private exploration – may make sense for two other reasons. First, there may be positive spillovers to the rest of the economy from successful exploration that raise the overall benefits for the government relative to private actors – thus justifying government interventions. Second, a principle-agent problem exists in exploration that may induce a sub-optimal exploration rate. The problem arises because of sunk (i.e. non-recoverable) costs of exploration (Collier and Venables, 2009). The reduction of this initial sunk cost through the provision of a subsidy is a way to address the problem.

The market may also fail to deliver a socially optimal level of exploration because of the so-called "tragedy of the commons".[38] If an explorer that discovers a mineral or an oil deposit may exclude others from the exploitation of the natural resource, he will have an incentive to explore and capture the benefits of a discovery as quickly as possible before others do. This "race" may result in over-exploration, as each discovery reduces the amount of resources available to all (Hotelling, 1931). As will be discussed in more detail below, there are a range of policy instruments available to address the problem of the commons – from rules and regulations to taxes and subsidies. One way to reduce over-exploration is to create an incentive to invest in other activities, for example by providing subsidies to encourage research into substitute or renewable resources (e.g. subsidies to encourage research into biofuels or solar energy as a way of offsetting the development of new oil deposits).

3. Trade policy and exhaustibility: The problem of open access

As explained in Section C, free trade in natural resources between two countries may not always be mutually beneficial when open access problems exist. What policies should governments adopt to address this problem? And are some approaches more efficient and effective than others?

(a) Trade policy instruments

The following analysis assumes that the exporting and importing countries are "large" economies capable of affecting world prices (the result would essentially be the same for "small" economies except for the terms-of-trade effect). Moreover, the discussion focuses on comparing the long run effect of policies rather than on the transition, i.e. steady-state equilibria.[39]

An export tax applied by a resource-exporting country with open access problems will reduce the level of extraction in the natural resources sector. It raises the welfare of the resource exporter in two ways: by improving its terms of trade and by increasing its long-run stock of natural resources. However, the use of an export tax has a beggar-thy-neighbour effect because the increase in welfare of the exporting country comes at the expense of the welfare of its trading partner. The importing country will suffer a terms-of-trade decline and its steady state natural resources stock will be lower.

Box 20: **Export restrictions in the tropical lumber industry**

The world's forests are endangered by decades of over-logging – primarily triggered by land conversion, notably into agriculture (Robalino and Herrera, 2009). Since the 1970s, many developing countries have resorted to taxes or bans on exports of logs for the purposes both of conserving their use and promoting greater domestic value-added processing. Jeffrey (1992) noted the use of (high) export taxes in Western Africa (Cameroon, Ivory Cost, Ghana), South East Asia (Indonesia and Malaysia) and Latin America. One justification for the use of these measures was to correct the effect of high tariff escalation imposed by some developed countries against processed woods, deemed to depress prices for tropical timber on international markets. Furthermore, export measures served industrial policy and development objectives by providing assistance to downstream industries in correcting the bias introduced against their exports by tariff escalation in importing countries, and by "capturing" some of the economic rent associated with the countries' perceived market power in these sectors.

Export measures have often been combined with domestic policy measures (government control of land and of logging concessions and licences, obligations by concessionaires to undertake further processing of timber) to encourage domestic processing industries. A number of WTO trade policy reviews have documented how high export duties on logs and export promotion measures (including concessionary credit, insurance and guarantees, exemptions and duty drawback on machinery) have played a central role in Indonesia and Malaysia's industrial policies. In 20 years, Indonesia – whose government had linked the granting of logging concessions to the establishment by the applicant company of a wood/plywood processor near the territory of the concession – fulfilled by the late 1990s its objective of becoming the world's largest plywood manufacturer and exporter, while expanding wood furniture industries. Malaysia also became the second-largest exporter of wood products. Undoubtedly, export policy contributed to generate employment, raise export receipts and to boost the economy generally.

However, some economists have argued that the scale at which these policies were conducted raises questions about efficient resource allocation and resource sustainability, even though sustainability may have been one of the two governments' objectives at the outset. Anderson (1997) as well as Varangis et al. (1993) argued that impediments to trade reduced the value of sustainable forestry. Although poor implementation of domestic policies regulating the production of domestic timber (inadequate logging supervision, lack of tenure rights, inadequate stumpage fees, non-transparent allocation of logging concessions) were mainly responsible for unsustainable logging, "trade policies are inefficient instruments for correcting domestic distortions and, in the case of tropical timber trade, may affect the environment perversely. Export and import restrictions ultimately depress the value of an already under-price resource – the forest."

Policy cases conducted by the World Bank (1998) identified some of the drawbacks associated with prohibitive export taxes in forestry (500 to 5,000 per cent in Indonesia in 1998) and requirements on concessionaires to establish wood-processing factors, resulting in domestic logs and timber prices being one-fifth of the international price, the proliferation of wood-processing mills (3,000 in Indonesia), wastage ratio superior to the international average, and finally the diversion of wood to relatively less remunerative and efficient downstream processing industries (plywood) than alternative industries (higher-value added furniture).

In the early part of this decade, the Indonesian and Malaysian governments corrected some of the identified drawbacks, notably by reducing the amount of the export tax, weakening powerful export cartels that had obtained trade and other privileges from previous governments, and partially liberalizing log exports. However, in view of the rapidly developing demand for raw and processed wood products in Asia on the one hand, and the expansion of uncontrolled logging and smuggling of wood products in the forests of both countries, both governments decided to re-establish export bans on tropical timber.

The resulting increase in the exporting country's long-run stock of natural resources assumes that there is no domestic processing sector that could make use of the natural resource. In cases where a domestic processing sector exists, an export tax is a less effective tool for protecting natural resource stocks, since it effectively lowers the resource price that domestic processors have to pay and increases the quantity they will demand (see Box 20).

What happens when the importing country imposes a tariff on the natural resource, leaving aside for the moment the question of precisely why it would want to do that. Given the large country assumption, such a restriction will improve the terms of trade of the importing country while reducing the terms of trade of the resource-exporting country. Moreover, the long-run stock of the natural resource in the importing country will fall while the steady state stock in the exporting country will rise. Brander and Taylor (1998) show that even though the resource exporter suffers a terms-of-trade loss, it gains in the steady state because of the greater stock of natural resources which, in turn, expands its consumption possibilities.

Brander and Taylor also show that the importing country may benefit from the imposition of protection in two ways: through a terms-of-trade improvement and

through the tariff revenues it collects. It is possible that these benefits could outweigh the loss from the lower steady state level of the natural resources stock. This possibility of a net gain could explain why a resource-importing country might be willing to impose a tariff on a natural resource.

Clearly, the exporting country will prefer an export tax to a tariff, while the importing country will have the opposite preferences. In both instances, the long-run welfare of the exporting country rises. The key difference between the two instruments is that the steady state utility of the importing country falls with an export tax, whereas the effect is ambiguous with an import tariff.

(b) Domestic policy instruments

(i) Strengthened property rights

The economic literature argues that a more efficient outcome can be achieved by strengthening property rights rather than by employing trade measures. The first-best policy is to eliminate the distortion at the source, which is the absence of property rights over the stock of natural resources (Brander and Taylor, 1998). This implies that when both trading partners are able to manage the resource sector effectively, both countries can reap the benefits of trade opening without risk of resource over-exploitation.

How does strengthening property rights in the exporting country compare with imposing export taxes, as discussed above? First, strengthening property rights improves resource allocation by reducing the level of extraction below the open access equilibrium to a point that would maximize rent (see Section C.3). Second, given the reduction in resource extraction, strengthened property rights will also produce a terms-of-trade gain for the exporting country. But unlike an export tax, strengthened property rights would fully correct the underlying distortion arising from open access problems – i.e. too much effort or labour devoted to harvesting the natural resource.

However, seeing this problem in terms of perfect property rights versus open access is probably unhelpful, given that property rights regimes typically lie between these two extremes. While strengthened property rights is the first-best solution, it is important to understand the limitations that regulators (whether national governments or local communities) face when trying to enforce rules governing access to natural resources or to monitor compliance (Copeland and Taylor 2009).

Ostrom (1990) has studied many successful examples of community efforts to manage common pool resources from around the world – ranging from freshwater basins in the United States to irrigation systems in the Philippines, and to mountain pastures in Switzerland (see Box 21). In each case, these are neither completely open access resources nor perfectly managed resource systems. Nor are they completely privatized or fully state-controlled systems. They operate using an assortment of rules for sharing the resource, for monitoring compliance with the norms and for adjudicating disputes. Frequently, agreement among the members of the community cover not only how the resource is to be shared but also how provision is to be made for maintaining, repairing or investing in the natural resource system. What is striking about these examples is their longevity, with some local institutions being centuries old. While it is not possible to claim that these local solutions achieve an economic optimum, the durability of the institutions nevertheless testifies to a certain level of success in managing natural resources.

Ostrom identifies a number of "design" principles that characterize these long-standing arrangements. The individuals who have rights to the resource and the boundaries of the resource itself are clearly identified. The rules governing the harvesting of the resource and the obligations to provide for maintenance repair or investments are tailored to local conditions. The individuals who are subject to the rules can participate in modifying those rules. Those who monitor compliance with the rules are accountable to the harvesters or are themselves harvesters. Sanctions are calibrated to the degree of seriousness of the offence. Low-cost venues for resolving disputes are available. Higher authorities at the regional or national levels do not challenge the right of local communities to devise their own rules or institutions.

The more complex the common pool resource system is, the more widely layered or multi-levelled are the rules.

Box 21: **Alpine meadows**

One of the successful examples of local community efforts to manage natural resources can be found in Törbel in the Swiss canton of Valais. Since at least 1224, historical records document that villagers have been managing several types of communal properties, including alpine meadows where cows are allowed to do their summer grazing. The communal meadows have co-existed with private ownership of lands for at least 500 years. For Ostrom, this indicated that communal ownership was not simply a vestige from the medieval ages, but a rationally chosen way to manage the meadows. Access to the meadows is strictly limited and regulations dating back to 1517 further set out these limitations: no citizen could send more cows to the Alp than he could feed during the winter. This "wintering" rule was strictly imposed, with officials in charge of enforcement given the right to collect half of all the fines levied on those caught violating it. Although yields are low, the meadows have conserved their productivity for hundreds of years. Villagers help to preserve this productivity by contributing labour to weed and manure the grazing areas, and by constructing and maintaining mountain roads.

Source: Ostrom (1990).

While Ostrom is able to offer exemplary cases of success, she also documents quite a large number of unsuccessful efforts at managing common pool resources. In her estimation, they failed because they lacked a sufficient number of the design principles. However, Ostrom is careful to offer the qualification that these design principles are not necessarily pre-conditions for success. The difficulty of providing an economically concise analysis or explanation for why these institutions work suggests that there is more than a touch of fortuity involved in the most successful cases.

Furthermore, the difficulty of achieving an ideal property rights regime may be particularly acute in developing countries. Institutional and socio-political limitations make it unlikely that poor developing countries will be able to implement such policies effectively in the near future (Lopez, 1998). This opens the door to the use of alternative policy instruments such as trade measures, which were discussed before, and domestic taxes and quotas.

In connection with this, it will be helpful to examine other domestic measures that have been used in the natural resources sector. The two reviewed here are a production quota or limit on harvest, and a tax on harvest. In addition, because subsidies in some renewable natural resource sectors, such as fisheries, have been particularly important, their impact is also examined

(ii) Tax on production or harvest

Brander and Taylor (1998) rank a production tax in the same order of efficiency as property rights, i.e. they are first-best instruments,[40] if the tax is set at a level that makes the harvester internalize the reduction in productivity that he inflicts on other harvesters. This is shown in Figure 34 which depicts the situation after trade opening, meaning that the revenue curve reflects world market or post-trade liberalization prices. The application of a production tax (at a rate equal to AB/AE**) shifts the revenue curve inward to the dashed curve (i.e. lowers the revenue from harvesting the resource) so that labour allocation under open access now becomes equal to the optimal level of effort E**.[41]

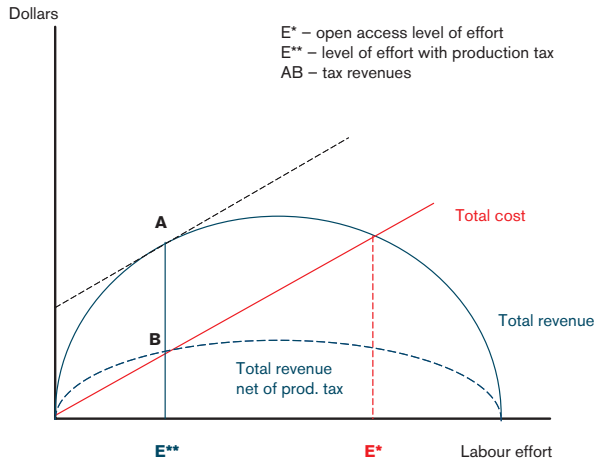
Note that E** is the allocation of labour that would result from the actions of an owner whose objective was to maximize the rent from the resource (marginal revenue equals marginal cost). The difference in this case is that the line segment AB represents tax revenue collected by the government instead of rent.

(iii) Quantitative limit on the harvest of natural resources

The view about the efficacy of production taxes is not shared by everyone. Chichilnisky (1994) claims that taxing the harvest of the natural resource can even exacerbate the rate of its extraction. However, it turns out that her result requires additional assumptions to be made about the consumption preferences of those working in the natural resources sector. The outcome she describes occurs because she assumes workers who harvest the natural resource have a demand for consumption goods produced in the non-resources sector that is not affected by price changes. Thus, faced with a reduction in their revenue as a result of the application of the production tax, they must harvest more of the resource so that they can purchase the same amount of the consumption good. On top of this, there will be an additional welfare loss from the increased harvesting because of the decline in the resource-exporting country's terms of trade.

Ferreira (2007) argues that the use of a production tax by the resource-exporting country will not be sufficient to prevent it from suffering a welfare loss. Her explanation for this is that unlike a quantitative restriction on harvesting, a tax on harvests does not fix the amount harvested since the allocation of labour responds to changes in relative prices. The movement from autarky to free trade increases the price of the natural resource in the country with poor property rights. Workers involved in the natural resources sector will increase their effort so that they can harvest and sell more of the resource at the higher price. A production tax will reduce but not eliminate the incentive for workers to allocate more of their labour to harvest the natural resource.

Figure 34: **Effect of a production tax**



Ferreira (2007) argues that a production quota on harvests is preferable. As long as there is some quantitative restriction in place to limit harvesting of the natural resource, free trade can be optimal for the exporting country. Furthermore, a government does not need exact information on the optimal level of harvest to set a quantitative restriction that will increase welfare. So long as the quantitative restriction on the amount harvested is binding, trade opening will not put additional stress on the stock of the natural resources sector and hence welfare will increase for the resource-exporting country. This is because a country that liberalizes usually experiences gains from two sources: increases in consumer surplus (because liberalization reduces the price paid by consumers for import-competing products) and increases in producer surplus (because factors of production are more efficiently utilized).

In a situation where the natural resources sector is characterized by open access, trade opening results in more effort or labour being allocated to the natural resources sector, leading to losses in producer surplus (rent dissipation) that dominates the gain in consumer surplus. However, if a quantitative limit is set on the harvest of the natural resource, so that no reallocation of labour to the natural resources sector takes place, the gains in consumer welfare will be sufficient to produce an overall increase in the country's welfare.

The argument about the superiority of a production quota to a production tax is surprising since at whatever level a production quota is set, there is always a way to set a production tax so that it achieves the same result when implemented. Using Figure 34 to illustrate this point, note that the optimal labour allocation E^{**} can be attained either by a production quota that fixes the harvest at the amount AE^{**} (assuming that the world price is normalized to one) or a production tax equal to AB/AE^{**}. Weitzman's (1974) classic article on prices and quantities shows that, when there is complete certainty about benefits and costs, price instruments are equivalent to quantitative controls. It is only when the regulator faces uncertainty about the structure of benefits and costs that the two instruments will not be equivalent in their welfare effects.[42]

Nevertheless, the result from Ferreira (2007) may have important practical policy implications if uncertainty is allowed and due to the fact that many poor but resource-rich countries do not have the monitoring and enforcement capability to implement a first-best property rights regime. A simple quota on the amount of resources that can be harvested, however, may be feasible for poor countries. Furthermore, the quota need not even be set at the optimal amount of harvest, and yet trade opening will be welfare improving for the resource-exporting country.

(iv) Subsidies

While it is widely recognized that important renewable resources are over-exploited, and that corrective measures need to be implemented to restore their productivity, this recognition has not stopped governments from providing various forms of financial support to producers. One notable example is fishing subsidies. The reasons for such support are varied. Since fish is an important food source, subsidies could be rationalized as a measure to ensure food security. Fishing communities may be located in struggling regions of a country and so subsidies often help jobs remain in those areas. Finally, subsidies may also be provided in order to reduce fishing efforts and conserve fish stocks (see Box 22 on the buy-back of fishing vessels).

Economic theory suggests that subsidies that reduce the cost of harvesting (e.g. subsidies for fuel used in fishing boats or subsidies for fleet modernization, or subsidies that are paid on the basis of harvest) will worsen the exploitation of stocks that already suffer from open access. The increase in revenue or the reduction in cost made possible by the subsidy raises rent in the natural resources sector and thereby attracts more entry. This infusion of entrants continues until rent is totally dissipated.

Despite the increased effort, the effect of the subsidies on harvest or output is ambiguous. It is only when the natural resources system is in the upward sloping portion of the supply curve that the subsidy results in more output or harvest. If the natural resources system is in the backward-bending portion of the supply curve, the subsidy will result in reduced harvest or output. To recall the explanation in Section C.3, the supply curve of the natural resource under open access is backward-bending because too much effort is involved in harvesting. Hence, when the price rises, drawing additional labour to the natural resources sector, those additional workers reduce instead of increase total harvest. By the same token, the subsidy aggravates the crowding in the natural resources sector and reduces, instead of increases, total harvest.

When the resources are subject to some form of management, whether subsidies worsen the exploitation of the natural resources stock or not may depend on the nature of the management system. If management of the resource takes the form of the individual transferable quota (ITQ) system, which has become popular in fisheries, where a total catch (the "total allowable catch") is determined at the outset and individual quotas are assigned to harvesters, the subsidy will not increase the exploitation of the resource if the total allowable catch is left unchanged and is effectively monitored and enforced. Instead, the subsidy simply stays with the harvesters or ITQ owners as increased rents.

What is the effect of subsidies on international trade? The interesting case is where the initial free trade equilibrium occurs in the backward-bending portion of the supply curve of the country with open access problems. Some have argued that given the severity of the open access problem in fisheries, this is the likely situation for that sector (Asche and Smith, 2009).

Box 22: **Are there good subsidies? The case of vessel buy-back schemes**

An example of a potentially "good" subsidy is a buy-back programme where fishermen are compensated to remove their fishing vessel and thereby reduce fishing efforts. However, opponents of the notion that there are good subsidies claim that all transfers will eventually be transformed into increased effort. Hence, the entry of new vessels or increased capacity in the remaining fleet will make up for the reduction in effort implied by the removal of one vessel.

Buy-back programmes are a common tool to reduce capacity in fisheries, particularly in developed countries. However some developing countries also have such programmes in place. Fishing vessels have little alternative value and it is therefore difficult for the fishermen to withdraw a vessel. Buy-back programmes provide the means to change this.

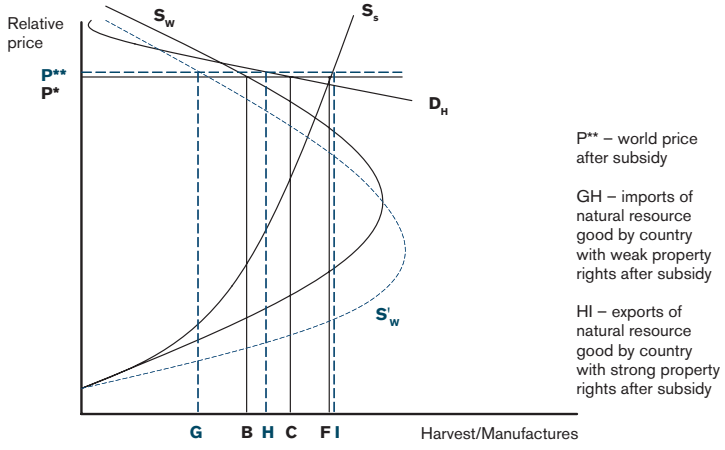
Groves and Squires (2007) give eight categories of reasons why vessel buy-backs are used as a management tool: (1) increasing economic efficiency, (2) modernizing fleets and adjusting fleet structure, (3) facilitating transition between management regimes, (4) providing alternatives when rights-based management forms are not an alternative, (5) providing disaster or crises relief, (6) addressing compensation and distribution issues, (7) helping conserve or rebuild over-exploited stocks, and (8) protecting ecological public goods and biodiversity. They recognize that a buy-back programme often targets several different and even conflicting objectives and that the programme is the outcome of a policy process that in most cases will target improved, not optimal, management as the objective.

How well a buy-back programme works depends to a large extent on its objectives, design and implementation. Groves and Squires (2007) and Hannesson (2007) show that buy-back programmes in fisheries without access restrictions cannot achieve its objective (with the possible exception of transferring revenue to a group of fishermen). In fact, if the programme is poorly designed and lacks restrictions on access or capacity expansion for the remaining vessels, a buy-back programme can reduce the size of the fisheries stock. A recent OECD report (2009d) based on case studies of a number of decommissioning schemes in OECD and non-OECD countries reaches similar conclusions. It recognizes that vessel buy-backs, as part of a package of transitional assistance and management changes, can accelerate the transition to a rationalized fisheries system. However, decommissioning schemes used on their own do not provide a long-term solution to the problems in fisheries with poorly developed or enforced use and access rights. Unless complementary measures are taken to effectively manage the fisheries stock, short-term gains from the buy-back are likely to be eroded as remaining fishermen expand their efforts, previously inactive vessels and licences are activated, or as new entrants join the fishery.

Sources: Asche and Smith (2009) and Organization for Economic Co-operation and Development (OECD) (2009d).

Figure 35 below shows the free-trade equilibrium occurring in the backward-bending portion of the supply curve. The structure of demand is the same in both countries and is given by D_H. The country with weak property rights imports the natural resource from the country with strong property rights. The world price is given by P^* with imports given by BC which is equal to exports CF. A subsidy by the country with weak property rights increases effort (shown as the shift in the supply curve to S'_W). However, since the subsidizing country is already in the backward-bending portion of its supply curve, this additional effort actually reduces its harvest and the steady state stock of the natural resource. As a consequence, at the initial world price P^*, the country

Figure 35: **Effect of a subsidy on trade**



providing the subsidy demands a greater amount of imports than before. This leads to a new equilibrium with a higher world price P^{**} and higher imports (equal to GH) for the subsidy-providing country.

Thus, it turns out that a subsidy by the importing country to its natural resources sector increases its imports and also leads to a deterioration in its terms of trade. While the subsidy worsens the state of its natural resources sector, the measure does not steal trade opportunities from its trade partners. By the same token, it can be shown that a subsidy that reduces capacity in the importing country will have the opposite effect to that described above. By reducing harvesting capacity, the subsidy-providing country improves production efficiency to such an extent that its harvest actually increases, its imports are reduced and there is an improvement in its terms of trade.

In summary, the economic literature on trade in renewable natural resources implies that free trade may not benefit both countries, particularly if the resource exporter suffers from a problem of open access. Since the inefficiency that plagues exhaustible natural resources is domestic in origin, trade policy will not be the first-best policy instrument. The economic inefficiency will be better addressed at source through stronger property rights or through a production tax/quota. However, institutional limitations, particularly in poor and developing countries, may make it unlikely that they will be able to implement resource management policies effectively, which might justify the use of trade instruments such as an export tax.[43]

4. Natural resources externalities and environmental policy

The following discussion looks at a set of policy instruments that governments could use to deal with the environmental externalities deriving from the extraction and use of exhaustible resources. First, it focuses on fossil fuel resources – and more specifically, on the optimal time pattern of consumption environmental taxes[44] to limit negative externalities such as pollution and habitat destruction. It is important to note that since most energy resources are unevenly distributed geographically, it is very likely that countries importing those resources are not producing them. Thus, analysing the effects of a consumption tax would be equivalent to analysing the effects of an import tariff.

Second, the effects of trade policy instruments such as import tariffs on renewable natural resources are considered. The effectiveness of these instruments is analysed in the context of common pool problems and environmental externalities such as habitat destruction. Finally, policy instruments such as eco-label schemes and environmental standards are discussed as alternative policy instruments to deal with negative effects on biodiversity.

As noted earlier, policy instruments such as export taxes can also be used to address environmental externalities. The ensuing discussion, however, focuses on those measures referred to most commonly in the specialized literature.

(a) Fossil fuels and the optimal pattern of consumption taxes (and import tariffs)

The optimal level of a consumption environmental tax – also known as Pigouvian tax – should reflect the costs of the environmental damage generated by the extraction or use of exhaustible resources such as fossil fuels. In addition, the efficient implementation of Pigouvian taxes should take into account the link between environmental damage and resource depletion. More specifically, when damage to the environment derives from the use of a non-renewable resource, policy-makers wishing to impose a tax on consumption should focus on the time path of the tax rather than just its level. Doing the contrary would be inefficient. In fact, as illustrated in Section D.2, imposing a constant *ad valorem* Pigouvian tax[45] on a non-renewable resource will not change the path of production and consumption of such a resource and hence will not reduce the resulting pollution.

The following section focuses on taxes on the carbon content of fuels.[46] Conclusions related to this particular policy instrument are also valid for taxes on energy consumption. The literature[47] shows that in the presence of flow environmental externalities (i.e. the environmental damage caused by the current extraction or use of the resource),[48] a falling *ad valorem* Pigouvian tax would be an optimal policy to delay depletion and hence to slow the accumulation of CO_2 emissions.[49] In the short run, the introduction of a Pigouvian tax will increase the consumer price of the resource in each period and will consequently reduce its total demand. A shift from present consumption towards future consumption is welfare enhancing since it reduces both the absolute amount of emissions and the present value of the environmental damage. As the marginal environmental damage decreases with decreasing consumption of the resource, the tax rate falls as time passes.

When stock externalities are considered (i.e. when environmental damage is a function of cumulative emissions), there is no general rule that can determine the optimal pattern of a carbon tax. The direction of the movement of a carbon tax will in fact depend on the effects and the interaction among different factors such as the natural rate of decay and the initial stock of carbon emissions and at what rate today's consumers discount future environmental damage in relation to the present. However, studies such as Ulph and Ulph (1994) show that for a special and very plausible case in which the stock of the pollutant decays over time, *ad valorem* carbon taxes should initially be rising when the initial stock of pollution is small and be falling towards the end of the resource's life. The previous theoretical result is in line with some empirical evidence showing that in the European Union and the United States, tax rates on fuels such as gasoline have increased substantially over time.[50]

How would the optimal path of a carbon tax change if the trans-boundary effects of environmental externalities are taken into account? In the context of

carbon emissions, for instance, it is likely that the actions taken by resource users in a certain country are not entirely contained within national borders, but spill over into other countries independently of international trade. Some economic models, for instance Amundsen and Schöb (1999), show that in the presence of cross-border effects, an agreement to increase taxes uniformly higher than the Pigouvian level would provide an efficient allocation of the natural resource over time. However, reaching an agreement is costly: although all countries could benefit from coordination, a single country always has an incentive to deviate from the coordinated tax scheme since its best policy would be to impose the lower Pigouvian tax. Hence, to overcome this "prisoner's dilemma" situation, coordination requires binding and enforceable agreements.

Finally, once the right policy instrument is announced, the speed of introduction of such a policy can be crucial to its success. In fact, in studies such as Long (1975) and Konrad et al. (1994) it has been shown that in order for the policy to be beneficial for the environment, any proposed tax needs to be introduced quickly. This is because announcing the imposition of coordinated taxes acts like an expropriation threat to the resource-owning countries. They have the incentive to increase present extraction prior to the date when the tax is imposed in order to reduce future losses.

In practice, the level of taxes imposed by governments deviates from the optimal Pigouvian tax level. The reasons for this are twofold. First, the difficulty of estimating the environmental damage costs generated by the use of fossil fuels makes countries implement more workable approaches, such as that introduced by Baumol and Oates (1971), where the tax rate is set to influence the behaviour of taxpayers in order to achieve a predetermined set of objectives for environmental quality. Second, different studies[51] show that the level of taxes today deviates from the optimal Pigouvian tax level due to the strategic interaction between consumers and producers of resources. This is because, as explored in Section D.2, the imposition of taxes also serves to capture resource rents from resource-exporting countries. For example, the fact that petroleum-producer and petroleum-consumer countries are two separate groups with different interests might make this latter group use carbon taxes not only with the objective of making consumers take account of the environmental damage derived from the consumption of an exhaustible resource, but also to appropriate rents.

(b) Renewable resources, biodiversity and environmental policy

(i) Import tariffs

In Section D.3 it was shown that when property rights with respect to resource harvesting are not well enforced, trade opening might have a negative impact on resource conservation. Therefore, trade policies such as tariffs imposed by the resource-importing country will reduce foreign demand for the resource commodity, mitigating – to some extent – the over-harvesting problem. In what follows, the analysis of trade policy instruments is performed taking into account not only the open access problem related to renewable resources but also the resulting environmental damage. More specifically, the following questions will be considered: is the imposition of a tariff still optimal when a negative externality such as habitat destruction is taken into account? Are there alternative instruments that could be used to deal with habitat destruction?

The effect of a tariff on biodiversity depends on the principal causes of habitat destruction. The destruction can be a direct result of over-harvesting – for instance, excessive timber extraction implies habitat loss due to declining soil fertility. In such a situation, the imposition of a tariff will be an optimal policy since it decreases the amount of the resource harvested and hence will also reduce habitat loss. If, however, the expansion of other economic activities takes place at the expense of habitat conservation, through land conversion (cross-industry externalities), then imposing a tariff will not always be the best policy. In fact, the work of Smulders et al. (2004) shows that when there is a negative relationship between economic activity and habitat conservation, the introduction of a marginal tariff on resource imports will have an ambiguous effect on both the importer's and exporter's stock of the resource.

To better illustrate the logic behind this result, consider an economy with two countries, home and foreign, and three sectors – harvesting, agriculture and manufacturing. The production of each good requires labour as well as a sector-specific input, and labour can shift freely between the three sectors within each country. While the development of the manufacturing sector does not necessarily have a negative impact on habitat conservation, an expansion of the agricultural sector will have two opposite effects on the stock of a renewable resource. On the one hand, it will reduce it through land conversion and hence habitat destruction. On the other hand, less labour will be available for harvesting which will have a positive effect on the resource stock.

Suppose now that the home country imposes a tariff on the harvested good. The effect of a tariff on the foreign country's resource stock is ambiguous and depends on the intensity of its direct effect on harvesting, through a decrease in demand, with respect to its indirect effect on other economic activities. More specifically, the introduction of a tariff on the harvested good will decrease its exports and hence will reduce harvesting. In addition, a decrease in harvesting will make labour resources shift to the manufacturing and agricultural sectors and the expansion of the latter will be at the expense of habitat conservation. The natural resources stock will therefore increase (decrease) – if the negative effect on habitat conservation through land conversion is smaller (larger) – than the direct positive effect due to a decrease in harvesting.

The analysis of the importer country can be divided into short- and long-run effects. In the short run, a tariff on the harvested good will reallocate labour away from the

agricultural sector to more harvesting and hence the size of the habitat will increase.[52] However, the price of agricultural products relative to harvesting products will decrease and their relative demand will rise. In the long run, because of a reduction in the overall resource stock, the costs of harvesting will increase and labour will shift back to the agricultural and manufacturing sectors. The more demand shifts to manufactured goods, instead of agriculture, the more likely it is that the resource stock will increase.

(ii) Eco-labels and environmental standards

An important implication of the above discussion is that when there are certain interdependencies between an exhaustible resource and economic activity, the introduction of a tariff might have a negative impact on habitat conservation. Are there some alternative policy instruments that governments could implement to efficiently address environmental problems such as biodiversity loss due to habitat destruction?[53]

First, governments may enforce environmental mandatory standards.[54] These are a set of quality conditions that are to be adhered to by each producer. Standards, also known in the literature as command-and-control systems, are especially attractive from the perspective of effectiveness. This is because the government directly dictates a clear quantity target (restriction) that has to be followed by market participants.[55] Second, governments (or non-governmental agencies) can provide eco-label schemes.[56] An eco-label is a certification scheme with the intention to provide information to consumers, helping them to identify green and environmentally friendly products. A typical eco-label scheme lists environmental criteria, and awards the eco-label to products that meet such criteria.[57] Examples of eco-labels run by non-governmental agencies, in the context of trade in renewable resources, are the sustainable seafood eco-label by the Marine Stewardship Council and sustainable timber eco-labels monitored by the Forest Stewardship Council. An example of a government-run eco-label is the Blue Angel label in Germany, which is awarded, among other criteria, to goods that protect resources.

Models such as Greaker's (2002) and Rege's (2000) show that an eco-label scheme may be able to achieve similar environmental goals as environmental standards and can even be more efficient. However, one important condition must be fulfilled for an eco-label to achieve policy objectives, which is that consumers must prefer environmentally friendly goods. Only if consumers see an additional benefit in consuming the higher-priced environmental quality goods (a so-called warm glow effect), will they respond to eco-labels by switching towards eco-labelled goods. Indeed, there is some literature documenting that consumers are willing to pay more for greener products.[58]

To illustrate the extent to which eco-label schemes might be more effective than environmental minimum standards, a comparison of the two previous policy instruments is performed in a simple model of trade with one domestic and one foreign firm which produce an identical good and compete on price in the domestic market. Depending on how much each firm cares for the environment, they will decide whether to produce a low or a high environmental quality good. From the consumers' side, there is a warm glow effect that makes them have a higher willingness to pay for high environmental quality goods. However, their personal tastes are negatively affected by transportation costs, as goods get more expensive for consumers that live further away from the importing location. In the absence of regulation, consumers will not have the possibility to distinguish whether firms produce environmentally friendly goods or not. In other words, consumers can only be sure about the environmental quality if the producer is regulated by an environmental standard or if an eco-label can be observed.[59]

Consider first the case where the domestic government imposes a mandatory environmental standard and assume that only the domestic firm is obliged to produce high environmental quality goods.[60] Since consumers in the home country will have no information to distinguish the quality of the goods imported from the foreign firm, it will have no incentive to produce environmentally friendly goods and will continue to produce low environmental quality goods, which are cheaper. In equilibrium, both high and low environmental quality goods are going to be sold in the domestic market. More specifically, since the share of consumers buying the high (low) quality good is increasing (decreasing) in the warm glow effect but decreasing (increasing) in the transportation costs, then the total demand for the environmentally friendly good will depend on the relative strength of the transportation costs effect over the warm glow effect.

What does the equilibrium look like if the government decides on an eco-label scheme instead of imposing a minimum environmental standard? In such a situation, both the domestic and the foreign firm can decide if they want to adopt the eco-label.[61] More precisely, if the average willingness to pay for an eco-label is higher than the per-unit abatement cost borne by the firm, both firms will adopt the eco-label and a higher overall environmental quality will be reached than with environmental standards.

5. The political economy of trade policy in natural resource sectors

The discussion so far has used the simplest assumption about the motivation of government – that it seeks to maximize economic efficiency or national welfare. However, policy-makers often take into account the instances of special interest groups that try to influence the outcome of the political decision-making process to benefit their members.[62] These considerations naturally apply to the extraction and trade of natural resources. If governments are influenced by the activities of lobby groups and other vested interests trying to "capture"

the relevant regulations in their favour, the rate of extraction of a renewable resource – or the rate of depletion of a non-renewable resource – is likely to differ from the social optimum, reflecting the outcome of the interaction between lobbies and the government.

(a) Examples of policies affected by political economy considerations

Systematic evidence on the influence of interest groups on policy formation is obviously hard to find, but it is not difficult to see how political economy considerations explain the use of some trade-related policies. A first example concerns subsidies to renewable natural resources. As explained in Section D.4, subsidies that reduce the cost of harvesting these resources worsen the exploitation of stocks that already suffer from open access. According to Ascher (1999), these policies can be implemented by policy-makers to capture part of those resources directly, or to grant them to groups who will reciprocate with political support and contributions.

Becker (1983) further notes that resource-related subsidies can be used by governments as a politically easy way to redistribute income. This is because the efficiency losses are small, they are usually far from the electorate and difficult to quantify, and the losses will only be incurred by future generations or by the poor.[63] A second example concerns export taxes. It has been argued in this report that restricting exports of a primary resource encourages downstream processing by providing, in effect, an input subsidy to processors. Since they redistribute rents from upstream to downstream producers, they are likely to be opposed by the former, and supported by the latter.[64] The use of export taxes on natural resources might therefore reflect a relatively higher weight of producers in downstream industries relative to natural resource producers in the political economy competition.[65]

A third example concerns the effects of "Dutch disease". The appreciation of the real exchange rate associated with it is likely to induce protectionist lobbying pressures by the lagging sector. Hillman's classical contribution (Hillman, 1982) shows that, although declining industries will inexorably decline even when they benefit from politically motivated protection, the government can slow down their rate of decline by offering more generous protection. This provides a rationale for lobbying in favour of more protection by declining industries. Freund and Ozden (2008) further show that, irrespective of the extent of lobbying, there will be a deviation from free trade that tends to favour loss-making industries. It has been documented that in South America and sub-Saharan Africa it was quite common for mineral rents to be used for the protection of the non-boom tradable (NBT) sectors through subsidies and protectionist strategies.[66] However, the inadequate performance of the weakened NBT sectors during post-boom downswings required levels of subsidy from the mining tradable sectors that were unsustainable. As shown by Freund and Ozden (2008), protection following a downswing is likely to be persistent.[67]

Sachs and Warner (1995) provide an empirical test for the hypothesis that high resource wealth is negatively correlated with lack of openness to trade as a consequence of governments trying to address the Dutch disease effects of resource abundance. They postulate a U-shaped relation between openness and resource intensity. In their logic, Dutch disease effects provoke a protectionist response, but only in countries with intermediate levels of resource intensity. For the most highly resource-endowed economies, however, the natural resources base is so vast that there is no strong pressure to develop an extensive industrial sector. Therefore, openness to trade would tend to be high. The overall effect would therefore be a U-shaped relationship between openness and resource abundance.[68] They find empirical evidence in favour of this prediction. In particular, almost all countries in the sample are in the downward-sloping segment of the relationship: higher primary exports tend to promote economic closure. Extremely resource-rich countries, such as Saudi Arabia and Malaysia, are in the upward-sloping part on the relationship, with a long tradition of open trade.

(b) Corruption, trade opening and resource utilization

The influence of special interest groups on policies that affect resource utilization raises two questions: is corruption associated with higher resource utilization? [69] And are the effects of trade policies on resource utilization dependent on corruption?

The answer to the first question is unambiguously positive. A number of studies in environmental economics consistently find that corruption is closely associated with environmental degradation. In a theoretical framework where the government uses a Pigouvian tax as a policy instrument to take account of pollution caused by resource utilization (i.e. pollution tax), Damania et al. (2003) show that an increase in corruption implies that the government places a greater relative weight on bribes, and thus on firm profits. The pollution tax consequently falls as corruption increases, deviating from the welfare-maximizing tax rate. Similarly, Lopez and Mitra (2000) investigate the impact of corruption on the empirical relationship between income and pollution – the Environmental Kuznets Curve (EKC). They show that corruption increases the income level at which the EKC begins to decline. The positive correlation between corruption and environmental degradation can easily be recast in terms of a positive correlation between corruption and resource extraction.[70]

Barbier et al. (2005) show that the rate of utilization of a renewable resource (in their model, the conversion of forest into agricultural land) increases with corruption (or intensified lobbying pressure). In their theoretical model, the rate of utilization is determined by the interaction between a government issuing extraction quotas, and resource-using firms seeking to influence the government's decisions through political

contributions.[71] An increase in corruption implies that the government places a greater weight on bribes, relative to social welfare, issuing more conversion quotas. This creates a positive correlation between utilization and corruption. Their empirical analysis on a sample of tropical countries[72] confirms this prediction.

Turning to the second question, the effect of trade opening on resource utilization is ambiguous, even in the presence of high corruption. Consider first the case in which there is no corruption. As shown by Barbier et al. (2005), greater dependency on resource exports (which may be caused by trade opening) is not necessarily linked to a higher cumulative level of resource use. Since greater exports are accompanied by higher levels of imports (to keep trade balanced), this lowers the demand for domestically produced output and land conversion pressures are thus reduced. The impact is therefore ambiguous.[73]

Barbier et al. (2005) further consider the effect of changes in terms of trade, defined as the ratio of export to import prices, on the conversion of forest into agricultural land. They find that a rise in the terms of trade of a country has a direct and negative impact on agricultural land expansion. The policy implication is that the imposition of policies that reduce the terms of trade of countries' economies could lead to more, rather than less, cumulative agricultural land expansion. Moreover, any reduction in terms of trade may deprive countries of the foreign exchange earnings that could be employed to diversify their economy, moving away from a path of dependence on resource-based exports.

Consider now the case in which there is corruption. The results of Damania et al. (2003) suggest that the effect of trade opening on resource utilization will vary not only according to the degree of corruption (low or high), but also according to the nature of trade policy in place before liberalization (protective or anti-protective).[74] The effects are summarized in Table 15.

The pollution tax (or similarly a conservation policy) increases with trade opening when the initial conditions are protective trade policy (import tariff or export subsidy) and high corruption – or when the initial conditions are anti-protective trade policy (import subsidy or export tax) and low corruption. Consider the case of protective trade policy and high corruption. Liberalization reduces output of the protected sector. This reduces bribes offered and leads to a higher pollution tax, or lower level of resource utilization. On the other hand, the welfare motive for increasing the pollution tax is weaker, causing a reduction in the tax (decrease in resource conservation). Since corruption is high, the first effect dominates, leading to an increase in pollution tax (increase in conservation).[75] The other case in which the pollution tax (or conservation of a natural resource) increases with trade opening is when trade policy is anti-protective and corruption is low. Intuitively, liberalization increases output of the protected sector (which creates more bribes and leads to a lower pollution tax, or higher level of resource utilization) and induces the government to increase the pollution tax (increase resource conservation) to improve welfare. Since corruption is low, this second channel dominates, leading to an increase in pollution tax (increase in conservation).[76]

It is interesting in this context to analyse possible feedbacks between trade openness and corruption. Rodrik et al. (2004) show that trade integration has a positive effect on institutional quality.[77] A number of studies further show that a strong rule of law reduces corruption. Damania et al. (2004), for instance, find that a strong rule of law, as defined by Rodrik et al. (2004),[78] is associated with a low level of corruption.[79] These results together imply that more trade reduces corruption. Since, as argued above, the rate of resource utilization increases with corruption, it can be argued that trade can have an indirect, beneficial effect on the management and conservation of natural resources via its effect on corruption.[80]

(c) Trade sanctions and exploitation of renewable resources

Some renewable resources such as tropical forests may confer significant cross-border external benefits, through their role as stores of carbon, genetic material, habitat for endangered species, etc. This has prompted calls for the use of various trade-based policies, so-called "trade sanctions", to coerce nations to reduce the level of resource exploitation. The literature on this, however, has shown that trade sanctions are not appropriate to cover the complexity of long-run ecological effects. The sanctions make harvesting less profitable in the short run, but in the long run specific management policies are necessary.[81]

Moreover, it has been shown that trade sanctions can have perverse effects if resource exploitation in the exporting country is determined in a political economy setting. Using a model where the government issues licences defining the maximum allowable harvest – while an industry group lobbies the government for greater access to the resource by offering political contributions – Damania (2000) shows that trade sanctions may lead to lower stocks of the renewable resource in equilibrium. When sanctions are imposed, the profits from harvesting decline and political contributions fall. A government that values political donations sufficiently will adopt policies to mitigate the decline in profits and contributions. It does this by increasing the harvest rate. Thus, resource stocks decline in response to trade sanctions.

Table 15: **Effect of trade liberalization on pollution taxes** (rate of conservation)

		Corruption	
		High	Low
Trade policy	Protective	Increases	Decreases
	Anti-protective	Decreases	Increases

In the light of this result, Damania and Barbier (2001) and Barbier and Rauscher (1994) argue in favour of international transfers[82] as the first-best management tool of a natural resource whose depletion creates cross-border externalities. In particular, if for low levels of the resource stock, the increase in transfers is high enough, transfers will always induce the government to increase equilibrium stocks. The profits from harvesting and the political contributions paid to the government are high when the resource stock is low. In this situation, a high rate of increase in transfers can reduce the influence of the lobbyist on policy decisions and induce resource conservation. Damania and Barbier (2001) further argue that if resource exploitation creates significant cross-border externalities, such transfers may be viewed as a means of internalizing externalities and promoting more efficient resource usage.

These insights qualify the result highlighted in Section D.4 that a tariff by the importing country favours conservation of renewable resources.[83]

6. National resource abundance and regional integration

This section takes a closer look at the issue of regional integration in the context of natural resources trade. It first reviews the concept of regional integration, discussing its nuances and stages of progression. Subsequently, it analyses issues that may provide incentives or disincentives for regional integration agreements. These issues, which assume salience in the context of natural resource abundance, relate to both economic efficiency and political economy. They range from standard issues of trade creation, trade diversion and asymmetric shocks to the relatively unconventional issues of export diversification and remote locations. Finally, this section analyses the potential impact of regional integration on the sustainable management of natural resources.

(a) Regional integration

In general, regional integration refers to a process by which countries enter into an agreement to enhance regional cooperation. The motivation can be economic or political, and the degree of integration can vary significantly. The most basic approaches involve framework agreements, which outline principles for dialogue on trade and related issues, usually between two countries.[84] More formal economic integration can be classified into four stages (Machlup, 1977). First, there are free or preferential trade agreements (FTAs/PTAs) whereby member countries eliminate tariffs and quotas on almost all goods and services traded between them. Customs unions augment FTAs by incorporating a common external tariff for member countries vis-à-vis the rest of the world. Third, a common market extends customs unions to include free movement of factors of production (capital and labour) and common policies on product regulation. Fourth, there are economic and monetary unions which consist of a common currency.

Furthermore, the literature classifies regional integration schemes as either "shallow" or "deep" (Lawrence,1996; Hoekman, 1998). The former involves the removal of barriers to trade in goods, i.e. forming a free-trade area or a customs union. The latter moves beyond this form of simple economic integration. It entails the removal of internal barriers that distort the allocation of international production within the region – e.g. fair treatment of foreign direct investment (FDI) and the protection of intellectual property. The minimum requirement of any "deep integration" agreement is the provision of national treatment to business activities of other trading partners (i.e. the principle of giving others the same treatment as one's own nationals).

Usually, however, "deep integration" requires countries to harmonize a variety of policies (fiscal and industrial) and adopt common standards in many fields (e.g. labour and health). For example, the Canada-US Free Trade Agreement (FTA) included both national treatment as well as restrictions on expropriation and a move towards harmonizing corporate income taxes (United Nations Conference on Trade and Development (UNCTAD), 1992). Similarly, India and Singapore have a Comprehensive Economic Cooperation Agreement, which includes an FTA in goods and services, a bilateral agreement on investment promotion and protection, an agreement on double taxation avoidance and a more liberal air services agreement (Narayan, 2005).

(b) Resource abundance and its implications

To understand the incentives for a resource-abundant country to enter into a regional integration agreement, issues of trade creation and trade diversion, potential responses to asymmetric shocks, diversification of production and export structures, and the importance of a remote location are analysed.

(i) Trade creation and trade diversion

A central exception to the MFN principle of equal treatment of all members in the GATT/WTO is for customs unions and free trade areas. There are two arguments that explain the rationale behind this exception. First, such agreements can contribute to the growth of world trade. Second, regional trade liberalization, enabled by these preferential agreements, can serve as a building block to further liberalization at the multilateral level. (Viner, 1950) introduced the concepts of trade creation and trade diversion in the economic analysis of preferential trade agreements. With a focus on the production effects, he defined trade creation as the displacement of domestic production by lower-cost imports from more efficient producers in other member countries. In contrast, he defined trade diversion as the shift in the flow of imports from a more cost-efficient non-member to a higher-cost member.[85]

For trade in natural resources, the issue of trade creation and trade diversion is somewhat different, even unique. This is because, relative to manufactured goods,

tariff and non-tariff barriers on natural resource commodities such as oil, natural gas, metals and minerals tend to be low (Carbaugh, 2007).[86] Hence, an analysis of potential trade creation and trade diversion effects when two resource-abundant countries enter into a preferential trade agreement will be a function of the extent of specialization – whether both have complete specialization in the production and export of resource-intensive goods (Case I), or whether the relatively resource-poor country has a small, developing manufacturing sector as well (Case II).

Case I

Consider that both member states of a regional trade agreement are natural resource abundant with complete specialization in the production and export of resource-intensive goods. First, if the two countries are abundant in different natural resources, tariffs imposed on these resource commodities within the free trade area are unlikely to constitute a major barrier to trade within this area (Fouquin et al., 2006). For instance, in a study on resource-abundant countries in Central Asia, Venables (2009) shows that tariff barriers to intra-regional trade are low. Hence, trade creation effects for resource-abundant countries are likely to be small.

Second, if the two resource-abundant countries are abundant in the same natural resource, they will have few incentives to trade with each other, with or without tariffs, as there is very little product differentiation in the same resource commodity. Hence, once again, trade creation effects are likely to be negligible. This is especially true of south-south trade as partners do not appear to be major export markets for natural resources (Fouquin et al., 2006). However, there are exceptions. Take the case of Indonesia and Singapore, where the former exports crude oil to the latter which has a thriving refining industry (Fouquin et al., 2006). Importantly, following the arguments presented above, trade diversion effects are also unlikely to be significant.

Case II

Consider that both member states of a regional trade agreement are natural resource abundant, where one has complete specialization in the production and export of resource-intensive goods and the other has a small, developing manufacturing sector. There is commodity dominance in the entire region and a policy of import substitution vis-à-vis the rest of the world. In this situation, the resource-abundant country with a non-existent manufacturing sector will enjoy no trade creation effects but will suffer notable trade diversion effects as imports from more efficient, low-cost producers in non-member states are replaced by those from a member state. On the other hand, the member country with a small manufacturing sector in its nascent stages will benefit from privileged access to markets inside the FTA, while continuing as commodity exporter to the rest of the world. This was precisely the situation which prevailed in Latin America in the 1970s and 1980s (Fouquin et al., 2006).

(ii) Asymmetric shocks

Countries in a regional integration agreement may suffer from "asymmetric shocks", including demand shocks, arising from disparate growth rates, or supply shocks, induced by sector-specific factors where the importance of different sectors may vary across resource-abundant and resource-scarce countries. Hence, the success of any regional integration agreement will depend on the mechanisms that exist to address these potential stresses. Unlike other factors of production, natural resources are immobile. Hence, an uneven allocation of resources across a group of countries may defy the tendency towards the law of one price, and aggravate the impact of commodity price shocks in integration agreements (Fouquin et al., 2006). For instance, resource-rich and resource-poor countries would be exporters and importers of the same resource commodity, crude oil for example. A price hike would involve the latter bearing a huge cost, and the former reaping a huge gain.

In fact, the two oil price shocks of the 1970s led to the collapse of many south-south regional integration schemes, as it widened the differences between net oil importers and net oil exporters. Commodity importers decided to focus on extra-regional trade agreements and commodity exporters abandoned domestic reforms after the windfall gains, thereby creating volatility in these regional integration schemes (Fouquin et al., 2006). A possible solution to such asymmetric shocks may be deep regional integration, which requires some burden sharing. However, resource-rich commodity exporters may be reluctant to share resource revenue owing to political economy constraints. Hence, resource-abundant countries tend to participate in shallow integration schemes, such as free trade agreements (FTAs), and avoid deeper integration schemes whose common policies might require resource revenue sharing (Fouquin et al., 2006).

(iii) Diversification of production and export structure

Resource-abundant countries have neither been driving forces for establishing regional integration schemes nor facilitators of deeper integration once they are part of such schemes. Integration into world markets has been faster for countries producing and exporting manufactured goods (Fouquin et al. 2006). This may be attributable, in part, to the natural resource curse hypothesis described earlier and the consequent desire of resource-rich countries to diversify into the production and export of manufactured goods. For instance, poorer resource-rich countries may want to develop a domestic industrial sector as they are commonly exposed to "Dutch disease" shocks. This provides a disincentive for these countries to join regional integration agreements, as trade creation would imply that goods produced by less efficient domestic firms in the industrial sector would be replaced by cheaper imports from partner countries.

In addition, to help develop their domestic commodity processing industries, resource-abundant countries may often restrict natural resource exports. There is evidence of such restrictions when resource-abundant countries are part of regional integration schemes, ostensibly justified on environmental grounds (i.e. to reduce the over-exploitation of natural resources) (Fouquin et al., 2006).

On the other hand, regional integration may actually help resource-abundant countries to diversify their export basket and break into the chain of global manufacturing production. This may be the case when natural resource endowments are concentrated in a region, but unevenly distributed between countries within this region. Africa, whose abundant resources are dispersed over several small countries, is an example of this situation, which has potential implications for economic efficiency. This is because the impact of resource revenues is likely to be subject to diminishing returns. Hence, while a country may have sufficient foreign exchange for vital imports, it may be constrained by other inputs such as labour, thereby implying that it will be unable to diversify into manufacturing production and achieve economies of scale.

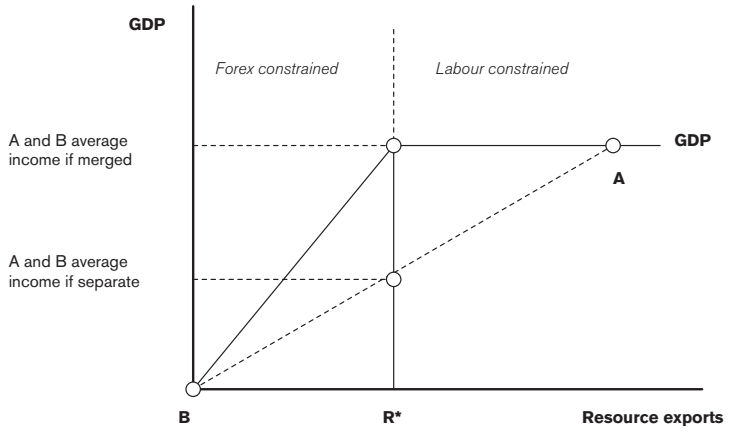
Consider the following model constructed by Collier and Venables (2008). Both countries consume and produce a single non-tradable good, which uses foreign exchange (to import oil or equipment) and domestic labour in fixed proportions. Moreover, the supply of labour is fixed and resource revenues are the only source of foreign exchange. In figure 36, if resource exports are less than threshold level R^*, then production is foreign exchange constrained, and real income is given by the upwards sloping section of the line (with slope equal to the foreign exchange content per unit GDP). If natural resource earnings are greater than the same threshold level R^*, then the economy is labour constrained, implying that further resource earnings beyond this point are simply accumulated as foreign assets. This reflects the fact that the resource-abundant country encounters diminishing returns in its ability to use resource revenues as it reaches full employment, i.e. no more labour is available to produce further income. Importantly, this argument may extend beyond labour to a range of inelastically supplied non-tradable goods and services. For example, a resource boom often leads to inflation in the construction sector as supply bottlenecks are encountered.

For analytical simplicity, assume that one economy has no resource revenue, i.e. at point B, and the other has resource revenue and is at point A. Their average income is the midpoint between A and B. It can be seen that integration of the two economies would increase overall income substantially, thereby implying that there will be large efficiency gains. This extreme case suggests that all the gains from trade accrue to the resource-scarce country. However, in general, regional integration will result in gains for both countries. The resource-poor country can increase its foreign exchange earnings to import inputs and capital equipment by gaining duty-free access to the market of its resource-rich partner country. On the other hand, the resource-rich country can import labour or goods that were previously supply constrained, thereby inhibiting economies of scale and successful diversification into manufacturing production.

While regional integration can enable resource-rich economies, specializing in the production and export of primary commodities, to diversify and become successful exporters of manufactured goods, any such successful diversification may depend on the kind of natural resources which are abundant in that country. For instance, in an empirical study of 73 countries from 1962 to 2000, Fuentes and Alvarez (2006) show that mineral-abundant countries are unlikely to ever become net exporters of relatively capital-intensive goods. This is because of the combination of capital scarcity, mineral abundance and high world prices for primary mineral commodities.

Most mineral-abundant countries are characterized by a relatively low capital-labour ratio and a capital-intensive mining sector. Given this situation, a relatively high price

Figure 36: **Overall income gain from regional integration**



Source: Collier and Venables (2008)

for the mining good implies that it is always produced, thereby taking up the extra capital accumulated by these countries. Hence, even if regional integration enables a mineral-abundant country to consistently accumulate capital, increasing its capital-labour ratio, it is unable to diversify successfully into the production and export of manufactured goods. As an exception to the norm, Fuentes and Alvarez (2006) reveal that after capital accumulation, a few mineral-abundant countries do gain comparative advantage in machinery and chemicals. Similarly, Nina and Andersen (2005) examine the case of Bolivia, a mineral-abundant country, and analyse the impact of its integration with MERCOSUR on its export pattern. They show that while regional integration has stimulated a diversion of trade away from the traditional US and EU markets towards MERCOSUR countries, the composition of exports has only moderately diversified.

(iv) Remote location and uneven distribution of natural resources in a region

Remote, landlocked countries have few opportunities for integration with the world economy due to high costs of trade. Critically short of the foreign exchange needed to finance essential imports, they have little chance of economic development via exports of manufactured goods. Yet, in many regions of the world, these countries have resource-rich neighbours that can be potential export markets. Given a comparative advantage in producing and exporting resource-intensive goods, these resource-rich countries may be concerned about the "resource curse" but may face difficulties in diversifying their production and export structure because of a shortage of labour or other goods and services. Greater integration with their relatively resource-poor neighbours may help relax these constraints. So while remoteness and resource dependence make it difficult to export non-resource based goods outside a region, there are potential opportunities for a mutually beneficial integration within a region – e.g. in Central Asia and the Great Lakes Region in Africa (see Box 23).

Venables (2009) presents a highly stylized model to investigate the issue. Consider two countries, "A" and "B", each endowed with a fixed supply of natural resources and a fixed quantity of labour. Moreover, assume that these natural resources are the only exports to the rest of the world (outside the region). Furthermore, assume that the value of these natural resource exports

Box 23: The case of Central Asia and the Great Lakes Region in Africa

Regional integration in Asia is usually focused on the development of global production networks through exports of manufactured goods. However, unlike East and South Asia, there is a group of countries in Central Asia with somewhat different characteristics. They are landlocked and, in some cases, rich in natural resources. At the same time, this region is seeking to develop regional integration agreements as well. Countries in the region are members of the Commonwealth of Independent States (CIS) Free Trade Agreement; Kazakhstan, the Kyrgyz Republic, Tajikistan and Uzbekistan are also members of the Eurasian Economic Community.

The integration process is being driven forward by the Central Asian Regional Economic Cooperation (CAREC), which seeks to promote cross-border activities – particularly in the areas of transport, trade policy and trade facilitation, and in energy. It currently has eight members: Afghanistan, Azerbaijan, China, Kazakhstan, the Kyrgyz Republic, Mongolia, Tajikistan and Uzbekistan.

The remoteness of the Central Asian region can be calculated in various ways. The World Bank's "Doing Business" database ranks six CAREC members in the bottom 10 of 181 countries for its measure of transport costs (World Bank, 2004). Remoteness can also be assessed by calculating measures of market access from trade data and gravity modelling. For example, Mayer (2008) reveals that, in a ranking of 196 countries, six countries in the region rank among the lowest, with their market potential being six times less than Malaysia's or the Republic of Korea's, and 90 times less than Belgium's, the top-ranked country.

Another way of seeing the impact of remoteness is to look at relative prices of commodities within the region. Evidence indicates the extremely high prices of tradable goods, such as machinery and equipment, clothing and footwear, transport and communications relative to non-traded goods – in particular, services such as education, health and utilities (World Bank, 2008). Similarly, resource abundance in the region, albeit uneven across its constituent countries, is also apparent. For Azerbaijan and Kazakhstan, hydro-carbon and minerals account for more than 50 per cent of exports, while oil and gas account for more than 25 per cent of fiscal revenue. Moreover, these countries have had major resource booms and their exports nearly quadrupled in value between 1999 and 2004. In contrast, Afghanistan, Tajikistan and Uzbekistan have much lower levels of natural resources wealth, and the exports of the Kyrgyz Republic, Tajikistan and Uzbekistan increased by less than 50 per cent from 1999 to 2004 (Venables, 2009).

The East and Central regions of Africa, together known as the Region of the Great Lakes, is another area which combines remote, landlocked countries with natural resource-abundant countries. For instance, in this region, Burundi, Rwanda and Uganda are landlocked while the Democratic Republic of the Congo is resource rich (Collier and Goderis, 2008). Current initiatives for regional integration in the region include the Common Market for Eastern and Southern Africa. In addition, there are proposals for deeper integration in the East African Community.

is the only difference between the two countries, i.e. it is the only source of comparative advantage. In particular, assume 'A' has more of these exports than 'B', thereby implying that the former is resource rich while the latter is relatively resource poor. In addition, both countries produce and consume from a continuum of sectors that use imported inputs and labour to produce non-resource (manufactured) goods. Each of these goods can be produced domestically, imported from the rest of the world, and may also be traded intra-regionally.

Given that country "A" has a comparative advantage in natural resource exports, the resource-poor country "B" will have a comparative advantage in producing the non-resource (manufactured) goods, i.e. "B" can produce those goods at a relatively lower price. This implies that the resource-poor country, "B", will import from the rest of the world but not from country "A", while the resource-rich country, "A", will import from "B" and the rest of the world. The need to distinguish between "globally traded" and "regionally traded" goods, where the distinction is set by real trade costs, and barriers to trade, is important for two reasons. First, the changing sets of goods produced domestically, imported from the region, or imported from the rest of the world are indicative of the trade-creating and trade-diverting effects of regional integration. Second, although the countries are price-takers in world markets, regional integration may change the price of regionally traded goods, thereby affecting the distribution of real income between them.

Using this stylized model, Venables (2009) shows that regional integration brings large overall efficiency gains for these remote, landlocked countries. However, it turns out that the gains from integration are unevenly distributed, as integration with a resource-rich economy is extremely valuable for the resource-poor country but not vice-versa. Remote and landlocked developing countries have very limited export potential with the rest of the world, but need foreign exchange to purchase inputs for production as well as consumption goods. Regional integration implies a reduction in tariffs on imports from country "B" in country "A". This enables country "B" to earn foreign exchange via their exports to the resource-rich partner country "A". Furthermore, this extra foreign exchange accruing to country "B" raises income, thereby bidding up the prices of these regionally traded goods, increasing wages and creating a terms-of-trade gain for the resource-poor country.

On the other hand, resource-rich economies lose (or at best experience very modest gains) from regional integration. First, a terms-of-trade gain for the resource-poor country is necessarily a terms-of-trade loss for the resource-rich economy. In addition, regional integration results in an increase in the share of imports coming from the partner country, "B", which from the viewpoint of country "A", is largely trade diversion, i.e. goods that were being imported from more efficient producers in the rest of the world are now imported from the partner. In contrast, multilateral trade liberalization will be beneficial for the remote resource-rich country as lower tariffs on more cost-efficient imports from non-member countries will entail trade creation, but no trade diversion.

Moreover, external trade liberalization implies a reduction in tariffs on imports from the rest of the world. Since intra-regional trade takes the form of exports of manufactured goods from the resource-poor "B" to the resource-rich "A", this reduction in the price of imports from the rest of the world is a terms-of-trade gain for the resource-rich economy, "A". Hence, while trade is a way for the resource-rich economy to relax the constraint causing diminishing returns in the use of its resource revenues, these gains come from non-preferential opening.

The analysis points to the potential for conflicting interests between resource-poor countries seeking preferential regional integration, and resource-rich countries seeking non-preferential trade opening. The way to overcome this obstacle is to look for other policy measures that can accompany a non-preferential opening. One possibility is the use of resource wealth to develop regional infrastructure. This helps maintain the competitive position of the resource-poor country while external liberalization takes place. Other ways of spreading the benefits of unevenly distributed resource wealth include labour mobility and monetary policy measures.

In sum, there appears to be a two-way relationship between natural resources and regional integration. Regional integration affects the potential development of resource-rich countries differently, relative to resource-poor countries (producing manufactured goods), in terms of economic efficiency, welfare and political economy. However, this effect is often contingent upon the location of the countries concerned and the kind of natural resource in which they are abundant. Hence, relative resource abundance in these different contexts, in turn, may shape the incentives for countries to engage in regional integration.

(c) Sustainable management of natural resources

(i) Regional and bilateral free trade agreements

Concerns about over-exploitation of natural resources and any other potential negative impact that trade may have on the environment are addressed in many regional and bilateral free trade agreements – whether in the preamble, in detailed chapters, in relevant provisions (such as government procurement or dispute settlement), or in accompanying environmental cooperation agreements (Robalino and Herrera, 2009). For example, the Association of Southeast Asian Nations (ASEAN) contains an agreement on trans-boundary haze pollution, which serves to improve monitoring and reporting, promote green technologies and establish a network of protected areas (Organization for Economic Co-operation and Development (OECD), 2008).

The North American Free Trade Agreement (NAFTA) recommends appropriate limits for specific pollutants, the promotion of pollution prevention techniques and a conservation of biodiversity programme that focuses on

shared and critical habitats, wildlife corridors and migratory and trans-border species (primarily birds and marine animals). An FTA between Canada and Colombia spells out that specific multilateral environmental agreements (MEAs), such as the Montreal Protocol for ozone layer depletion, will prevail in the event of an inconsistency between FTA and MEA obligations (Organization for Economic Co-operation and Development (OECD), 2009a).

Article 108 of an FTA between Chile and China includes a Memorandum of Understanding to promote cooperation in the field of environmental protection, on the basis of equality and mutual benefit. Similarly, Chapter 18 of the US-Colombia trade agreement outlines the importance of optimal use of natural resources in accordance with the objective of sustainable development (Organization for Economic Co-operation and Development (OECD), 2008). There are several other examples of bilateral free trade agreements that include relevant provisions or are accompanied by bilateral environmental cooperation agreements, where cooperation includes management of the water environment, pollution control and monitoring, and biodiversity conservation. These include three recent free trade agreements involving Canada (Canada-Colombia, Canada-Jordan, Canada-Peru) and the New Zealand-China agreement (Organization for Economic Co-operation and Development (OECD), 2009a).

(ii) Deep integration: the case of fisheries

Fisheries are an open access natural resource, i.e. much like public goods, it is difficult to exclude people from accessing the resource. At the same time, unlike public goods, fisheries are characterized by rivalry in consumption. Given the above, rapid growth in the demand for fish and fish products, accompanied by new fishing techniques and commercial structures, has led to over-exploitation of fish stocks in international waters. Over-fishing has also placed broader ecosystems, of which fish are an integral part, under threat (European Commission, 2009b).

Territories for fishing in international waters are defined by "exclusive economic zones" (EEZs) of 200 miles (see also Section E) (Asche and Smith, 2009). This was the result of a gradual process which was consolidated in the UN Convention on the Law of the Sea (UNCLOS) in 1982. As a result, most fisheries fall within the jurisdiction of individual nations, thereby giving them legal authority to bring an end to open access problems by excluding fishing vessels and by managing fishery resources for their economic benefit.

Given these developments, over-fishing typically falls under two categories: poorly managed fisheries that lie within EEZs (Worm et al., 2009); and open access problems for fisheries that remain outside a single EEZ. Regional integration is likely to affect the latter areas which consist of shared stocks (where fishing can take place within the jurisdiction of two or more countries), straddling stocks (where fish stock also moves into international waters) and highly migratory species (where fish stock is primarily in international waters) (Asche and Smith, 2009).

For shared stocks, the countries involved in most cases are likely to find a cooperative solution by sharing the quota, although side payments may often be made to obtain higher quotas. For straddling and highly migratory stocks, such as tuna, however, agreement is much more difficult to reach, as no single country can prevent over-fishing and enforce a management plan (Asche and Smith, 2009). A cooperative outcome may be facilitated by "regional fisheries management organisations" (RFMOs)[87] which were created under the 1995 United Nations Fish Stocks Agreement. These bodies consist of coastal states and relevant distant-water fishing nations. However, their effectiveness so far is questionable, partly because non-members to the RMFO can still fish freely; and partly because there are no enforcement mechanisms even among members (Bjorndal, 2009).

Some form of deep regional integration may provide an alternative solution to the over-fishing problem. Regional integration may also play an important role in the conservation of marine biodiversity, the benefits of which will accrue to both member and non-member states.

The Common Fisheries Policy (CFP) of the European Commission/European Union is one example of a potentially effective regional approach to these issues (see Box 24) (European Commission, 2009b). The CFP

Box 24: The European Union's Common Fisheries Policy

The Common Fisheries Policy (CFP) was formally created in 1983, but its origins go back to the early 1970s when fisheries were a part of the Common Agricultural Policy. In the early days, the main concern was to avoid conflict at a time when many countries around the world were extending their territorial waters, until they created exclusive economic zones (EEZs), which define territories for fishing in international waters. To avoid the disruption this new regime could have caused, EU member states agreed to grant free mutual access to each other's waters, thereby enabling the preservation of each nation's traditional fishing grounds and practices.

Hence, the CFP started out as an attempt to preserve the diversity which characterized the traditional fabric of the European fishing industry. Over the last decade, Europe, as well as the rest of the world, have seen alarming declines in fish stocks. Hence, sustainable fisheries are now firmly at the top of the international fisheries agenda, with annual EU regulations setting total allowable catches (TACs) and quotas for the most important commercial species of fish. In a recent green paper, while observing that the CFP has not worked well enough to prevent problems of over-fishing and declining catches, the European Commission (2009a) has proposed major reforms.

provides a comprehensive system of rules for the protection and preservation of vulnerable fish stock. While it is the responsibility of national inspectorates to monitor what quantity of fish is caught, inspectors of the European Commission monitor the effectiveness of national inspection systems and ensure that CFP rules are enforced effectively across the whole of the EU. In fact, the EU has played a leading role in pioneering new technologies, such as satellite vessel monitoring systems (VMS), which have made control and monitoring more efficient.[88] The EU also processes catch data reported by the member states and publishes regular reports. In addition, the CFP has the authority to close fisheries when a quota is exhausted. Finally, if a member state is gravely endangering the sustainable management of resources by not implementing rules agreed at EU level, the Commission can bring proceedings against them before the European Court of Justice.

Other natural resources such as water, forestry, fuels, minerals and metals are also characterized by similar problems of overuse and cross-border externalities. As with fisheries, the sustainable management of these resources is often facilitated by regional agreements, which may or may not be a part of trade agreements signed by the same parties. Section E provides an overview of such agreements, by resource sector.

7. Conclusions

The set of trade policy instruments commonly applied to the natural resources sector include export taxes, quotas and prohibitions; import tariffs; non-tariff measures; and subsidies. There appears to be a higher incidence of export taxes and restrictions on natural resources than on other sectors. Tariff protection in the natural resources sector is generally lower than for overall merchandise trade, with the possible exception of fisheries. There is some evidence of tariff escalation in some natural resources, namely forestry and mining. Subsidies to fisheries are widespread, provided by both developed and developing countries, and represent a hefty proportion of the value of the total catch. The available information on consumption taxes on fuels shows that they are high and dwarf the size of import tariffs.

For natural resource exporters, export taxes or restrictions can serve several purposes. They can increase the rents received by the exporting country through an improvement in its terms of trade. This is strictly a beggar-thy-neighbour effect, as the welfare of the exporter rises at the expense of a welfare loss of its trading partners. Where resource-exporting countries face problems of open access, they can also help to address the over-exploitation of the resource. They can assist countries facing volatile commodity markets to stabilize producer revenues. For countries concerned about over-dependence on the export of a few natural resources, export taxes or restrictions can assist export diversification by encouraging downstream processing activities. Finally, they can form part of a response by natural resource exporters to tariff escalation in their trade partners' markets.

For resource-importing countries, import tariffs can help "capture" some of the rents earned by exporters with market power (the beggar-thy-neighbour effect). When property rights with respect to resource harvesting are not well enforced, trade opening might have a negative impact on resource conservation. A tariff imposed by the resource-importing country will reduce foreign demand for the resource and so mitigate, to some extent, problems of over-harvesting and help to conserve the resource stock. Faced with "Dutch disease", industries that have been adversely affected by a boom in the natural resources sector can be partly sheltered by being given some degree of import protection through tariffs.

For countries facing increasing scarcities of energy resources, subsidies can help to correct sub-optimal levels of exploration arising from the inherent uncertainty and risk surrounding that activity and the large sunk costs involved. Governments can also direct subsidies towards management and conservation programmes aimed at sustaining natural resources.

The availability of large rents and the prevalence of rent-seeking behaviour in natural resource sectors can have a corrosive effect on the institutional framework. This means that policy choices purportedly aimed at improving specific outcomes – such as reducing over-exploitation or helping to conserve natural resources – may end up favouring vested interests.

In examining whether governments should choose trade policies or domestic measures (production restrictions, consumption taxes, etc.) to address natural resource problems, two broad conclusions emerge. First, trade measures are often a second-best policy to address problems associated with natural resources, as in the case of open access and environmental externalities linked with consumption or production of natural resources. The first-best policies are domestic measures – strengthened property rights or pollution taxes – that address the distortions at the source. Second, given the geographical concentration of natural resources, domestic measures are close substitutes for trade measures. Thus, production restrictions have the same effect as export restrictions and consumption taxes have the same effect as import tariffs. This suggests that governments have greater leeway to affect natural resources trade through the use of domestic measures compared with trade in other products.

Finally, the value of regional integration schemes for natural resource-abundant economies appears ambiguous. On the one hand, small trade creation effects, potentially large trade diversion effects and difficulties in addressing asymmetric shocks constitute a set of disincentives for regional integration. On the other hand, potential diversification of production and export structures, and the internalisation of cross-border externalities, provide strong incentives for regional integration.

Endnotes

1 Developed countries include: Australia, Canada, Iceland, Japan, New Zealand, Norway, Switzerland and the United States. The European Union is also included in this category. The group of developing countries also includes Least Developed Countries (LDCs).

2 Determining semi-finished or finished products that are derived from natural resources is not a straightforward process for the obvious reason that all manufactured goods are in a fundamental sense based initially on raw materials. For the purpose of this analysis, four finished products or product groups that in large part are based on the natural resource in its raw state are considered: cork, wood and paper products; wooden furniture; petrochemicals; and non-metallic mineral semi-manufactures and metal semi-manufactures.

3 For a detailed description of these measures, see http://r0.unctad.org/trains_new/tcm.shtm.

4 Annex 3 of the Marrakech Agreement states that: "The first four trading entities so identified (counting the European Communities as one) shall be subject to review every two years". Currently, the first four trading entities are the European Communities, the United States of America, Japan and China. For the other WTO members the procedure is as follows: "the next 16 shall be reviewed every four years. Other Members shall be reviewed every six years, except that a longer period may be fixed for least-developed country Members."

5 Note that export tax on re-exported goods, as well as statistical charge, guarantee fund, stamp duty, re-export tax, income tax, corporation tax, automation fee, exit duty, export development charge and consent fee were not taken into account.

6 The general rule of transparency (Article X of the GATT) applies to both duties and quantitative export restrictions, but there is no explicit obligation of notification pursuant to that article. There is a notification requirement for quantitative resetrictions under the Decision on Notification Procedures for Quantitative Restrictions adopted by the Council for Trade in Goods on 1 December 1995 (G/L/59). No export taxes have been notified under this Decision.

7 See for instance http://www.ifpri.org/sites/default/files/bp013Table01.pdf.

8 The value refers to the net sales in the industry of the acquired firm.

9 Recall that estimates are upper bounds and that the extent of the over-estimation may differ across countries. In addition, note that these data only refer to the coverage of export taxes and not to the degree of restrictiveness of the measure.

10 As discussed in Box 15, these results are based only on the ten countries that have notified quantitative restrictions to the WTO.

11 These articles define the general exceptions to the general elimination of quantitative restrictions. See Section E for a discussion on WTO rules on export restrictions.

12 For detailed information on export restrictions on strategic metals and minerals, see Korinek and Kim (2009).

13 Under the SCM Agreement, a subsidy involves a financial contribution by a government that confers a benefit specific to a firm or industry or group of firms or industries.

14 See OECD (2000).

15 Table 13 presents annual amounts of GFTs to the fisheries sector in 2006. Detailed figures covering 1996 to 2006 are presented in Annex Table 3.

16 Sumaila et al. (2009) find lower levels for capacity-enhancing subsidies in 2003. Including fuel subsidies, this category amounts to US$ 16.2 billion. Other categories of subsidies, such as those devoted to resource management, are of similar magnitude.

17 However, one shortcoming of the model used in these studies is that the monopolist supplier is assumed to be implausibly passive.

18 Note, however, that the overall output path can be tilted towards the present or away from it, when the importing and the exporting countries differ in terms of technologies or demand elasticities (Brander and Djajic, 1983).

19 See Figure 12 for a more detailed description of the equilibrium conditions in this set-up.

20 These types of strategies that depend only on the calendar time and the initial conditions are called "open loop strategies". In a theoretical model, Karp and Newbery (1992) show that it is possible instead to define time-consistent equilibria under Markov-perfect strategies, that is, in each period, each exporter chooses its current supply according to the remaining resource stock while each importer selects the tariff that maximizes instantaneous welfare, taking exporters' decisions (i.e. current aggregate supply) as given.

21 There appears to be no study that looks at the optimal path of export taxes on exhaustible resources. This sub-section therefore relies on the analysis of an export tax in a static framework to provide an understanding of its effects and the motivations behind it. For a discussion on the legal aspects of export taxes, see Section E.

22 It is interesting to note that in the case of non-renewable natural resources, especially oil, this is not an uncommon situation. In fact, many oil-exporting countries have only a minor local demand. In addition, since the marginal cost of extraction is negligible, the oil supply is likely to be price inelastic.

23 This policy may be welfare improving for the exporting country in the natural resources sector. Economic theory shows that in a partial equilibrium setting with perfect competition and constant returns to scale, the optimal export tax is the reciprocal of the elasticity of residual demand facing the exporting country (Dixit and Norman, 1980).

24 For an analysis of the impact of an export tax in a small country, see Gandolfo (1998), for example. In this set-up an export tax is welfare reducing for the country concerned.

25 See Section E.

26 For a detailed description of the economic effects of export taxes and the rationale for their use as a policy instrument in primary commodities in general, see Piermartini (2004).

27 The study defines as heavily dependent on a single commodity a country that presents a ratio of commodity exports to non-commodity GDP of above 10 per cent. In addition, it measures variability as the standard deviation of the de-trended log of commodity exports and commodity GDP.

28 A similar justification for the use of export taxes is used for the case of a large currency depreciation. There is generally strong political support for imposing an export tax at the time of a large currency depreciation. In these circumstances, exporters receive windfall gains and a tax on these gains is regarded as a means to increase government revenue, while responding to a principal of fair redistribution of income. It is worth noting that the large currency depreciation argument for taxation of exports justifies only temporary export taxes and potentially justifies taxation of all exports, including those commodities in respect of which the exporting country possesses no monopoly power.

29 The income multiplier refers to the fact that increased spending (private or public) has an impact on national income greater than the initial amount of spending.

30 See Section C.4.

31 For some evidence on the use of natural resource rents to subsidize the non-booming sector of the economy, see Sarraf and Jiwanji (2001) and Sachs and Warner (1995).

32 The infant industry argument is that new domestic industries may not be able to compete with well-established foreign firms simply because they do not have enough experience. Over time they can learn by doing, reduce their costs and be competitive in the international markets. However, due to the initial absence of expertise, if the government does not intervene (this can take the form of a trade barrier or a subsidy), the industry will never take off.

33 See sub-section D1 and the section on non-fuel commodity prices in the *World Trade Report* 2003 (World Trade Organization (WTO), 2003).

34 The same set-up has been used in Figures 12 and 32. Again, the quantity Q_S is the stock of the resource. Consumption in period 1 is measured along the horizontal axis from the left hand and in period 2 from the right. The vertical axes measure the prices in the two periods and D_1 and D_2 denote the demand curves in period 1 and 2, respectively. Under free trade, the equilibrium is at point E where, at a given price (in present value terms), demand in each period fully exhausts the stock.

35 Despite the extensive use of subsidies in non-renewable natural resources, there appears to be no study that uses a dynamic model to examine optimal subsidies for exhaustible natural resources. Therefore, any analysis of the rationale for and the effects of subsidies has to rely on traditional static models. A one-period model, where the supply curve is rigid and fixed at the level of the proven amount of a certain natural resource reserve, seems to provide a reasonable benchmark framework for the analysis (see Figure 31). However, the inter-temporal effects will depend on the time path of a subsidy.

36 This point can be illustrated by referring back to Box 16. Like an export tax, a consumption subsidy will shift the export supply curve (that is the residual supply net of the domestic demand for the resource) to the left. The new equilibrium will be in X, the world price will increase to P_X both in the foreign and domestic market, but domestic consumers will only pay part of this price, say P_D, where P_D is the world price of the resource net of the subsidy.

37 The incentive to explore will also depend on the certainty of contract conditions between the government and the exploring company as well as the allocation of extraction rights. Problems in this case arise because of the difficulty of governments to make credible commitments, thus creating time inconsistency problems (Collier and Venables, 2009).

38 See Section C.

39 See the discussion in Brander and Taylor (1997).

40 See Brander and Taylor (1998), pages 198-199.

41 This analysis abstracts from the terms-of-trade effect of an increase in the world price of the natural resource good arising from the application of the production tax.

42 Under uncertainty, and in the context of controlling a negative externality, price instruments are preferred if the marginal cost function is close to being linear or there is significant curvature in marginal benefit. Quantitative controls are preferred if the marginal cost function is highly curved and marginal benefit is constant.

43 Note, however, that the recent EU report on its own fisheries policy "Green paper on a reform of the Common Fisheries Policy" suggests developed country management systems often fall short too. See http://eur-lex.europa.eu.

44 Since the focus of this report is on trade in natural resources, instruments such as border tax adjustments or cap and trade systems will not be considered in this sub-section. Mostly, these policy instruments are not directly applied to natural resources *per se* but to final products or economic agents that use natural resources as intermediate inputs. For a description and analysis of these policy measures, see WTO-UNEP (2009).

45 The *ad valorem* Pigouvian carbon tax is defined as the specific Pigouvian carbon tax divided by the producer price for the resource, say oil. The time pattern of a specific tax will depend then on the time path of the *ad valorem* tax relative to the time path of the resource price.

46 Results on the optimal pattern of carbon taxes are also valid for the imposition of an import quota on petroleum (with a cap-and-trade scheme for consumers). Emission quotas are the main scheme for controlling carbon emissions under the Kyoto Protocol and the European Union emissions trading scheme.

47 See Ulph and Ulph (1994), Sinclair (1992), Grimaud and Rougé (2005) and (2008), Acemoglu et al. (2009) and Groth and Schou (2007).

48 See definition of flow and stock externalities in Section C.3.

49 This is true if zero extraction costs of a resource are considered.

50 Data from the Energy Prices and Taxes Report (2009) show that, for the United States, the EU and Japan the taxes on gasoline have increased respectively by 17 per cent, 40 per cent and 15 per cent.

51 See for instance Wirl (1994), Rubio and Escriche (2001), Liski and Tahvonen (2004) and Strand (2008).

52 This is true under the assumption that labour productivity of harvesting is large relative to the resource growth with respect to habitat size.

53 While not discussed here, eco-labels and environmental standards can also be applied in the context of non-renewable resources such as fossil fuels as well as on final products that use natural resources.

54 Voluntary standards set by a non-government entity also exist. An example of these voluntary standards is the ISO14000 on environmental management systems that can be applied to forestry management. For other examples on these standards, see WTO-UNEP (2009).

55 For a further analysis of this, see Nunes and Riyanto (2001).

56 Most voluntary eco-label schemes come from non-government entities. However, sometimes they are endorsed or followed by governments.

57 See definition of eco-labels in WTO-UNEP (2009), p. 120, and Greaker (2002).

58 See, for instance, Kapelianis and Strachan (1996), Pepper (2000), Teisl et al. (2002), Hemmelskamp and Brockmann (1997), Gudmundsson and Wessells (2000).

59 This is true under the assumption that there is perfect information between the government and the two firms. Rege (2000) shows that regulation may also help to reach an efficient solution in situations with a large number of firms where it is difficult for the government to detect cheating firms (firms that produce low quality but pretend to produce high quality). In addition, she shows that also a non-governmental party providing an eco-label scheme may be able to achieve similar environmental quality as governmental regulation.

60 This assumption is purely theoretical. The legal issues regarding the fact that environmental minimum standards could, in practice, be imposed on foreign firms are treated in Section E of this report.

61 In reality, instruments such as eco-labels and environmental standards are not considered by governments as mutually exclusive. For instance, an eco-label could be used to show compliance with a standard or to show if a product is exceeding the requirements set by a certain regulation.

62 The branch of economics studying how interest groups influence policy-making is called political economy. Seminal contributions include Olson (1965), Stigler (1971), Peltzman (1976) and Becker (1983). For applications to the formation of trade policies, see Hillman (1982) and Grossman and Helpman (1994).

63 For a more articulate discussion of Ascher (1999) and Becker (1983), see Deacon and Mueller (2004).

64 This abstracts from terms-of-trade effects, discussed in Box 16 above.

65 This political economy motive for trade policy is independent of the terms-of-trade considerations discussed earlier.

66 Sarraf and Jiwanji (2001). Davis (1994) notices that South Africa's trade policies have long sought to deflect its natural advantage in minerals by subsidizing manufacturing, a fact that might be attributed to the politico-economic consequences of the Dutch disease. See also Roemer (1985) and the related discussion in Section D.3.

67 Van der Ploeg (2006) argues that if the funds are used to stimulate R&D and education directly, this may be less of an issue.

68 It should be noted that Sachs and Warner's postulate is not entirely consistent with what we know about the wealthiest OPEC members. Amuzegar (2001) argues that these countries did have extreme interest in diversifying away from oil. They just had enough financial resources that they could attempt the first-best approach, subsidies and state-led efforts, rather than second-best trade policies. Sachs and Warner's explanation for the upward-sloping part of the U-shaped relation between openness and resource abundance may therefore not be correct, though the underlying statistical relationship is.

69 The weight given to special interest groups by the government may be interpreted as a measure of corruption. Throughout this section, "corruption", "special interest politics" and "political economy considerations" are therefore used interchangeably.

70 As noted in Section C.3, the use of natural resources can generate negative externalities such as environmental damage and habitat destruction, and it can also be treated as an externality itself.

71 This is the so-called "protection for sale" approach of Grossman and Helpman (1994).

72 Panel data analysis of agricultural land expansion over 1960–99 for tropical low and middle-income economies in Latin America, Asia and Africa.

73 The empirical results indicate, however, that increased resource-trade dependency leads to greater agricultural land expansion in a tropical developing economy.

74 Damania et al. (2003) consider the effect of liberalization on the optimal pollution tax. The results can, however, be applied to the rate of utilization of a natural resource. An increase in the optimal pollution tax is interpreted as an increase in the rate of conservation of the resource (reduction in the rate of utilization).

75 In the empirical analysis, Damania et al. (2003) find that there is also a significant interaction effect between corruption and trade liberalization: distorted trade policies increase the effect of corruption. Since corruption increases pollution (rate of resource conversion), this means that corruption and protection are complements in creating lax environmental policies (resource depletion). This is an instance in which protection has adverse effects on the management of natural resources.

76 There are other studies on the effect of trade openness on corruption. The conclusions are not clear-cut. Rauscher (1994) finds that trade openness may have ambiguous effects on lobbying intensity. Fredriksson (1999) finds that in a perfectly competitive sector, trade liberalization reduces (increases) both industry and environmental lobby groups' incentive to influence environmental policy if the country has a comparative disadvantage (advantage) in the polluting sector. In a related study, Bommer and Schulze (1999) argue that environmental policy is tightened by trade liberalization if the export sector is relatively pollution-intensive, but will be relaxed if the import competing sector is pollution-intensive.

77 Trade integration is measured as *de facto* nominal openness (ratio of exports plus imports over GDP). In order to control for reverse causality, institutions (rule of law) are instrumented using settler mortality as in Acemoglu et al. (2001).

78 The rule of law index of Kaufmann et al. (1999) measures the extent to which economic agents abide by the rules of society, perceptions of the effectiveness and predictability of the judiciary, and the enforceability of contracts.

79 Van Rijckeghem and Weder (2001) similarly suggest that strengthening the rule of law has beneficial effects on corruption. Measuring the quality of institutions with risk of expropriation, Mocan (2008) also finds that higher-quality institutions reduce corruption, measured as the incidence of being asked for a bribe. For a survey of the determinants of corruption, see Gunardi (2008).

80 This observation leads to interpret the results of Damania et al. (2003) with some caution. In their model, corruption is exogenously given. In a richer model where corruption endogenously decreases with trade liberalization, trade might be more likely to reduce resource utilization.

81 See Robalino and Herrera (2009).

82 Examples of such initiatives include debt-for-nature swaps and the World Bank's Global Environmental Fund (GEF). Debt-for-nature swaps usually involve a portion of national debt being converted at a discount to an environmental fund. GEF provides direct funding for environmental projects in four key categories: bio-diversity preservation, climate change, water pollution and ozone depletion. The distinguishing feature of these schemes is that the transfer is conditional upon environmental improvements being undertaken in the recipient nations.

83 Section D.5 has already discussed an exception to this result, arguing that the imposition of an import tariff by the exporter may worsen the habitat destruction externality.

84 For example, the United States has a Trade and Investment Framework Agreement (TIFA) with Saudi Arabia, whereby both countries have agreed to develop their international trade and economic relationship (Office of the United States Trade Representative (USTR), 2003).

85 This basic welfare analysis subsequently needs to take the consumption effects into account as well (Lipsey, 1957; Carbaugh, 2007).

86 The exception to this norm is agricultural commodities as several developed countries impose high tariffs on agricultural goods to protect their own farmers. However, agricultural commodities, with the exception of raw materials, are beyond the scope of this report.

87 There are nine existing RFMOs (Tarasofsky, 2007).

88 For instance, it is likely to help monitor illegally harvested fish from regulated fisheries, unreported or misreported fishing activities, and unregulated fishing by unknown vessels (Metuzals et al. 2009).

Annex Table 1: **Average applied and bound tariff rates in natural resource sectors, 2007** (per cent)

Market	Applied MFN duty					Bound duty								
	HS	Fishery	Forestry	Mining	Fuels	HS	Binding coverage[1]				Average			
							Fishery	Forestry	Mining	Fuels	Fishery	Forestry	Mining	Fuels
Afghanistan	HS02	4.3	4.2	5.0	4.2	-	-	-	-	-	-	-	-	-
Albania	HS02	0.0	0.1	2.5	8.0	HS96	100.0	100.0	100.0	100.0	0.0	0.3	2.8	9.4
Algeria	HS07	29.7	9.1	11.8	10.0	-	-	-	-	-	-	-	-	-
Angola	HS07	19.2	13.0	7.3	12.9	HS96	100.0	100.0	100.0	100.0	60.0	60.0	60.6	63.2
Antigua and Barbuda	HS96	22.5	5.0	3.9	5.8	HS96	0.0	100.0	100.0	100.0	-	50.0	50.4	53.4
Argentina	HS02	10.1	3.8	5.7	0.4	HS96	100.0	100.0	100.0	100.0	33.8	28.1	33.2	34.5
Armenia		.	.	.	.	HS96	100.0	100.0	100.0	100.0	15.0	1.0	5.5	5.0
Australia	HS07	0.0	1.3	1.0	0.3	HS96	100.0	100.0	99.6	97.4	0.6	1.4	2.1	2.7
Azerbaijan	HS02	11.1	6.2	4.4	7.3	-	-	-	-	-	-	-	-	-
Bahamas	HS02	26.1	23.7	32.7	32.2	-	-	-	-	-	-	-	-	-
Bahrain	HS07	3.2	4.7	4.8	5.0	HS96	0.0	17.0	59.5	13.2	-	35.0	35.0	35.0
Bangladesh	HS02	23.9	3.8	9.1	11.7	HS96	2.0	6.4	0.8	0.0	50.0	16.7	12.5	-
Barbados	HS02	32.9	7.4	5.6	8.4	HS96	0.0	100.0	100.0	100.0	-	70.0	71.2	79.3
Belarus	HS02	12.9	14.4	8.6	5.0	-	-	-	-	-	-	-	-	-
Belize	HS02	32.3	7.6	4.0	7.9	HS96	5.0	100.0	100.0	100.0	110.0	50.0	50.7	50.5
Benin	HS07	14.6	6.7	7.2	5.3	HS96	16.0	0.0	23.8	10.5	6.5	-	50.0	7.3
Bermuda	HS07	6.1	13.3	20.1	27.3	-	-	-	-	-	-	-	-	-
Bhutan	HS07	30.0	15.4	24.0	18.3	-	-	-	-	-	-	-	-	-
Bolivarian Rep. of Venezuela	HS02	19.3	7.0	6.5	6.6	HS96	100.0	100.0	100.0	100.0	31.7	32.9	32.9	35.0
Bolivia	HS02	10.0	8.7	8.2	7.7	HS96	100.0	100.0	100.0	100.0	40.0	40.0	40.0	40.0
Bosnia and Herzegovina	HS02	2.9	1.0	1.8	0.9	-	-	-	-	-	-	-	-	-
Botswana	HS07	4.6	0.2	1.3	2.5	HS96	0.0	100.0	98.0	2.6	-	4.3	5.7	0.0
Brazil	HS07	10.0	4.1	5.7	0.4	HS96	100.0	100.0	100.0	100.0	33.4	22.4	31.8	33.4
Brunei Darussalam	HS02	0.0	9.4	0.0	0.0	HS96	100.0	97.9	96.8	100.0	21.0	29.6	20.1	20.0
Burkina Faso	HS07	14.6	6.7	7.2	5.3	HS96	16.0	48.9	0.0	10.5	6.5	100.0	-	7.3
Burundi	HS02	8.3	9.4	5.9	7.4	HS96	5.0	0.0	0.4	0.0	6.0	-	5.0	-
Cambodia	HS02	19.2	10.2	8.9	7.3	HS96	100.0	100.0	100.0	100.0	23.8	23.1	18.6	18.0
Cameroon	HS07	24.5	21.4	11.8	10.3	HS96	0.0	0.0	0.0	-	-	-	-	-
Canada	HS07	0.8	0.1	0.7	1.9	HS96	100.0	100.0	100.0	81.6	1.1	0.1	1.9	3.6
Cape Verde	HS07	23.7	2.9	0.9	3.7	HS07	100.0	98.2	100.0	100.0	25.5	7.8	7.8	7.1
Central African Republic	HS07	24.5	21.4	11.8	10.3	HS96	0.0	0.0	42.5	100.0	-	-	34.6	30.0
Chad	HS07	24.5	21.4	11.8	10.3	HS96	0.0	0.0	0.0	-	-	-	-	-
Chile	HS02	6.0	6.0	6.0	6.0	HS96	100.0	100.0	100.0	100.0	25.0	25.0	25.0	25.0
China	HS07	10.9	0.9	3.6	5.3	HS96	100.0	100.0	100.0	100.0	10.9	1.7	3.8	5.7
Colombia	HS02	19.3	7.2	6.3	6.5	HS96	100.0	100.0	100.0	100.0	35.0	35.0	35.0	35.0

Annex Table 1: **Average applied and bound tariff rates in natural resource sectors, 2007** (per cent) continued

Market	Applied MFN duty					Bound duty								
	HS	Fishery	Forestry	Mining	Fuels	HS	Binding coverage[1]				Average			
							Fishery	Forestry	Mining	Fuels	Fishery	Forestry	Mining	Fuels
Congo	HS07	24.5	21.4	11.8	10.3	HS96	0.0	0.0	0.0	-	-	-	-	-
Congo, Dem. Rep. of	HS02	17.2	13.6	8.7	9.4	HS96	100.0	100.0	100.0	100.0	92.1	100.0	100.0	100.0
Costa Rica	HS07	8.9	1.7	1.0	4.1	HS96	100.0	100.0	100.0	100.0	46.2	36.9	45.0	45.0
Croatia	HS07	7.4	0.3	1.4	4.4	HS96	100.0	100.0	100.0	100.0	7.5	0.6	3.2	5.7
Cuba	HS02	4.6	2.1	5.0	2.6	HS96	10.0	14.9	7.9	34.2	2.8	0.0	1.8	1.4
Côte d'Ivoire	HS07	14.6	6.7	7.2	5.3	HS96	13.0	0.0	0.0	10.5	5.8	-	-	7.3
Djibouti	HS02	20.1	29.7	31.4	31.1	HS96	100.0	100.0	100.0	100.0	40.0	40.0	40.0	41.4
Dominica	HS02	29.3	5.3	3.5	6.1	HS96	0.0	100.0	100.0	100.0	-	50.0	50.0	50.0
Dominican Republic		.	.	.	.	HS96	100.0	100.0	100.0	100.0	40.0	40.0	33.7	40.0
Ecuador	HS02	19.2	6.6	5.8	5.5	HS96	100.0	100.0	100.0	100.0	29.0	15.7	16.5	15.6
Egypt	HS07	5.3	4.0	4.4	3.7	HS96	100.0	100.0	100.0	100.0	27.9	13.5	22.8	22.2
El Salvador	HS07	9.7	1.7	1.0	5.1	HS96	100.0	100.0	100.0	100.0	46.1	32.3	37.4	36.8
Equatorial Guinea	HS07	24.5	21.4	11.8	10.3	-	-	-	-	-	-	-	-	-
Ethiopia	HS02	12.6	1.0	9.2	5.8	-	-	-	-	-	-	-	-	-
European Union (27)	HS07	10.9	0.2	1.6	0.6	HS96	100.0	100.0	100.0	100.0	11.7	0.0	1.6	0.6
Fiji		.	.	.	.	HS96	0.0	0.0	3.6	0.0	-	-	40.0	-
FYR Macedonia	HS07	1.1	0.4	2.5	4.1	HS02	100.0	100.0	100.0	100.0	1.2	0.4	2.5	4.1
Gabon	HS07	24.5	21.4	11.8	10.3	HS96	100.0	100.0	100.0	100.0	15.0	15.0	15.0	15.0
Gambia	HS92	19.8	20.0	19.7	20.0	HS96	0.0	0.0	1.2	0.0	-	-	40.0	-
Georgia	HS02	0.0	0.0	2.9	0.0	HS96	100.0	100.0	100.0	100.0	0.4	6.1	7.1	12.0
Ghana	HS02	10.5	9.6	11.6	9.4	HS96	0.0	0.0	0.8	0.0	-	-	30.0	-
Grenada	HS96	28.7	7.4	5.6	7.5	HS96	100.0	100.0	100.0	100.0	50.0	50.0	50.0	50.0
Guatemala	HS07	9.7	1.8	1.0	4.7	HS96	100.0	100.0	100.0	100.0	41.1	27.6	43.4	41.3
Guinea	HS02	14.6	6.8	7.2	6.0	HS96	16.0	48.9	0.0	10.5	6.5	22.6	-	7.3
Guinea Bissau	HS07	14.6	6.7	7.2	5.3	HS96	100.0	100.0	99.2	0.0	50.0	50.0	50.0	-
Guyana		.	.	.	.	HS96	100.0	100.0	100.0	100.0	50.0	50.0	50.0	50.0
Haiti	HS96	0.9	0.0	1.3	0.2	HS96	35.0	48.9	79.0	100.0	25.7	11.3	15.8	10.4
Honduras	HS07	9.7	1.8	1.0	4.6	HS96	100.0	100.0	100.0	100.0	34.7	35.0	34.3	32.9
Hong Kong, China	HS07	0.0	0.0	0.0	0.0	HS96	100.0	95.7	75.4	10.5	0.0	0.0	0.0	0.0
Iceland	HS07	1.2	0.1	0.0	0.0	HS96	95.0	100.0	99.6	73.7	1.5	5.1	1.7	0.3
India	HS07	29.8	7.3	5.6	8.4	HS96	10.0	91.5	63.1	7.9	102.5	31.7	37.1	29.2
Indonesia	HS07	5.9	1.0	4.3	3.9	HS96	100.0	100.0	97.6	97.4	40.0	37.7	39.4	40.0
Iran, Islamic Republic of	HS02	18.0	4.7	7.3	7.6	-	-	-	-	-	-	-	-	-
Israel		.	.	.	.	HS96	51.0	97.9	87.3	78.9	4.9	5.1	6.5	4.7
Jamaica	HS07	30.1	5.2	1.4	6.7	HS96	100.0	100.0	100.0	100.0	50.0	48.1	46.2	49.6

Annex Table 1: **Average applied and bound tariff rates in natural resource sectors, 2007** (per cent) continued

Market	Applied MFN duty					Bound duty								
	HS	Fishery	Forestry	Mining	Fuels	HS	Binding coverage[1]				Average			
							Fishery	Forestry	Mining	Fuels	Fishery	Forestry	Mining	Fuels
Japan	HS07	5.5	0.5	1.2	0.8	HS96	90.0	87.2	99.6	94.7	5.0	0.6	1.2	2.5
Jordan	HS07	20.5	6.1	5.9	10.4	HS96	100.0	100.0	99.6	97.4	19.9	14.6	15.2	15.8
Kazakhstan	HS02	11.6	8.0	5.5	4.8	-	-	-	-	-	-	-	-	-
Kenya	HS02	25.0	2.8	6.3	7.3	HS96	45.0	0.0	0.0	0.0	62.0	-	-	-
Korea, Republic of	HS07	16.1	2.5	3.6	4.0	HS96	51.0	91.5	98.8	89.5	15.4	4.3	6.2	5.4
Kuwait	HS07	3.2	4.7	4.8	5.0	HS96	100.0	100.0	100.0	94.7	100.0	100.0	100.0	100.0
Kyrgyz Republic	HS02	10.0	0.0	3.6	5.0	HS96	100.0	100.0	99.6	100.0	10.0	0.6	5.9	8.5
Lao People's Democratic Republic	HS02	13.0	12.7	5.9	6.2	-	-	-	-	-	-	-	-	-
Lebanon	HS07	5.1	0.3	1.8	2.6	-	-	-	-	-	-	-	-	-
Lesotho	HS07	4.6	0.2	1.3	2.5	HS96	100.0	100.0	100.0	100.0	60.0	60.0	60.0	60.0
Macao, China	HS02	0.0	0.0	0.0	0.0	HS96	0.0	6.4	36.1	0.0	-	0.0	0.0	-
Madagascar	HS07	20.0	6.8	8.0	7.3	HS96	0.0	6.4	1.2	2.6	-	3.3	30.0	5.0
Malawi		.	.	.	.	HS96	86.0	6.4	2.4	0.0	40.0	46.7	36.7	-
Malaysia	HS02	1.9	2.3	2.4	0.3	HS96	55.0	80.9	63.1	23.7	8.2	10.0	10.3	10.6
Maldives		.	.	.	.	HS96	0.0	100.0	100.0	100.0	-	30.0	30.0	30.0
Mali	HS07	14.6	6.7	7.2	5.3	HS96	16.0	0.0	8.3	10.5	6.5	-	60.0	7.3
Mauritania	HS96	20.0	7.0	7.6	5.1	HS96	22.0	0.0	0.0	10.5	12.9	-	-	7.3
Mauritius	HS07	0.4	0.3	0.3	0.0	HS96	0.0	0.0	0.0	-	-	-	-	-
Mayotte	HS07	10.0	4.4	3.4	0.0	-	-	-	-	-	-	-	-	-
Mexico	HS02	16.8	6.4	6.6	5.4	HS96	100.0	100.0	100.0	100.0	34.8	32.3	33.6	33.5
Moldova		.	.	.	.	HS96	100.0	100.0	100.0	100.0	4.0	2.8	2.2	0.0
Mongolia	HS07	5.0	5.0	5.0	5.0	HS96	100.0	100.0	100.0	100.0	20.0	20.0	19.7	20.0
Montenegro	HS07	9.3	1.2	2.5	2.0	-	-	-	-	-	-	-	-	-
Morocco	HS02	47.8	18.8	12.2	11.2	HS96	100.0	100.0	100.0	100.0	40.0	35.4	39.3	34.5
Mozambique	HS02	19.8	6.0	4.2	4.4	HS96	0.0	0.0	0.0	-	-	-	-	-
Myanmar	HS02	8.4	8.7	3.1	0.8	HS96	0.0	0.0	17.9	21.1	-	-	20.0	25.0
Namibia	HS07	4.6	0.2	1.3	2.5	HS96	0.0	100.0	98.0	2.6	-	4.3	5.7	0.0
Nepal	HS07	10.8	7.4	9.7	11.1	HS02	100.0	100.0	100.0	90.2	21.5	15.2	22.2	18.4
New Zealand	HS07	0.4	0.6	0.8	0.2	HS96	100.0	100.0	100.0	97.4	1.3	1.7	3.5	1.1
Nicaragua	HS07	9.7	1.7	1.0	4.5	HS96	100.0	100.0	100.0	100.0	40.0	40.0	40.0	40.0
Niger	HS07	14.6	6.7	7.2	5.3	HS96	100.0	100.0	99.2	100.0	43.0	50.0	50.0	45.5
Nigeria		.	.	.	.	HS96	2.0	0.0	7.5	0.0	50.0	-	50.5	-
Norway	HS07	0.0	0.0	0.0	0.0	HS96	100.0	100.0	100.0	100.0	0.0	0.0	0.3	0.7
Oman	HS07	3.2	4.7	4.8	5.0	HS96	100.0	100.0	100.0	100.0	19.3	8.1	14.6	15.4
Pakistan	HS02	10.8	6.3	7.7	9.4	HS02	100.0	100.0	100.0	100.0	63.0	44.5	58.9	59.6

Annex Table 1: **Average applied and bound tariff rates in natural resource sectors, 2007** (per cent) continued

Market	Applied MFN duty					Bound duty								
	HS	Fishery	Forestry	Mining	Fuels	HS	Binding coverage[1]				Average			
							Fishery	Forestry	Mining	Fuels	Fishery	Forestry	Mining	Fuels
Panama	HS02	12.9	5.3	8.1	5.1	HS92	100.0	100.0	100.0	100.0	16.7	29.7	26.5	28.7
Papua New Guinea	HS02	23.1	7.8	0.0	0.0	HS96	100.0	100.0	100.0	100.0	55.0	69.4	22.6	24.3
Paraguay	HS02	10.1	3.8	5.6	0.4	HS96	100.0	100.0	100.0	100.0	35.0	32.9	34.5	33.0
Peru	HS02	12.0	9.0	8.5	6.7	HS96	100.0	100.0	100.0	100.0	30.0	30.0	30.0	30.0
Philippines	HS02	8.3	2.4	2.5	2.9	HS96	0.0	97.9	56.3	2.6	-	16.8	23.6	10.0
Qatar	HS07	3.2	4.7	4.8	5.0	HS96	100.0	100.0	100.0	100.0	15.0	15.0	17.7	15.0
Russian Federation	HS07	12.9	14.4	8.3	4.8	-	-	-	-	-	-	-	-	-
Rwanda		.	.	.	.	HS96	100.0	100.0	100.0	100.0	86.7	100.0	99.6	100.0
Saint Kitts and Nevis	HS96	11.9	4.9	2.3	6.6	HS96	0.0	100.0	100.0	100.0	-	70.0	70.0	70.1
Saint Lucia	HS96	29.8	7.3	2.2	5.7	HS96	79.0	100.0	100.0	100.0	116.3	51.6	50.4	54.5
Saint Vincent and the Grenadines	HS96	28.5	7.3	4.4	6.9	HS96	91.0	100.0	100.0	100.0	119.1	51.6	50.5	53.5
Saudi Arabia	HS07	3.2	4.7	4.8	5.0	HS02	100.0	100.0	100.0	100.0	10.6	7.8	13.2	13.6
Senegal	HS07	14.6	6.7	7.2	5.3	HS96	100.0	100.0	100.0	100.0	30.0	30.0	29.9	30.0
Serbia	HS02	8.7	1.2	3.1	2.1	-	-	-	-	-	-	-	-	-
Seychelles	HS92	89.8	4.2	0.0	0.0	-	-	-	-	-	-	-	-	-
Sierra Leone		.	.	.	.	HS96	100.0	100.0	100.0	100.0	50.0	50.0	49.8	50.0
Singapore	HS02	0.0	0.0	0.0	0.0	HS96	100.0	93.6	50.8	2.6	10.0	5.5	9.8	10.0
Solomon Islands	HS92	10.0	10.0	9.4	11.4	HS96	100.0	100.0	100.0	100.0	85.6	80.0	79.4	37.9
South Africa	HS07	4.6	0.2	1.3	2.5	HS96	0.0	100.0	98.0	2.6	-	4.3	5.7	0.0
Sri Lanka	HS07	14.7	3.8	5.3	5.8	HS96	100.0	27.7	2.4	15.8	50.0	13.5	53.3	24.2
Suriname		.	.	.	.	HS96	12.0	0.0	0.4	10.5	22.7	-	20.0	6.8
Swaziland	HS07	4.6	0.2	1.3	2.5	HS96	0.0	100.0	98.0	2.6	-	4.3	5.7	0.0
Switzerland	HS07	0.2	2.1	0.8	0.2	HS96	100.0	100.0	100.0	68.4	0.5	2.1	1.0	1.3
Taipei, Chinese	HS02	23.7	0.0	0.8	1.6	HS96	100.0	100.0	100.0	100.0	25.0	0.0	1.0	2.2
Tanzania	HS02	25.0	2.8	6.3	7.3	HS96	0.0	0.0	0.0	-	-	-	-	-
Thailand	HS07	13.5	0.9	1.2	1.3	HS96	98.0	59.6	56.7	10.5	13.7	10.7	18.6	23.0
Togo	HS07	14.6	6.7	7.2	5.3	HS96	0.0	0.0	8.7	0.0	-	-	80.0	-
Tonga		.	.	.	.	HS02	100.0	100.0	100.0	100.0	19.8	15.3	19.8	20.0
Trinidad and Tobago	HS07	30.3	5.2	1.0	6.3	HS96	100.0	100.0	100.0	100.0	50.0	41.1	41.0	47.7
Tunisia		.	.	.	.	HS96	3.0	51.1	20.6	2.6	43.0	20.9	35.7	27.0
Turkey	HS07	33.5	0.3	1.6	0.8	HS96	17.0	46.8	15.1	10.5	60.6	14.7	13.1	16.3
Uganda	HS02	25.0	2.8	6.3	7.3	HS96	9.0	8.5	0.0	0.0	50.0	50.0	-	-
Ukraine		.	.	.	.	HS02	100.0	100.0	100.0	100.0	3.3	0.6	4.0	6.7
United Arab Emirates	HS07	3.2	4.7	4.8	5.0	HS96	100.0	100.0	100.0	100.0	15.0	12.9	14.8	15.0
United States	HS07	0.9	0.1	1.2	0.3	HS96	100.0	100.0	100.0	97.4	1.0	0.0	1.2	0.4

Annex Table 1: **Average applied and bound tariff rates in natural resource sectors, 2007** (per cent) continued

Market	Applied MFN duty					Bound duty								
	HS	Fishery	Forestry	Mining	Fuels	HS	Binding coverage[1]				Average			
							Fishery	Forestry	Mining	Fuels	Fishery	Forestry	Mining	Fuels
Uruguay	HS02	10.1	3.7	5.3	0.4	HS96	100.0	100.0	100.0	100.0	35.0	25.0	33.2	35.0
Uzbekistan	HS02	5.0	8.9	14.1	10.9	-	-	-	-	-	-	-	-	-
Vanuatu	HS02	29.5	13.6	10.2	1.3	-	-	-	-	-	-	-	-	-
Viet Nam	HS02	32.2	1.4	1.9	4.2	HS02	100.0	100.0	100.0	100.0	18.4	1.5	3.2	8.2
Zambia	HS07	23.9	17.0	8.9	14.6	HS96	0.0	0.0	0.4	0.0	-	-	35.0	-
Zimbabwe	HS07	10.7	6.6	6.8	11.0	HS96	75.0	14.9	2.8	0.0	1.9	15.0	25.0	-

1 The binding coverage is calculated as the share of 6-digit subheadings containing at least one bound tariff line.
Note 1: For each country, national tariff lines are first averaged at the 6-digit level. The averages at the 6-digit level are then used to calculate the national average.
Note 2: The methodology used for calculating the ad valorem equivalents of non-ad valorem duties can be found in World Tariff Profiles 2006, pp 186-197.
Source: WTO Integrated Database and International Trade Centre.

Annex Table 2: **Applied MFN tariff rates of processed products, 2007** (per cent)

Country	Cork and paper	Petro-chemicals	Mineral-based semi-manufactures	Wooden furnitures
Afghanistan	5.3	4.5	7.7	10.0
Albania	0.1	1.2	9.4	0.0
Algeria	20.7	10.2	21.8	30.0
Angola	10.6	3.1	9.7	15.0
Antigua and Barbuda	8.9	4.2	9.5	17.5
Argentina	12.3	7.2	13.2	18.0
Australia	4.1	2.4	3.7	5.0
Azerbaijan	12.3	1.2	12.8	15.0
Bahamas	29.3	28.9	32.2	31.9
Bahrain	5.0	4.3	5.0	5.0
Bangladesh	20.1	6.2	17.8	25.0
Barbados	9.8	4.2	11.3	56.7
Belarus	14.0	8.2	13.7	31.7
Belize	10.1	1.8	9.9	27.5
Benin	12.2	5.1	17.0	20.0
Bermuda	20.7	18.7	20.7	22.3
Bhutan	19.8	10.0	21.4	50.0
Bolivarian Rep. of Venezuela	14.5	8.2	14.1	20.0
Bolivia	9.8	6.4	9.4	10.0
Bosnia and Herzegovina	6.3	2.9	7.9	10.0
Botswana	7.1	1.8	6.8	20.0
Brazil	12.4	7.1	13.4	18.0
Brunei Darussalam	3.4	0.0	0.4	5.0
Burkina Faso	12.2	5.1	17.0	20.0
Burundi	11.9	5.2	11.3	30.0
Cambodia	9.7	3.8	15.1	35.0
Cameroon	18.2	9.2	22.7	30.0
Canada	0.8	2.1	3.2	5.9
Cape Verde	9.7	0.0	11.4	50.0
Central African Republic	18.2	9.2	22.7	30.0
Chad	18.2	9.2	22.7	30.0
Chile	6.0	6.0	6.0	6.0
China	6.4	7.1	11.8	0.0
Colombia	14.5	8.0	13.6	20.0
Congo	18.2	9.2	22.7	30.0
Congo, Dem. Rep. of	15.4	7.4	15.3	20.0
Costa Rica	6.4	0.3	5.2	14.0
Croatia	1.3	1.6	6.8	4.6
Cuba	9.7	8.1	10.6	18.8
Côte d'Ivoire	12.2	5.1	17.0	20.0
Djibouti	30.5	28.4	30.0	33.0
Dominica	7.9	1.9	9.0	35.0
Ecuador	13.9	6.1	13.0	20.0
Egypt	12.5	2.2	12.7	30.0
El Salvador	6.6	0.5	5.6	15.0
Equatorial Guinea	18.2	9.2	22.7	30.0
Ethiopia	13.0	7.0	20.1	30.6
European Union (27)	1.2	4.2	3.0	0.7
FYR Macedonia	2.3	2.8	9.9	12.0
Gabon	18.2	9.2	22.7	30.0
Gambia	20.0	20.0	19.9	20.0
Georgia	0.0	0.0	1.7	0.0
Ghana	18.7	8.2	13.6	20.0
Grenada	8.9	4.2	9.5	17.5
Guatemala	6.8	0.4	5.5	15.0
Guinea	11.9	4.2	16.4	20.0
Guinea Bissau	12.2	5.1	17.0	20.0
Haiti	0.9	0.0	3.4	8.8
Honduras	6.8	0.3	5.5	15.0
Hong Kong, China	0.0	0.0	0.0	0.0

Annex Table 2: **Applied MFN tariff rates of processed products, 2007** (per cent) continued

Country	Cork and paper	Petro-chemicals	Mineral-based semi-manufactures	Wooden furnitures
Iceland	2.3	0.0	2.7	10.0
India	10.0	6.1	9.6	10.0
Indonesia	5.6	3.8	8.6	8.8
Iran, Islamic Republic of	21.7	7.0	25.3	55.0
Jamaica	5.8	0.2	6.7	17.5
Japan	1.1	2.4	1.1	0.0
Jordan	15.1	0.9	18.6	30.0
Kazakhstan	8.2	4.6	12.4	15.0
Kenya	20.8	1.1	16.0	25.0
Korea, Republic of	2.4	5.6	7.3	2.0
Kuwait	5.0	4.3	5.0	5.0
Kyrgyz Republic	0.0	1.0	5.2	2.5
Lao People's Democratic Republic	14.0	5.0	6.4	40.0
Lebanon	7.4	1.5	6.7	30.0
Lesotho	7.1	1.8	6.8	20.0
Macao, China	0.0	0.0	0.0	0.0
Madagascar	14.6	4.2	14.0	20.0
Malaysia	14.7	3.1	13.8	0.0
Mali	12.2	5.1	17.0	20.0
Mauritania	11.6	5.1	17.2	20.0
Mauritius	5.6	2.3	4.1	23.4
Mayotte	6.1	8.4	8.3	10.0
Mexico	9.7	5.4	13.0	16.6
Mongolia	5.0	5.0	5.0	5.0
Montenegro	4.5	1.5	5.8	10.0
Morocco	43.7	15.7	29.6	50.0
Mozambique	10.0	2.5	9.9	20.0
Myanmar	5.5	1.1	4.7	15.0
Namibia	7.1	1.8	6.8	20.0
Nepal	15.6	13.3	14.0	25.0
New Zealand	1.3	0.6	3.5	7.0
Nicaragua	6.5	0.3	5.4	15.0
Niger	12.2	5.1	17.0	20.0
Norway	0.0	0.0	0.0	0.0
Oman	5.0	4.3	5.0	5.0
Pakistan	20.3	8.7	19.2	25.0
Panama	7.7	0.4	9.0	15.0
Papua New Guinea	10.4	0.0	2.8	25.0
Paraguay	11.6	6.5	12.7	18.0
Peru	10.8	5.7	8.6	12.0
Philippines	7.2	3.6	7.1	15.0
Qatar	5.0	4.3	5.0	5.0
Russian Federation	14.0	8.0	13.5	32.4
Saint Kitts and Nevis	9.6	1.9	10.1	20.6
Saint Lucia	6.8	1.8	7.8	17.5
Saint Vincent and the Grenadines	8.9	1.9	9.0	17.5
Saudi Arabia	5.0	4.3	5.0	5.0
Senegal	12.2	5.1	17.0	20.0
Serbia	4.7	2.0	7.4	20.0
Seychelles	2.1	0.0	3.5	0.0
Singapore	0.0	0.0	0.0	0.0
Solomon Islands	10.1	7.4	9.3	10.0
South Africa	7.1	1.8	6.8	20.0
Sri Lanka	15.9	2.9	16.7	28.0
Swaziland	7.1	1.8	6.8	20.0
Switzerland	5.6	0.9	1.9	0.7
Taipei, Chinese	0.6	2.2	5.7	0.0
Tanzania	20.8	1.1	16.0	25.0
Thailand	7.5	3.8	11.3	20.0
Togo	12.2	5.1	17.0	20.0

Annex Table 2: **Applied MFN tariff rates of processed products, 2007** (per cent) continued

Country	Cork and paper	Petro-chemicals	Mineral-based semi-manufactures	Wooden furnitures
Trinidad and Tobago	5.8	0.2	6.7	17.5
Turkey	1.0	4.7	3.1	0.7
Uganda	20.8	1.1	16.0	25.0
United Arab Emirates	5.0	4.3	5.0	5.0
United States	0.7	2.7	2.6	0.0
Uruguay	11.0	6.0	13.2	18.0
Uzbekistan	16.4	8.6	18.5	30.0
Vanuatu	15.0	7.2	15.8	33.1
Viet Nam	19.3	2.3	19.0	36.9
Zambia	16.5	1.5	16.6	25.0
Zimbabwe	20.9	5.4	21.9	40.0

Note 1: For each country, national tariff lines are first averaged at the 6-digit level. The averages at the 6-digit level are then used to calculate the national average.
Note 2: The methodology used for calculating the *ad valorem* equivalents of non-*ad valorem* duties can be found in *World Tariff Profiles* 2006, pp 186-197.
Source: WTO Integrated Database and International Trade Centre.

Annex Table 3: **OECD government financial transfers to fishing** (USD millions)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Australia	37.4	41.2	..	..	82.3	75.9	78.0	95.6	95.6	46.3	90.0
Belgium	5.0	4.9	..	4.5	6.8	2.8	1.6	1.7	6.3	8.6	7.8
Canada	545.3	433.3	..	606.4	564.5	521.4	497.8	590.0	618.8	591.0	591.0
Denmark	85.8	82.0	90.5	27.8	16.3	..	68.8	37.7	28.5	58.1	113.2
Finland	29.0	26.2	26.9	19.2	13.9	16.5	16.0	20.2	19.4	24.8	23.4
France	158.2	140.8	..	71.7	166.1	141.8	155.3	179.7	236.8	126.2	113.8
Germany	81.6	63.2	16.5	31.3	29.8	29.0	28.2	33.9	18.3	30.9	30.7
Greece	52.3	47.0	26.9	43.0	87.3	87.0	88.3	119.0	35.5	61.0	79.6
Iceland	43.8	38.7	37.0	39.8	42.0	28.3	29.0	48.3	55.7	64.3	52.4
Ireland	112.7	98.9	..	143.2	..	..	63.6	65.0	21.4	22.1	29.4
Italy	162.6	91.8	..	200.5	217.7	231.7	159.6	149.3	170.1	119.2	119.2
Japan	3,186.4	2,945.8	2,135.9	2,537.5	2,913.1	2,574.1	2,323.6	2,310.7	2,437.9	2,165.2	1,985.1
Korea	367.8	379.0	211.9	471.6	320.4	428.3	538.7	495.3	495.3	649.4	752.2
Mexico	14.2	16.8	..	..	..	..	..	177.0	114.0	85.0	89.1
Netherlands	39.9	35.8	..	..	1.4	12.8	12.4	6.6	5.2	13.7	21.3
New Zealand	37.2	40.4	29.4	29.6	27.3	15.1	19.0	38.3	50.1	32.2	38.6
Norway	172.7	163.4	153.0	181.0	104.6	99.5	156.3	139.2	142.3	149.5	159.5
Portugal	71.8	65.1	..	28.7	25.6	25.1	24.9	26.9	26.9	32.8	29.3
Spain	246.5	344.6	296.6	399.6	364.1	376.6	301.9	353.3	256.6	433.8	425.4
Sweden	62.3	53.5	27.0	31.1	25.2	22.5	24.8	30.7	34.4	36.6	41.5
Turkey	28.7	15.1	..	1.3	26.4	17.7	16.2	16.3	59.5	98.1	133.9
United Kingdom	115.4	128.1	90.8	76.0	81.4	73.7	..	82.7	87.5	103.2	114.7
United States	891.2	1,002.6	1,041.0	1,103.1	1,037.7	1,169.6	1,130.8	1,290.4	1,064.4	..	2,128.8
OECD total	6,547.6	6,258.2	4,183.5	6,046.7	6,154.0	5,949.3	5,734.9	6,307.8	6,080.6	6,174.5	7,169.9

Source: Organization for Economic Co-operation and Development (OECD), 2009b.